

A GCSE Proposal Statement on Key Competencies in Sustainability

Guidance on the Accreditation of
Sustainability and Sustainability-
Related Programs in Higher Education



Global Council for Science
and the Environment

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GCSE Oath To Be Anti-Racist and Inclusive Through Sustained Learning, Action, and Accountability

The Global Council for Science and the Environment (GCSE) acknowledges that regardless of one's own race or ethnicity, individuals are at various points along an anti-racist journey. As an organization committed to becoming anti-racist and multicultural, GCSE will purposefully work to identify, discuss, and challenge issues of race, color, ethnicity, orientation, and the impact(s) they have on GCSE, its mission, its partner organizations, and its people. We accept this challenge as our continuous journey.

We explicitly and publicly **affirm** our identity as an anti-racist multicultural organization. We **resolve** to develop and work to implement strategies that dismantle racism within all aspects of our organization and society. We **commit** to recognize, address and oppose all forms of racism, injustice, oppression, intolerance, and hate.

Introduction

The rapid evolution of sustainability degree programs raises important questions for administrators, faculty, current and prospective students, and other stakeholders in the field of sustainability education in higher education.¹ These questions are related to quality, teaching and assessment standards, and processes of program and curricula design and evaluation. To address these areas and advance sustainability and sustainability-related programs in higher education, establishing a shared reference framework for a set of dynamic learning objectives is a key task for the field.

The Global Council for Science and the Environment (GCSE) has undertaken this task as part of a broader initiative to establish accreditation standards to strengthen sustainability and sustainability-related programs in higher education. The *Pathways toward Accreditation* initiative aims to enhance the quality, diversity, and impact of these programs. The initiative features several activities, in particular:

- this statement on the shared reference framework of key competencies in sustainability,
- the establishment of a Sustainability Education Leadership Advisory Council, and
- professional development opportunities for program leaders and instructors.

These activities will build towards a flexible, inclusive, and innovative approach to program accreditation that sets standards related to program-level learning objectives to provide dynamic guidance for programs toward quality, accessible, and context-sensitive teaching, learning, and assessment.

GCSE is uniquely qualified and situated to lead this effort. Currently, GCSE's membership includes more than 150 US and international academic institutions taking leading roles in the field of sustainability in higher education. GCSE's Leaders Alliance (formerly the Council of Environmental Deans and Directors) aims, as part of its mission, "to facilitate the formulation of goals, policies and objectives and provide advice and management for educational and research programs and facilities in environmental sciences and studies as well as related fields." This has led to a focus on advancing the program-level development, administration, and operation of sustainability and sustainability-related programs in higher education. Given this background, GCSE is positioned to provide guidance on learning objectives for these programs, while facilitating dialogue among stakeholders and collaborating with GCSE member institutions and other organizations to inform broader visions of progress in the field such as program accreditation.

¹ The field is recognized in the international discourse as sustainability education, education for sustainable development, education for sustainability, sustainable education, or environmental and sustainability education, among other terms. While there are meaningful differences between these terms, in this document we use "sustainability in higher education" to represent the range of terms. We make this choice for practical and conceptual reasons. Practically, "sustainability in higher education" seems to be the most common term used in the context of North American higher education. Conceptually, we suggest that "sustainability programs in higher education" encompasses the key dimensions of the relationship between sustainability and education as articulated by Sterling (2001): (1) education *about* sustainability, (2) education *for* sustainability, and (3) education *as* sustainability.

The Utility of Key Competencies in Sustainability for Higher Education Programs

In international practice, policy, and research, the development of sustainability competencies has been articulated as a key area of discourse related to sustainability in higher education.² Progress has been made to identify an interrelated set of key competencies in sustainability that are relevant as a shared reference framework for sustainability and sustainability-related programs in higher education.

The set of key competencies facilitates successful task performances that lead to positive outcomes that progress sustainability given what is known, valued, and aspired at a given moment in time (Wals, 2015). The key competencies in sustainability can be applied while working on specific sustainability challenges and opportunities in a range of contexts. Thus, key competencies in sustainability represent both an individual and collective capacity to address sustainability challenges. Additionally, the key competencies in sustainability offer a relevant framework to help shape potential learning objectives for sustainability and sustainability-related programs in higher education. The shared reference framework of key competencies in sustainability also provides a clear explanation of the distinguishing characteristics that graduates from sustainability and sustainability-related programs have compared to graduates from other programs. Box 1 provides further information and definitions of key terms related to this topic, based on Brundiens et al. 2021.

Box 1: Definitions of Key Terms

Sustainability Competency: An individual disposition comprising a cluster of interrelated knowledge, skills, as well as motives and attitudes that allow successfully completing a sustainability related task. In combination, sustainability competencies enable students to address challenges in a range of different contexts, including in sustainability-focused careers and professional settings, as well as personal contexts.

Key Competency in Sustainability: Combines *related* sustainability competencies into one distinctive and multidimensional competency. It entails complexes of interrelated knowledge, skills, and attitudes related to a shared function for successful task performance. Each key competency in sustainability contributes a specific and distinct function for successful problem solving of real-world sustainability challenges. In combination, the key competencies in sustainability are then functionally linked to support each step in collective and iterative sustainability problem-solving processes.

Shared Reference Framework of Key Competencies in Sustainability: A minimal set of distinct (non-overlapping), yet functionally interrelated key competencies, which are synthesized into an integrated perspective. This integrated set facilitates successful performance along the sustainability problem-solving process and a positive outcome that progresses sustainability, while working on a specific sustainability challenge in its context.

Competency Menu: Describes the concepts and methods entailed in a specific key

² Throughout the paper, information and discussion is borrowed and expanded upon from the work of Brundiens et al. (2021), which builds on Wiek et al. (2016) and Wiek et al. (2011).

competency in sustainability. These can be used to inform learning objectives related to the key competency (see Appendix). Includes the cognitive, behavioral, and social-emotional capacities entailed in the performance of the competency as described below (see Barth et al., 2007; Orr, 1992; Rieckmann, 2018; Sipos et al., 2008):

- **Knowledge/cognitive domain (head):** includes knowledge (definitions, theories, concepts) related to a competency and associated thinking skills, which are necessary to better understand the competency and the challenges in applying it.
- **Skills/behavioral domain (hands):** includes action-related and psycho-motor aspects of a competency (methods, processes), and associated skills used in applying it.
- **Affective/socio-emotional domain (heart):** includes socio-emotional dispositions, including both inter- and intra-personal aspects, such as attitudes, motivations, volition, and reflective abilities as they arise in applying it.

Research by international scholars (Brundiers et al. 2021) and a comprehensive literature review (Redman & Wiek 2021) show the emerging consensus around a shared reference framework of key competencies in sustainability. In recent years, increased activity has attempted to address the need for further consolidation of a standard set of key competencies in sustainability. This work has provided a foundation to focus on addressing the need to operationalize the key competencies in sustainability as associated learning objectives for sustainability and sustainability-related programs in higher education (Wiek et al. 2016). For example, the consensus study report published in 2020 by the National Academies of Sciences, Engineering, and Medicine (NASEM), entitled *Strengthening Sustainability Programs and Curricula at the Undergraduate and Graduate Levels*, presented several key findings and recommendations to outline ways forward for the field.

First, the report describes sustainability in higher education as a unique and significant field that is needed to educate students to address complex challenges in society. These needs position the field of sustainability in higher education as a specialized area of study, requiring its own set of learning objectives, teaching strategies and learning experiences, as well as assessments. The report emphasizes the necessity of defining the features and functions of this field:

Academic institutions of higher education should embrace sustainability education as a vital field that requires specifically tailored educational experiences and the development of core sustainability-focused competencies and capacities delivered through courses, majors, minors, certifications, research, and graduate degrees in sustainability. (NASEM, 2020, p.5)

Beyond advancing the goal of strengthening sustainability and sustainability-related programs across higher education, the NASEM report highlighted a fundamental shortcoming for institutions to achieve this objective. Specifically, it emphasized the need for a consolidated set of key competencies in sustainability, which can facilitate program design and evaluation:

Lack of a shared reference framework specifying the key competencies in sustainability presents a key limitation to fully characterizing the effectiveness of sustainability education. (NASEM, 2020, p.1)

The need for a shared reference framework to inform program-level learning objectives is at the core of potential advances for how institutions strengthen their efforts related to sustainability in higher education. Exploring the ways that sustainability and sustainability-related programs are “converging, diverging, or otherwise evolving” (NASEM, 2020, p.102) around the key competencies in sustainability will provide a more effective foundation for their implementation across a diverse range of contexts.

In recognizing these needs, GCSE aims to establish convergence on the key competencies in sustainability and better understand how these “competencies are translated into program-level learning outcomes, assessment tools, and effective curricula for a broad array of institutions of higher learning” (NASEM, 2020, p.102). This effort seeks to spur action in institutions to strengthen sustainability and sustainability-related programs and raise the quality, accessibility, and impact of the field of sustainability in higher education (see Box 3 for benefits of this work for different stakeholders).

Box 3: Benefits of a Shared Reference Framework on Key Competencies in Sustainability

A shared reference framework on key competencies in sustainability is essential to the advancement of sustainability and sustainability-related programs in higher education as it can contribute to benefits for a range of stakeholders. These benefits support enhancing the quality in these programs, and increase capacity for students to contribute to sustainability problem-solving processes. Articulating and adopting a shared reference framework on key competencies in sustainability can unlock various benefits for different groups of stakeholders:

- **Students:** Knowledge of key competencies provides guidance in selecting academic programs and charting their academic progression in pursuit of sustainability careers and personal capacities to contribute to sustainability.
- **Faculty:** Offers insights into relevant learning objectives related to sustainability that can be linked to a variety of topics and different formats of teaching and learning.
- **Instructional Designers:** Supports program, curriculum, and course development and evaluation processes by affirming relevant and rigorous learning objectives.
- **Administrators:** Enables clarity in recruiting students and promoting programs that link educational experiences to the professional opportunities and the potential for tangible impacts.
- **Employers:** Increases their understanding of the qualifications of graduates, drives market recognition of their skills and abilities, and generates demand for sustainability professionals.
- **Community:** Promotes stronger sustainability and sustainability-related programs that support the development of students as professionals and citizens who can advance sustainability in a range of contexts.

To meet the needs of stakeholders in and beyond higher education, GCSE is acting on the recommendations outlined in the NASEM report by promoting and seeking further input on a shared reference framework on the key competencies in sustainability. This framework, synthesized in 2011 (Wiek et al.) from the literature emerging since the early 2000s, has been

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reviewed in 2021 (Brundiens et al.) as part of an international Delphi study and of a comprehensive literature review (Redman & Wiek) respectively, and thus provides a robust basis for this effort of consolidating program-level learning objectives.

The GCSE participatory process can further contribute to strengthening sustainability and sustainability-related programs in higher education by enabling more robust program design and evaluation in an array of diverse institutions. Ultimately, the efforts of GCSE aim to lay the foundation for an accreditation process of sustainability and sustainability-related programs in higher education that provides flexible benchmarks across a diverse range of contexts while advancing inclusion, equity, and access to quality sustainability learning experiences.

Two Decades of Activities Informing the Proposal Statement

The interrelated framework of key competencies in sustainability presented in this statement builds from a rich set of efforts by researchers and practitioners. While these efforts are wide-ranging and represent a variety of perspectives in theory and practice, we present an overview of several key progressions in the discourse that have directly contributed to the GCSE Proposal Statement. Figure 1 presents an overview of milestones related to developing a shared reference framework of key competencies in sustainability since the early 2000.

Figure 1: Milestones related to developing a reference framework of key competencies in sustainability

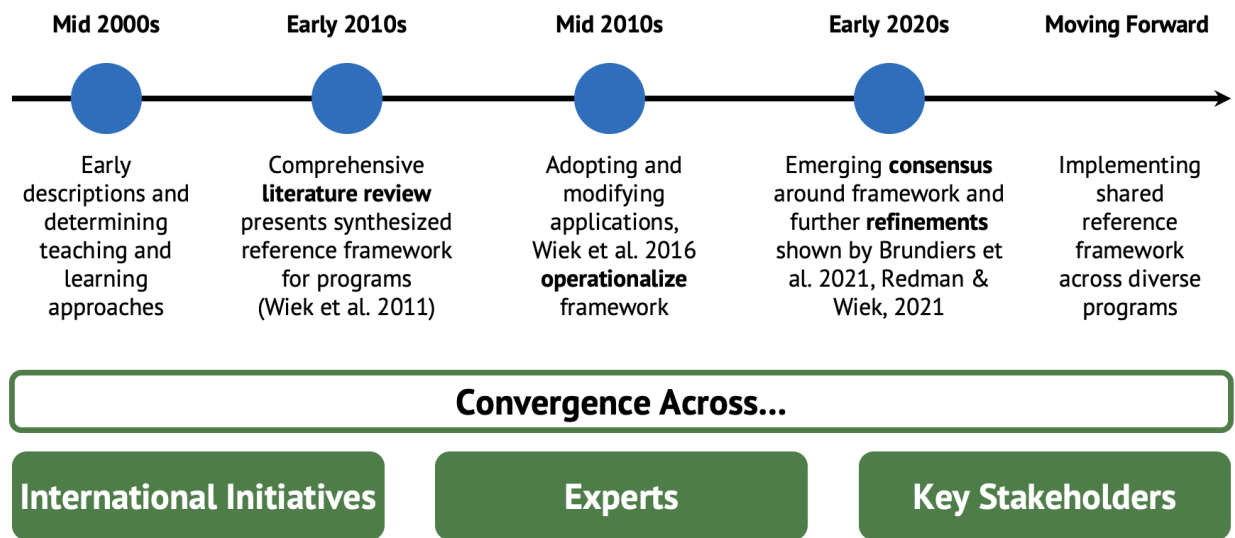


Figure 1 presents an overview of the development of the sustainability competencies literature since the 2000. It highlights key milestones and international work by practitioner organizations with regards to the shared reference framework of key competencies in sustainability as synthesized from the literature and refined through ongoing deliberations.

Mid 2000s: Preliminary attempts are undertaken to describe key competencies in sustainability problem-solving processes (de Haan, 2006) and determine teaching and learning approaches in higher education to promote their development (Barth et al., 2007).

Early 2010s: Wiek and colleagues (2011) synthesized theoretical and practical literature on sustainability competencies into an integrated framework of key competencies in sustainability. The framework serves as a reference for learning objectives for sustainability and sustainability-related programs in higher education. The framework includes five competencies:

- Systems thinking competency
- Futures thinking competency
- Values thinking competency
- Strategic thinking competency
- Interpersonal competency

Mid 2010s: The framework of key competencies is adopted and modified in a range of sustainability and sustainability-related programs in higher education. This leads to an effort to operationalize the key competencies in sustainability into learning objectives at novice/bachelor, intermediate/masters, and proficient/doctoral levels. Wiek and colleagues (2016) also proposed a sixth meta-competency, which explicitly pulls together the other five competencies in applying them to address complex sustainability problems:

- Integrated problem-solving competency

Early 2020s: Further work is undertaken to adapt the framework of key competencies in sustainability into practice, leading to both convergence and confusion in interpretation and implementation across different types of programs and institutions. A Delphi study of experts (Brundiens et al., 2021) confirmed agreement toward the existing framework and refined it by proposing two additional key competencies in sustainability:

- Intrapersonal competency
- Implementation competency

Moving Forward: A systematic literature review by Redman and Wiek (2021) found convergence among scholars and practitioners on the set of key competencies in sustainability. They presented a unified comprehensive framework to guide teaching, learning, and assessment in sustainability programs in higher education, while highlighting the need for consolidated implementation efforts by institutions. To support institutions in overcoming well known implementation challenges related to operationalizing competencies, aligning competencies and pedagogies, as well as assessing competency development, and professional success, practical guidelines were outlined in Wiek and Redman (2022).

To build from this background, GCSE and the Sustainability Education Community of Practice have undertaken several activities to inform this statement and demonstrate convergence around the key competencies in sustainability. These activities explored convergence (briefly summarized below):

- across international initiatives,
- across experts, and
- across key stakeholders.

Convergence across international initiatives: A series of international initiatives from various international contexts with different purposes, audiences, and levels of education were reviewed. This included efforts led by the United Nations Educational, Scientific and Cultural Organization (Rieckmann, 2018), the European Commission's Joint Research Center (2022), the Australian Council of Environmental Deans and Directors (Phelan et al., 2015), the Educating Future Change Agents Research Project (Barth et al. 2016)³, and the National Academies of Sciences, Engineering, and Medicine (NASEM, 2020). The initiatives demonstrated convergence on:

- what the key competencies in sustainability are,
- how they are necessarily interrelated,

³ See: <https://www.leuphana.de/en/research-centers/cgsc/research-projects/educating-future-change-agents.html>

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- their importance as a shared reference framework for learning objectives in the context of sustainability in higher education,
- the key role of values-thinking competence, and
- the efficacy of a diverse set of teaching and learning approaches to promote their development.

Convergence across experts: An expert-based, international Delphi Study was conducted to examine perspectives on the key competencies (Brundiens et al., 2021). The study found agreement on the key competencies outlined in the framework outlined by Wiek and colleagues (2011; 2016). In addition, the study:

- refined the definitions of the competencies and their operationalization at different levels,
- suggested two additional competencies: implementation competency and intrapersonal competency/mindset,
- identified values-thinking competency as a lead-competency used to orient both learning and problem-solving related to sustainability, and
- specified additional learning objectives for students interested in a career as a sustainability researcher beyond previous descriptions of objectives for sustainability professionals in general.

Convergence across key stakeholders: A series of presentations and workshops were held to engage with partners and stakeholders to receive feedback on the proposed framework. This included sessions with the following organizations: Association for the Advancement of Sustainability (aashe.org), Association for Environmental Studies and Sciences (<https://aessonline.org/>), Australian Council of Environmental Deans and Directors (<https://acedd.edu.au/>), National Academies of Science, Engineering, and Medicine (<https://www.nationalacademies.org/>), and the Sustainability Curriculum Consortium (<https://www.curriculumforsustainability.org/>). Overall, dialogue with key stakeholders indicated agreement on the key competencies in sustainability and support for a proposal statement to inform the practices of sustainability and sustainability-related programs in higher education.

Proposal Statements

Overview

The key competencies in sustainability shared reference framework provides guidance on the design and evaluation of program-level learning objectives. This supports program directors, instructional designers, and faculty to outline the competencies that graduates of sustainability and sustainability-related programs can gain through their cumulative higher education experience.

The following proposal statements are related to using the shared reference framework for program design and evaluation. Having this shared reference framework allows for creativity and context-sensitivity in applying it holistically at the program / curriculum level of a program, and, subsequently, on the course-level as its elements can inform course design, lesson plans, or assessments.

Four statements are proposed related to the shared reference framework on key competencies in sustainability:

- **Proposal Statement 1:** The shared reference framework **entails eight interrelated key competencies in sustainability**; each key competency entails a cluster of sustainability competencies that relate to each other as they contribute similar functions to sustainability problem-solving.
- **Proposal Statement 2:** The key competencies in sustainability are **interrelated within a framework** that describes the **functional contribution** of each key competency to major steps of collective and iterative **sustainability problem-solving processes and change agency**.
- **Proposal Statement 3:** Within the shared reference framework, **values-thinking competency holds a lead role** in orienting the application of the other competencies; emphasizing justice, equity, diversity, and inclusion; and identifying, acknowledging, negotiating, and reconciling diverse values with sustainability values.
- **Proposal Statement 4:** The shared reference framework with its eight interrelated key competencies provides dynamic and context-sensitive guidance on the **design and evaluation of program-level learning objectives** for sustainability and sustainability-related programs in higher education.

Thus, the proposal statements help to clarify the utility of the shared reference framework of key competencies in sustainability for two interrelated purposes: The shared reference framework can be used:

- to inform program-level learning objectives in context-sensitive ways, and
- to guide collaborative and iterative problem-solving processes for sustainability

In connecting teaching and learning in higher education with the real-world actions of sustainability professionals in the workforce, the shared reference framework can strengthen

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both what happens in sustainability and sustainability-related programs in higher education as well as practices in the workforce, where graduates apply their learning as professionals and citizens.

Proposal Statements

Proposal Statement 1

The shared reference framework entails eight interrelated key competencies in sustainability; each key competency entails a cluster of sustainability competencies that relate to each other as they contribute similar functions to sustainability problem-solving.

The shared reference framework constitutes a minimal set of distinct (non-overlapping), yet functionally interrelated **key** competencies in sustainability, which are synthesized into an integrated perspective. Key competencies in sustainability are not a “list” but are conceptually and practically applied in a holistic, integrated way. For students, developing the interrelated set of key competencies in sustainability facilitates achieving successful performance and a positive outcome that progresses sustainability, while working on a specific sustainability challenge in its context. This link to the performance of collective and iterative sustainability problem-solving processes suggests the relevance of the key competencies in sustainability as a shared reference framework for learning objectives for graduates of sustainability and sustainability-related programs in higher education.

The eight key competencies in sustainability include six previously identified and consolidated key competencies and two recently proposed key competencies in sustainability. Below, we present the eight key competencies in sustainability and provide a definition of the abilities that each entails.

Systems-thinking competency

- The ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different spatial and temporal scales (local to global; past, present, future), thereby considering change agents, cause-effect structures, cascading effects, inertia, feedback loops and interdependencies as well as other systemic features related to sustainability issues.

Futures-thinking competency

- The ability to collectively explore future developments and states, specifically to anticipate how sustainability problems might evolve or occur over time (scenarios), considering concepts such as inertia, path dependencies, and triggering events. It also includes the ability to collectively analyze, evaluate, and craft rich "pictures" of future visions, which provide a foundation for researching evidence-supported alternative development pathways.

Values-thinking competency

- The ability to collectively identify values, and to map, analyze and specify values as well as the ability to apply, reconcile, and negotiate sustainability values, principles, goals, and targets as well as trade-offs. As sustainability is an inherently normative concept, centered on intra- and intergenerational justice and equity among people and between

people and the environment, values-thinking competency includes the ability to engage principles and practices emphasizing concepts of justice, equity, diversity, and inclusion.

Strategic-thinking competency

- The ability to collectively design and plan to implement transformational (systemic) interventions, transitions, and transformative governance strategies toward sustainability while accounting for strategic leverage points, power dynamics, uncertainty and surprises as well as social and organizational learning in navigating these strategies.

Interpersonal competency

- The ability to motivate, enable, and facilitate collaborative and participatory sustainability research and collective problem-solving processes. Additionally, interpersonal competency is the ability to facilitate collective and inclusive co-production of knowledge and collaboration across academic disciplines (interdisciplinary collaboration), between academic and societal communities (transdisciplinary collaboration), and across diverse ways of knowing (epistemologies) and being (ontologies).

Intrapersonal competency/mindset⁴

- The ability to consciously and pro-actively engage as a change agent for sustainability. This involves the ability to be aware of one's own emotions, desires, thoughts, and behaviors as well as one's positionality in society and one's own role in the local community and (global) society. Building on this, intrapersonal competency involves the ability to reflect and act on that self-awareness and to regulate, motivate, and continually evaluate one's actions and improve oneself, drawing on competencies of emotional intelligence.

Implementation competency⁵

- The ability to collectively carry out and realize (on the ground) a planned solution over time working toward a sustainability-informed vision. This involves the ability to collaborate with others on monitoring and evaluating the realization process, and on addressing emerging challenges (adjustments), recognizing that sustainability problem-solving is a long-term, iterative process between planning, realization, adjustment and evaluation.

Integrated problem-solving competency

- The ability to select an appropriate problem-solving framework developed for complex sustainability problems, and to apply the selected framework to collective approaches that first, jointly develop viable solution options as a result of meaningfully integrating problem analysis, sustainability assessment, visioning and strategy building and, second, to jointly plan to implement the co-created solution options on the ground.

⁴ The classification of the intrapersonal competency as a competency or a mindset is still debated.

⁵ Drawing on Redman & Wiek (2021) and Wiek & Redman (2022)

Proposal Statement 2

The key competencies in sustainability are interrelated within a framework that describes the functional contribution of each key competency to major steps of collective and iterative sustainability problem-solving processes and change agency.

Beyond its implications for teaching, learning, and assessment, the shared reference framework of key competencies in sustainability is important as it organizes the key competencies around the major steps involved with collective and iterative sustainability problem-solving processes. The shared reference framework shows the functional contribution of each key competency in sustainability to sustainability problem-solving processes, and explains why and how the key competencies are interrelated with each other as part of these processes.

While sustainability problem-solving processes can be approached in a variety of ways, scholarly discourse has identified several common major steps (Lang & Wiek, 2016, 2021). These steps commonly include:

- a. analyzing and describing the current state and its history in its systemic complexity,
- b. framing (assessing) the problem as a sustainability problem,
- c. exploring the range of future states from business-as-usual/ non-intervention scenarios to desired future states, and assessing their respective contributions to sustainability,
- d. constructing a shared sustainability vision, and
- e. developing sustainability transition strategies.

The major steps provide the basis for co-creating solution proposals (applying integrated problem-solving competency) that address the problem (a, b) and enable progress towards the sustainability vision (d, e), while avoiding business-as-usual or other ‘undesired’ pathways (c, e). Considering the complexity and normativity entailed in each step, an integrated approach to multi-stakeholder collaboration is critical. Additionally, deep exploration of each step will produce new insights as well as ambivalence and ambiguity, which require revisiting and revising prior work and knowledge produced.

Figure 2 presents the shared reference framework of key competencies in sustainability as it relates to the major steps entailed in collective and iterative sustainability problem-solving processes. One or several key competencies might be involved in carrying out each step.

The figure outlines one way of sequencing the major steps and the associated key competencies in the process of generating sustainability solutions proposals. While the process depicted starts with analyzing the current state of the problem, other approaches (e.g., DeTombe, 2001; Loorbach, 2010; Scholz & Tietje, 2002; Rotmans et al., 2001) take variable strategies. For example, one approach (Robinson, 2003) begins by crafting a sustainability vision and “backcasting” from there to the current state, using the insights gained from this process to then develop sustainability transition strategies to achieve the sustainability vision. In these different problem-solving approaches, the key competencies in sustainability are interrelated to support the successful development and implementation of sustainability solution proposals.

Figure 2: The key competencies in sustainability reference framework (Brundiens et al., 2021)

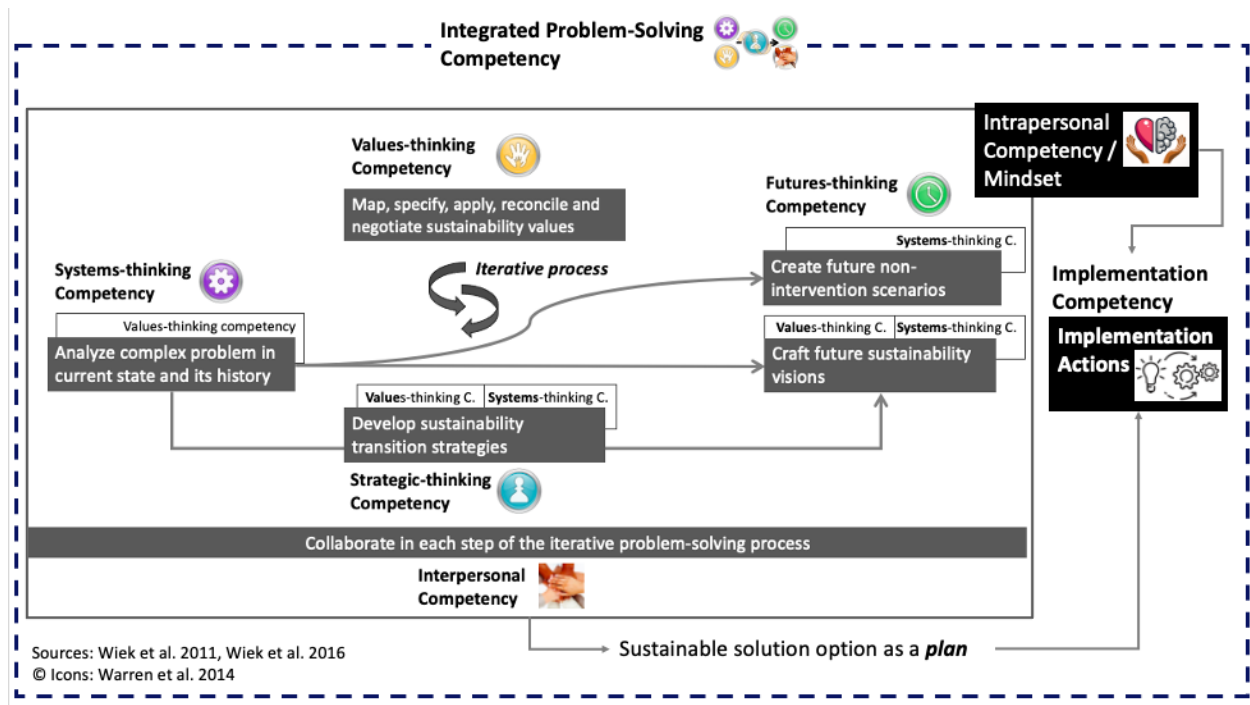


Figure 2 presents the refined “Shared Reference Framework of the Key Competencies in Sustainability” for higher education programs developed through the international Delphi Study (c.f., Brundiens et al. 2021). It details how the key competencies can be applied in the major steps of collective and iterative sustainability problem-solving processes. The figure is reproduced with permission from the authors: Brundiens et al. 2021, p. 9/17.

Each key competency makes a **functional contribution** to one or more of the major steps entailed in sustainability problem-solving processes.

Systems-thinking competency

- This key competency provides a critical foundation for understanding the increasing complexity and system dynamics in a globalized world through holistically analyzing and describing the historic developments and current state. With this foundation, systems-thinking competency supports anticipating future trajectories as well as identifying intervention or leverage points and crafting transition strategies.

Futures-thinking competency

- This key competency is critical for orienting planning activities, which in turn provides foundations for developing adaptation and mitigation responses, exercising precaution in decision making, and motivating change. Futures-thinking competency intersects with values-thinking competency to assess the sustainability of future states/scenarios and to develop visions, including sustainability vision. Visions represent what is desired and by whom and thus represent normative pictures of the future.

Values-thinking competency

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- This key competency is critical for each major step in the sustainability problem-solving process as it helps in identifying and understanding the diversity of values involved in a sustainability problem-solving process. This competency requires the ability to systematically identify and understand one's own values and social position as well as others' values and to consider alternative values based on values clarification. Additionally, values-thinking competence helps reflect on one's professional practice examining to what extent the values and beliefs claimed to guide sustainability problem-solving processes are put into action by those claiming them. Values-thinking competency demonstrates individual and collective ability to address and work with the values that are in front of us.

Strategic-thinking competency

- This key competency is critical for designing and planning to carry out solution proposals that can create transformational change. It intersects with values-thinking competency to design strategies that have transformational (systemic) impact toward sustainability as well as interpersonal competency to co-create these sustainability strategies in inclusive and equitable ways.

Interpersonal competency

- This key competency is a critical foundational ability for all other key competencies in sustainability. Considering the complexity of sustainability challenges and the need for holistic solution approaches, each key competency is described as the ability to facilitate collective action around analyzing current and future states and co-creating solution proposals. Thus, each major step along the sustainability problem-solving process involves a participatory approach, which requires successfully facilitated collaboration. Collaborative skills are essential to co-create transformational change, because collaboration co-creates knowledge, builds capacity, and develops shared ownership for the intervention strategies.

Intrapersonal competency

- This key competency is critical, as it centers human agency in sustainability problem-solving processes. These processes are intense, involving existential questions, which impact people's mental and physical health. Intrapersonal competency fosters abilities for self-care, building psychological, spiritual, and physical resilience for continuing sustainability work and extending care and compassion to others. Mindsets are the most effective leverage points to intervene when aiming for transformative (systemic) change (Meadows, 1999). Certain mindsets facilitate motivation for sustainability transformations more than others (Schwartz, 2022). Fostering the ability for self-awareness and self-regulation opens opportunities for awareness of one's own values and biases and how they shape choices related to sustainability.

Implementation competency

- This key competency is critical for taking action; for implementing a planned solution on the ground. (The planned solution is a thought product, resulting from the integrated

steps and associated competencies described above. It is the implementation of this solution proposal that can facilitate transformational (systemic) change across a range of different levels and settings (e.g., individual, group, institutional, social, etc.).⁶

Integrated problem-solving competency

- This key competency is a meta-competency demonstrating the ability to purposefully integrate the other competencies in support of collective and iterative efforts to solve complex sustainability problems and foster sustainable development.

⁶ See Wiek & Redman (2022) for differentiation between planning competencies and implementation competency.

Proposal Statement 3

Within the shared reference framework, values-thinking competency holds a lead role in orienting the application of the other competencies; emphasizing justice, equity, diversity, and inclusion; and identifying, acknowledging, negotiating, and reconciling diverse values with sustainability values.

Values-thinking competency is the main reference point within the framework of interrelated key competencies in sustainability as it “provides the normative orientation for all others, clarifying values embedded in all other competencies” (Brundiers et al., 2021, ix). Rather than prescribing certain values, this competency enables engagement with and clarification of values in sustainability problem-solving processes and facilitates negotiation and reconciliation across sustainability values. This lead role is crucial in: (1) collective assessments of the (un-)sustainability of current and/or future states of social-ecological systems, (2) the collective creation and crafting of sustainability visions for these systems, and (3) informing a sustainable design of transition processes and collaborative processes.

Moreover, the lead role of values-thinking competency reinforces the integrated nature of the framework and the specific, functional role of each of the key competencies in sustainability problem-solving processes. This normative orientation, and the interrelationship between values-thinking competency and the other key competencies, is a unique feature of the practice of sustainability that distinguishes the eight interrelated key competencies in sustainability from their use in other disciplines. The leading role of values-thinking competency also reflects an emphasis on justice, equity, diversity, and inclusion, which is crucial to dismantle white supremacy and structural racism and to advance sustainability solutions that incorporate the perspectives of and positively impact historically underrepresented communities across social, environmental, and economic domains.

Proposal Statement 4

The shared reference framework with its eight interrelated key competencies provides dynamic guidance on the design and evaluation of program-level learning objectives for sustainability and sustainability-related programs in higher education.

While the shared reference framework outlines the contribution of the interrelated key competencies in sustainability to problem-solving processes, the framework can also inform the design and evaluation of program-level learning objectives for sustainability and sustainability-related programs in higher education. On a local level for specific institutions, the information from the shared reference framework can be adapted and operationalized in context-sensitive ways to guide teaching, learning, and assessment. On a broader level for the field of sustainability in higher education, the shared reference framework can be used to guide standards for the accreditation of sustainability and sustainability-related programs. To this goal, the shared reference framework on key competencies in sustainability provides a foundation for the GCSE's *Pathways toward Accreditation* initiative by establishing program-level learning objectives for these programs, or the “what” to accredit. Ongoing and future work by GCSE will explore the process, or “how”, of accreditation.

To provide guidance on the design and evaluation of program-level learning objectives for sustainability and sustainability-related programs in higher education, learning objectives have been proposed for each key competency as well as competency menus, which provide the basic concepts and methods related to the specific key competency (Wiek et al. 2016). These competency menus can be used to operationalize learning objectives that clarify what students are able to do in order to demonstrate mastery of each key competency.

In the Appendix, we present a set of learning objectives and a competency menu for each key competency in sustainability⁷. These resources can provide dynamic guidance for the design and evaluation of program-level learning objectives by offering a starting point for understanding the key competencies in sustainability. The Appendix lists the learning objectives for the undergraduate (bachelor) levels. These learning objectives provide a baseline for developing basic literacy in each key competency. From this starting point, learning objectives build progressively towards the masters- and doctoral programs levels and reflect students' advanced and increasingly sophisticated understanding and application of the concepts and methods in participatory and transdisciplinary research processes (for a comparison of learning objectives for bachelor/novice, masters/intermediate, and doctoral/proficient levels, please see Wiek et al. 2016).

Adaptations and additions can be made to the learning objectives and competency menus on each level to ensure that the shared reference framework is operationalized in context-sensitive ways. In design and evaluation efforts, different combinations of key competencies, learning objectives, or concepts and methods from the competency menus can be selected. However, it is important that these efforts apply the key competencies in sustainability as an integrated framework. Focusing on how the interrelated set of key

⁷ Because implementation and intrapersonal competencies are recently proposed, scholarly work has not yet established convergence around learning objectives or concepts and methods related to these key competencies. Thus, this information is not provided for these key competencies, though future work will address this gap.

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competencies can be cultivated across a program-level learning experience allows students to develop basic literacy in each key competency and hone into higher levels of proficiency for select competencies related to their interests and topical areas of subject matter expertise. Through this integrated approach sustainability and sustainability-related programs in higher education can ensure that their graduates develop the abilities to succeed as professionals and contribute to collective and iterative sustainability problem-solving processes, while developing their own unique profiles.

Conclusion

This Proposal Statement represents a next evolution in the rich practical and scholarly discourse on the key competencies in sustainability. Building from several activities to demonstrate convergence on a shared reference framework, this work can provide guidance on the design, evaluation, and ultimately accreditation of sustainability and sustainability-related programs in higher education. From this context, we have offered four specific proposal statements about the key competencies in sustainability:

1. The shared reference framework entails eight interrelated key competencies in sustainability; each key competency entails a cluster of sustainability competencies that relate to each other as they contribute similar functions to sustainability problem-solving.
2. The key competencies in sustainability are interrelated within a framework that describes the functional contribution of each key competency to major steps of collective and iterative sustainability problem-solving processes and change agency.
3. Within the shared reference framework, values-thinking competency holds a lead role in orienting the application of the other competencies; emphasizing justice, equity, diversity, and inclusion; and identifying, acknowledging, negotiating, and reconciling diverse values with sustainability values.
4. The shared reference framework with its eight interrelated key competencies provides dynamic guidance on the design and evaluation of program-level learning objectives for sustainability and sustainability-related programs in higher education.

In this final section, we reflect on some of the potential considerations for applying the insights presented in this document. Then, we consider some of the possible implications of this effort for strengthening sustainability and sustainability-related programs in higher education.

Recommended Applications & Considerations

Building from the proposed shared reference framework on key competencies in sustainability, this section outlines how the framework can be put into action by program leaders, faculty, and instructional designers. We envision the shared reference framework as a tool to be used in guiding program design and evaluation across a range of institutional settings. The shared reference framework suggests possible program-level learning objectives, while also providing competency menus for each key competency that allow for flexible application that meets the needs and goals of specific contexts and stakeholders.

While the proposal statements outlined above suggest the “what” of possible learning objectives for sustainability and sustainability-related programs in higher education, they do not provide guidance as to “how” to structure the teaching and learning processes to promote and assess their development in students. With this caveat, this section provides some areas for recommended application of the key competencies in sustainability as well as considerations in these efforts to meet the specific, contextual needs and goals of diverse sustainability and sustainability-related programs in higher education.⁸ We suggest these possibilities as ways to operationalize the shared reference framework through a variety of adaptations, in a variety of contexts, and towards a variety of outcomes. Thus, these recommended applications and considerations should be considered as a vision of the potential utility of the shared reference framework and the tactics necessary for implementing it.

Table 1: Recommended Applications and Considerations

Recommended Application	Consideration
<p>Across a range of institutions and disciplines</p> <p>The framework aims to be relevant across the diversity of sustainability and sustainability-related programs in higher education within different institutional, cultural, and socio-ecological contexts. Different types of institutions and programs with different audiences of students, who bring different needs and positionalities to learning processes and sustainability, may engage with the framework and determine approaches to adapting it for use.</p>	<p>The shared reference framework details a range of cross-cutting concepts, methods, skills, and mindsets.</p> <p>The key competencies in sustainability are defined at the highest level of aggregation. As an umbrella of related competencies, they can be relevant across different sustainability learning experiences and practices. The framework may also be related to a variety of subjects, fields, and topical areas. This includes potential connections to other sustainability professional skills and basic academic competencies.</p>
<p>Across different levels and courses within sustainability programs</p>	<p>The shared reference framework informs program-level learning objectives rather</p>

⁸ See Wiek & Redman (2022) for more insights on this topic.

<p>The framework aims to enable program leaders, faculty, and instructional design staff to determine the level of depth that students engage with the key competencies in sustainability. While a basic overview of all key competencies in sustainability and their interrelations is needed, the framework can be used in targeting different combinations of key competencies at different times or fostering different levels of mastery throughout the program.</p>	<p>than guiding specific course-level learning objectives.</p> <p>At the course-level individual key competencies or combinations can be selected to guide teaching, learning, and assessment approaches. In this way, and through intentional program-level planning, students can cultivate the full set of key competencies in sustainability by progressing through different courses and levels within a program.</p>
<p>Across different pedagogies and assessments</p> <p>The framework aims to detail key competencies in sustainability that can inform program-level learning objectives. However, the ways that the key competencies are taught, learned, and assessed is not described in this Proposal Statement. There are a multitude of strategies for adapting and aligning learning objectives to suitable pedagogies and assessment formats, as well as linking them to professional success. These strategies are described in a robust practical and empirical discourse .</p>	<p>The shared reference framework outlines the interrelated key competencies in sustainability that can be promoted and assessed through a range of activities and approaches.</p> <p>Ensuring constructive alignment (Biggs, 1996) between learning objectives, pedagogies, and assessments is a fundamental step toward quality teaching and learning. Typical pedagogies in sustainability and sustainability-related programs in higher education emphasize experiential, problem- and solution-oriented learning opportunities, that are inter- and trans-disciplinary, participatory and collaborative, and that cultivate action-oriented and transformative outcomes (NASEM, 2020; Rieckmann, 2018; Sandri, 2020; SDSN, 2020). Typical assessments include self-perceiving-based, observation-based, and test-based methods (Redman et al., 2021).</p>

Toward Stronger Sustainability and Sustainability-Related Programs in Higher Education

This Proposal Statement aims to guide the advancement of sustainability and sustainability-related programs in higher education across a range of contexts. It provides insights on relevant and robust learning objectives for students of these programs, their design and evaluation, and how programs can support graduates to contribute to sustainability problem-solving processes as change agents. The Proposal Statement also builds the foundation for a dynamic approach to the accreditation of sustainability and sustainability-related programs in higher education.

As a next step, we invite input from GCSE member institutions, key stakeholders, and those from the broader community of stakeholders of sustainability education in higher education. GCSE deliberately seeks to create an open commenting period that includes all kinds of expertise beyond the often narrowly defined ‘academic’ subject matter experts. This open commenting process will be used to receive feedback on the proposal statements concerning the shared reference framework on key competencies in sustainability and its utility in program design and evaluation. Through this process, GCSE aims to highlight convergence around the shared reference framework and the ways that it can be operationalized in strengthening programs. The process will also seek to identify additional interpretations and ideas for implementation that reflect the diversity of sustainability and sustainability-related programs in higher education. Ultimately, GCSE hopes that this process of gathering input to elaborate upon the shared reference framework of key competencies in sustainability and its implications for practice can lead to new insights on how to support more robust program design and evaluation, which then enhances opportunities for the accreditation of programs and access to quality sustainability education across a multitude of contexts.

The possibilities engendered by stronger sustainability and sustainability-related programs in higher education are needed to respond to the urgent and complex sustainability challenges faced by current and future generations. As students progress through their higher education experiences, they will need to become equipped with the necessary capacities to contribute to sustainability problem-solving processes in both professional settings and in their personal lives. Thus, establishing relevant and rigorous sustainability-focused learning objectives for students must become a fundamental goal for higher education. The implications of this goal extend beyond approaches to teaching, learning, and assessment and into the pursuit of sustainable social, ecological, and economic futures for both local and global communities. We hope that this Proposal Statement offers a vision for what is needed for sustainability and sustainability-related programs in higher education, and the institutions that they are embedded within, to contribute to these sustainable, resilient, and equitable futures, particularly as these programs grow and evolve in their capacity to translate learning into sustainability impact. In collaboration with a broader community of stakeholders, GCSE is committed to advancing these efforts to actualize a diverse, shared, and dynamic vision of higher education’s future that meets the needs of students and society.

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Appendix

For each key competency in sustainability, except for intrapersonal and implementation as recently-proposed competencies that have yet to be fully described, we provide an overview. The overview entails the following parts:

- **Definition:** An explanation of what the key competency is, what it entails, and its general purpose (detailed in Proposal Statement 1).
- **Functional Contribution to Sustainability Problem-Solving:** An explanation of how the key competency is involved in facilitating steps in problem-solving processes (detailed in Proposal Statement 2).
- **Undergraduate Program-Level Learning Objectives:** A list of basic learning objectives that can be used in program design and evaluation (detailed in Proposal Statement 4). The learning objectives are listed in a progressiver order, starting with objectives fostering basic comprehension and literacy and ending with more demanding objectives that enable action and critical reflection. In guiding program design and evaluation, these learning objectives could potentially be selected or adapted to fit contextual needs and goals.
- **Competency Menu:** A list of the concepts and methods entailed in the competency that can also support program design and evaluation (detailed in Proposal Statement 4). The competency menus offer options to “pick & choose” concepts and methods in relation to the learning objectives for specific programs and their contextual needs and goals.

For illustrative purposes, consider reviewing the UN SDG: Learn platform, which offers a self-paced mini-assessment for each key competency in sustainability.⁹

⁹ The UN SDG: Learn platform (available at: <https://www.unsdglearn.org/microlearning/sdg-fitness-test/>) uses the same key competencies in sustainability as presented in this proposal statement. They call intrapersonal competency “self-awareness-competency” and they elevated “critical thinking competency” to a key competency in sustainability, whereas the proposal statement presents it as a general academic competency as critical thinking is relevant to any discipline.

Systems-Thinking Competency

DEFINITION

The ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different spatial and temporal scales (local to global; past, present, future), thereby considering change agents, cause-effect structures, cascading effects, inertia, feedback loops and interdependencies as well as other systemic features related to sustainability issues.

FUNCTIONAL CONTRIBUTION TO SUSTAINABILITY PROBLEM-SOLVING

This key competency provides a critical foundation for understanding the increasing complexity and system dynamics in a globalized world through holistically analyzing and describing the historic developments and current state. With this foundation, systems-thinking competency supports anticipating future trajectories as well as identifying intervention or leverage points and crafting transition strategies.

UNDERGRADUATE PROGRAM-LEVEL LEARNING OBJECTIVES

- Define key concepts of systems thinking that will be used when applying systems thinking
- Create basic systems diagrams of sustainability problems, using some empirical data to illustrate elements of the problem (e.g. adverse effects, feedback loops, stocks, processes, fluxes)
- Explain how sustainability problems have emerged (historical and spatial perspective)
- Describe how multiple, different intervention points are relevant for sustainability problem-solving
- Discuss how modifying a driver changes the problem constellation (how interventions in drivers play out in system)
- Describe some benefits of systems thinking in sustainability problem-solving
- Describe in principle how different personal (and professional) activities contribute to, or solve/mitigate sustainability problems

COMPETENCY MENU

Concepts	Methods
<ul style="list-style-type: none"> - Systems & system dynamics (incl. non-linearity, time lags, surprises, uncertainty, etc.) - Feedback loops, complex cause-effect chains (e.g., surface vs. root causes, attractors), cascading effects, thresholds, tipping and leverage points, legacy, inertia, resilience, adaptation, structuration, etc. - Variables/indicators, systems, sub-systems, structures, (e.g., 	<ul style="list-style-type: none"> - Descriptive methodologies (“thick” description, narrative research methods) - Modeling methods - Qualitative methods, e.g., concept maps, network analysis, and - Quantitative modeling and simulations, e.g., STELLA, Life Cycle Assessment (inventory component of LCA) - Institutional-, decision-, governance-, and social-systems analysis, actor analysis, constellations analysis, syndrome

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<p>archetypes), functions, elements/stocks and processes/interconnections/fluxes</p> <ul style="list-style-type: none">- People and social systems: values and attitudes, ideologies (White supremacy), preferences, needs, perceptions (collective), motives, actions and habits, decisions, power, tactics, politics, policies, laws, institutions, culture etc.- Across/multiple temporal and spatial scales: local to global, short to long-term- Across/multiple/coupled domains: society, environment (ecosystems), economy, technology, etc.	<p>approach and methods operationalizing CHAT (Cultural Historical Activity Theory)</p> <ul style="list-style-type: none">- Methods to identify archetypes, leverage points, intervention points for disruption- Participatory systems approaches, including participatory modeling and games- Geographic Information Systems
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Futures-Thinking Competency

DEFINITION

The ability to collectively explore future developments and states, specifically to anticipate how sustainability problems might evolve or occur over time (scenarios), considering concepts such as inertia, path dependencies, and triggering events. It also includes the ability to collectively analyze, evaluate, and craft rich "pictures" of future visions, which provide a foundation for researching evidence-supported alternative development pathways.

FUNCTIONAL CONTRIBUTION TO SUSTAINABILITY PROBLEM-SOLVING

This key competency is critical for orienting planning activities, which in turn provides foundations for developing adaptation and mitigation responses, exercising precaution in decision making, and motivating change. Futures-thinking competency intersects with values-thinking competency to assess the sustainability of future states/scenarios and to develop visions, including sustainability vision. Visions represent what is desired and by whom and thus represent normative pictures of the future.

UNDERGRADUATE PROGRAM-LEVEL LEARNING OBJECTIVES

- Define different concepts about the future, including long-/short-term views, and the meaning of possible, probable, plausible and desirable future states
- Describe the importance of inter-generational concepts for sustainability (e.g., intergenerational equity)
- Discuss how emotions, including hope and fear, influence futures thinking
- Discuss cultural differences in concepts of time and the future and their implications
- Describe the basic structure of futures thinking methods, including scenario construction, forecasting, and visioning
- Explain what types of knowledge these methods generate and how they can be used in sustainability problem-solving activities
- Outline basic scenarios and visions for one’s own lives and familiar systems (like one’s school) on different timescales; expand to more global perspective
- Describe some benefits of futures thinking in sustainability problem-solving
- Anticipate in principle how one’s personal life, as well as personal and professional activities might evolve over time (sketch trajectories) and how one’s personal and professional activities might contribute to, or solve/mitigate future sustainability problems

COMPETENCY MENU

Concepts	Methods
<ul style="list-style-type: none"> - Concepts of time including temporal phases (past, present, future), temporal scales (short, long), states, continuity (dynamics, paths), non-linearity - Concepts of future developments (predictions, scenarios, visions) and related epistemic status (probability, possibility, desirability) and uncertainty - Concepts of inertia, path dependency, 	<ul style="list-style-type: none"> - Backcasting and envisioning methods, e.g., story-telling and narrative research methods - Scenario methodology including modeling - Forecasting from statistical and simulation models

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<p>non-interventions vs. concepts of disruptive interventions and pathways</p> <ul style="list-style-type: none">- Concepts of consistency and plausibility of future developments, unintended consequences- Concepts of risk, intergenerational equity, cross-cultural perspectives precaution, anticipatory governance, biophysical limits- Concepts of creativity, imagination, “real utopias”- Concepts of emotions, e.g., fear and hope	<ul style="list-style-type: none">- Anticipatory multi-methodologies- Participatory (action research) anticipatory approaches (including Delphi and future workshop)- Iterative approach to dealing with the future, that is, as time passes one approaches the “future” and continually refines one’s concept of the future
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Values-Thinking Competency

DEFINITION

The ability to collectively identify values, and to map, analyze and specify values as well as the ability to apply, reconcile, and negotiate sustainability values, principles, goals, and targets as well as trade-offs. As sustainability is an inherently normative concept, centered on intra- and intergenerational justice and equity among people and between people and the environment, values-thinking competency includes the ability to engage principles and practices emphasizing concepts of justice, equity, diversity, and inclusion.

FUNCTIONAL CONTRIBUTION TO SUSTAINABILITY PROBLEM-SOLVING

This key competency is critical for each major step in the sustainability problem-solving process as it helps in identifying and understanding the diversity of values involved in a sustainability problem-solving process. This competency requires the ability to systematically identify and understand one's own values and social position as well as others' values and to consider alternative values based on values clarification. Additionally, values-thinking competence helps reflect on one's professional practice examining to what extent the values and beliefs claimed to guide sustainability problem-solving processes are put into action by those claiming them. Values-thinking competency demonstrates individual and collective ability to address and work with the values that are in front of us.

UNDERGRADUATE PROGRAM-LEVEL LEARNING OBJECTIVES

- Explain intra- and inter-generational equity and their importance for sustainability
- Differentiate intrinsic and extrinsic values
- Identify one's own values, preferences and norms (self- discovery)
- Learn to empathize with others holding different values
- Explain the influence of values on stakeholder actions and activities
- Identify value differences and trade-offs, e.g. among different courses of actions
- Explain key sustainability principles, why they are part of the overarching concept of sustainability, and how they will be used in values thinking (e.g., justice, equity, human dignity, fairness; social-ecological systems integrity, responsibility)
- Describe the basic structure of values-based methods. Incl. sustainability assessments and visioning; link these methods with the types of knowledge they generate and their use in sustainability problem-solving activities
- Describe some benefits of values-thinking in sustainability problem-solving
- Select indicators and targets to assess the sustainability effects / impacts of one's personal activities (life) as well as job activities and envision a sustainable future for one's personal activities (life) and profession (preliminary assessment)

COMPETENCY MENU

Concepts	Methods
<ul style="list-style-type: none"> - Value self-awareness (what do I value?) - Positionality, related privileges, 	<ul style="list-style-type: none"> - Envisioning methods (e.g., backcasting), note: select visioning elements represent

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<p>normalized oppression, and biases</p> <ul style="list-style-type: none">- Intrinsic vs. extrinsic values, worldviews, ethics, morals and moral obligations/ duties, religious values; legal pluralism, human and non-human rights etc.- Sustainability principles, goals, targets, thresholds (tipping points)- Concepts of justice (racial justice, White supremacy), fairness, equality, equity, responsibility, safety, happiness, wellbeing, social-ecological integrity, resilience, precautionary principle- (Un-)sustainability of past, current or future states, (un-)sustainability of current practices for ecosystem diversity and health, planetary boundaries- Concepts of risk, harm, damage, dissent, power relations, imbalances, hegemonies- Concept of reinforcing gains (“win-win”) and tradeoffs	<p>underlying values)</p> <ul style="list-style-type: none">- Individual values clarification methods (e.g., audit of individual or household energy consumption, moral dilemma discussions, role modeling)- Social values identification methods (e.g., surveys, interviews, focus groups, giving-voice-to-values, narrative research methods, philosophical debate, discourse analysis)- Multi-criteria assessment methods (normative component of assessment methods such as Life-Cycle Assessment, Multi-Attribute Utility Theory, sustainability indicators, cost-benefit analysis, etc.); note: select assessment criteria represent underlying values- Methods for power / equity analysis- Risk analysis- Sustainability efficiency analysis- Participatory methods (e.g. negotiation methods, reconciliation, consensus conference, collective-memory work, action research conversations)
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Strategic-Thinking Competency

DEFINITION

The ability to collectively design and plan to implement transformational (systemic) interventions, transitions, and transformative governance strategies toward sustainability while accounting for strategic leverage points, power dynamics, uncertainty and surprises as well as social and organizational learning in navigating these strategies.

FUNCTIONAL CONTRIBUTION TO SUSTAINABILITY PROBLEM-SOLVING

This key competency is critical for designing and planning to carry out solution proposals that can create transformational change. It intersects with values-thinking competency to design strategies that have transformational (systemic) impact toward sustainability as well as interpersonal competency to co-create these sustainability strategies in inclusive and equitable ways.

UNDERGRADUATE PROGRAM-LEVEL LEARNING OBJECTIVES

- Explain basic concepts of intentionality and decision- making
- Explain the basics of theories of change
- Explain the basics of concepts such as: barriers, power dynamics, assets, roles, effectiveness, etc. as part of the overarching concepts of sustainability transitions, social learning and organizational change
- Describe the basic structure of building strategies for change (strategies such as transitions, interventions, resilience and adaptation) towards sustainability
- Identify factors that affect the success or failure of transitions and interventions
- Create basic transition strategies that intervene in a defined system or problem constellation
- Describe some benefits of strategic thinking in sustainability problem-solving
- Explore strategies that could make sure that one’s personal and job activities positively contribute to sustainability transitions

COMPETENCY MENU

Concepts	Methods
<ul style="list-style-type: none"> - Intentionality, goals, objectives - Mitigation and adaptation - Leverage points (legal/regulatory, economic, social/educational) - Disruption, transgression, and creative destruction - Measures of success, viability, feasibility, effectiveness - Obstacles and barriers (resistance, reluctance, path dependency, habits, unintended consequences, inertia) - Synergies 	<ul style="list-style-type: none"> - Methods to design governance arrangements, policies, institutions, incentives and incentives structures - Methods to assess their effectiveness - Decision support methodologies - Transition management methodology - Organizational (change) management, including methods to support social learning and reflexivity - Participatory Action Research, - Methods to support changes in habits, behaviors and practices, including

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<ul style="list-style-type: none">- Instrumentalization and alliances (critical friends, stakeholder networks, power dynamics)- Social learning (real world implications, political understanding, intervention timing, tuning for audience)- Social movements, resource acquisition and mobilization	<p>social-emotional learning to develop emotional investment that generates motivation to act, and disruptive techniques</p> <ul style="list-style-type: none">- Methods to build networks, form connections, identify allies
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Interpersonal Competency

DEFINITION

The ability to motivate, enable, and facilitate collaborative and participatory sustainability research and collective problem-solving processes. Additionally, interpersonal competency is the ability to facilitate collective and inclusive co-production of knowledge and collaboration across academic disciplines (interdisciplinary collaboration), between academic and societal communities (transdisciplinary collaboration), and across diverse ways of knowing (epistemologies) and being (ontologies).

FUNCTIONAL CONTRIBUTION TO SUSTAINABILITY PROBLEM-SOLVING

This key competency is a critical foundational ability for all other key competencies in sustainability. Considering the complexity of sustainability challenges and the need for holistic solution approaches, each key competency is described as the ability to facilitate collective action around analyzing current and future states and co-creating solution proposals. Thus, each major step along the sustainability problem-solving process involves a participatory approach, which requires successfully facilitated collaboration. Collaborative skills are essential to co-create transformational change, because collaboration co-creates knowledge, builds capacity, and develops shared ownership for the intervention strategies.

UNDERGRADUATE PROGRAM-LEVEL LEARNING OBJECTIVES

- Explain general concepts critical to interpersonal interactions, including listening, oral/written communication, negotiation, conflict management and resolution, teamwork, stake-holder engagement; empathy etc.
- Describe the basic types, phases and techniques of teamwork and stakeholder engagement in sustainability projects
- Explain the what interdisciplinary and transdisciplinary collaboration mean
- Work effectively and respectfully in teams on simple projects, employ teamwork and project management concepts and tools
- Identify different groups of stakeholders relevant to a particular project
- Conduct stakeholder interviews in lower-risk settings and identify and empathize with different perspectives and values
- Participate in stakeholder engagements in supportive roles to allow for participatory observation/learning and practicing
- Identify for each of the different groups of stakeholders relevant to a particular project the appropriate communication approach (medium, language, message) to engage them
- Describe some benefits of interpersonal competency in sustainability problem-solving
- Explain the basic benefits of listening, communication, teamwork, stakeholder engagement, and other interpersonal skills for one's personal (social) activities, civic engagements and professional job

COMPETENCY MENU

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Concepts	Methods
<ul style="list-style-type: none"> - Functions, types, and dynamics of collaboration and stakeholder engagement (within and beyond academia; interdisciplinarity, transdisciplinarity) - Strengths, weaknesses, success, and failure in teams; different levels of teamwork (ranging from information exchange to co-creation) - Concepts of leadership (incl. personal and interpersonal leadership, e.g., distributed, transformative, pedagogic leadership) - Concepts of trans-cultural thinking, pluralism, diversity - Limits and opportunities of cooperation, competition and empathy (on individual and group level), compassion - Concepts of solidarity, ethnocentrism, deceneration, address all kinds of bias towards the ingroups - Concepts of conflict management - Concepts of emotional intelligence and multiple-intelligences framework 	<ul style="list-style-type: none"> - Stakeholder analysis (e.g., interest vs. power matrix, who to include, why/why not?) - Participatory methods, involving stakeholders, including negotiation, mediation, deliberation, constructive conflict management methodology, consensus strategies, cooperative inquiry, integrative design; require methods for group facilitation - Participatory methods for the reflection on group processes and structures - Teamwork methods, including communication (written, verbal, non-violent communication), and methods to resolve conflicts in teams - Methods for mindfulness, compassion and empathy building to minimize the influence of emotions in responsible decision making or enhancing capacities to engage in discussion with open-mindedness and in a non-judgmental manner - Interdisciplinary and transdisciplinary research approaches, participatory action research

Integrated Problem-Solving Competency

DEFINITION

The ability to select an appropriate problem-solving framework developed for complex sustainability problems, and to apply the selected framework to collective approaches that first, jointly develop viable solution options as a result of meaningfully integrating problem analysis, sustainability assessment, visioning and strategy building and, second, to jointly plan to implement the co-created solution options on the ground.

FUNCTIONAL CONTRIBUTION TO SUSTAINABILITY PROBLEM-SOLVING

This key competency is a meta-competency demonstrating the ability to purposefully integrate the other competencies in support of collective and iterative efforts to solve complex sustainability problems and foster sustainable development. .

UNDERGRADUATE PROGRAM-LEVEL LEARNING OBJECTIVES

- Define general concepts of transition, transformation, etc.
- Describe local or prominent cases of social movements and organizational change
- Apply one problem-solving framework to a defined sustainability problems
- Describe how sustainability problem-solving competence integrates the five other competencies
- Give one example for combining:
 - systems-thinking with one of the other competencies
 - futures-thinking with one of the other competencies
 - values-thinking with one of the other competencies
 - strategic thinking with one of the other competencies
 - intrapersonal competence and interpersonal competence with one of the other competencies
- Describe some benefits of integrated sustainability problem-solving competency in sustainability problem-solving processes
- Identify how sustainability problem-solving competence is critical in activities in activities of one’s own life, internships, and in and professional jobs

COMPETENCY MENU

Concepts	Methods
<ul style="list-style-type: none"> - Transitions and transformations (and other change dynamics) - Roadblocks and barriers - Triggers and supporting factors - Social movements and organizational change (learning) - Power, politics, authority in transition processes 	<ul style="list-style-type: none"> - Transition management and governance - Organizational change management - Intervention research methodology - Integrated foresight and backcasting - Transformational planning methodology - Transdisciplinary case study - Transformational sustainability research framework