Sustainability competencies in 21st century higher education

Strengthening Sustainability Programs and Curricula at the Undergraduate and Graduate Levels
NAS
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Focusing on program level core competencies (Program-Level Learning Outcomes) addresses how our sustainability programs and their PLLOs relate to larger frameworks:

- **institutional frameworks**: general education and the 21st century student
- **sustainability frameworks** like SDGs

our roles as sustainability educators

how we differentiate our graduates from those of other 21st century, interdisciplinary programs
### Working through the layers, general to specific

1) **Education in the 21\textsuperscript{st} century**  
   general competencies and frameworks

2) **STEM higher education framework**

3) **Education for sustainable development/sustainability**  
   core competencies  
   core competencies in sustainability

4) **Pedagogies and learning activities in sustainability**  
   teaching and learning environments  
   educator and student  
   transparency of competencies and learning outcomes  
   normative competencies and the challenges of assessment  
   developing change agents working professionals and scholars

5) **Ongoing activities**

### Discussion and questions
A transformative learning environment

- Focus on self-organization: shape and organize their own working and learning environment, define "how to play"
- Peer-to-peer learning: students share knowledge and expertise; work together on various projects
- Collaboration with different stakeholder groups of the region
- Open house rule of a learning and development space – communication and mutual social learning

Krasny et al., 2010
Competences, within a framework

• a cluster of specific abilities (a number of related abilities per competency)

• “ability to use knowledge” – encompassing – information, understanding, skills, values, and attitudes – in specific contexts and to meet demands.”

• students’ “capability to adapt and to respond” to “changes in the world today, [which are] characterized by new levels of complexity and contradiction.”

UNESCO 2015
core competencies

- **Core or key** competencies “can be described as a **set of sub-competencies** from distinctive competence classes such as”
  - personal, professional-methodological, social-communicative and action competencies (c.f., Erpenbeck & Heyse 1999)
  - UNESCO four pillar approach ‘Learning, the treasure within’ (Delors 1998)

- **Learning to know, do, be, live together**
assessment driven

all levels of learning

P21 or C21 general framework

skills for the current workforce

problem-based learning
co-operative learning
experiential learning
special focus on information & communication technologies (ICT)

cognitive skills
Knowledge of Human Cultures and the Physical and Natural World
Sciences, mathematics, social sciences, humanities, histories, languages, arts
*Focused* by engagement with big questions, both contemporary and enduring

**Intellectual and Practical Skills:**
• Inquiry and analysis
• Quantitative literacy
• Information literacy
• Teamwork and problem solving
*Practiced extensively*, through progressively more challenging problems, projects

**Personal and Social Responsibility:**
• Civic knowledge and engagement—local and global
• Intercultural knowledge and competence
• Ethical reasoning and action
*Anchored* through active involvement with diverse communities and real-world challenges

**Integrative and Applied Learning:**
• Synthesis across general and specialized studies
*Demonstrated* by the application of knowledge, skills, and responsibilities to new settings
Cognitive competencies
  knowledge
  processes & strategies
  (critical thinking, analysis, problem-solving)
  creativity

Interpersonal competencies
  leadership
  collaboration, communication, teamwork

Intrapersonal competencies
  intellectual openness (adaptability, cultural awareness, curiosity responsibility)
  work ethic/conscientiousness
  self-regulation, stability
Comparing general frameworks

Table 4. Similarities and differences between frameworks.

<table>
<thead>
<tr>
<th>Mentioned in all frameworks</th>
<th>Mentioned in most frameworks (i.e. P21, EnGauge, ATCS, and NETS/ISTE)</th>
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</thead>
<tbody>
<tr>
<td>Collaboration</td>
<td>Creativity</td>
</tr>
<tr>
<td>Communication</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>ICT literacy</td>
<td>Problem-solving</td>
</tr>
<tr>
<td>Social and/or cultural</td>
<td>Develop quality products/</td>
</tr>
<tr>
<td>skills, citizenship</td>
<td>Productivity (except in ATCS)</td>
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Overall focus on cognitive and academic skills but also recognize some interpersonal competence.
no mention of interdisciplinarity, community engagement or engagement in sustainability challenges, but indicates that service or community-based learning is a “high-impact practice”
Transformational pedagogy typically includes:

- action-oriented, inquiry-based learning
- systems-based learning
- integrated, holistic approaches
- creative use of technology

The 21st century education agenda lacks:

- attention to the sustainability context of social and environmental challenges
- acknowledgement of the existence of planetary limits to old style economic growth

Lozano et al., 2017
“ESD* is a learning process based on the principles that underlie sustainability and is concerned with all levels and types of learning to provide quality education and foster sustainable human development –

- **learning to know** (a way of thinking),
- **learning to be** (a way of being),
- **learning to live together** (a way of co-existing),
- **learning to do** (a way of acting)
- **learning to transform oneself and society.”

*education for sustainable development is a preferred international term, for our purposes synonymous with sustainability education*

The Competences for educators in education for sustainable development

Learning to know
The educator understands...

- The basics of systems thinking
- The interdependent nature of relationships within the present generation and between generations, as well as those between rich and poor and between humans and nature
- Their personal world view and cultural assumptions and seek to understand those of others
- The connection between sustainable futures and the way we think, live and work
- Their own thinking and action in relation to sustainable development

Learning to do
The educator is able to...

- Create opportunities for sharing ideas and experiences from different disciplines/places/cultures/generations without prejudice and preconceptions
- Work with different perspectives on dilemmas, issues, tensions and conflicts
- Connect the learner to their local and global spheres of influence

Learning to be
The educator is someone who...

- Person, pedagogy and education
- Why there is a need to transform the education systems that support learning
- Why there is a need to transform the way we educate/learn
- Why it is important to prepare learners to meet new challenges
- The importance of building on the experience of learners as a basis for transformation
- How engagement in real-world issues enhances learning outcomes and helps learners to make a difference in practice

Learning to live together
The educator works with others in ways that...

- Actively engage different groups across generations, cultures, places and disciplines
- Facilitate the emergence of new worldviews that address sustainable development
- Encourage negotiation of alternative futures
- Challenge unsustainable practices across educational systems.

Framework for education in sustainable development
Progressing through the sustainability problem-solving framework and levels of competence attainment

transdisciplinary learning processes (adapted from Lang et al., 2012)
• literature on competencies in education for sustainability, "is characterized by a sea of labels, terminological confusion, and relative inattention to pedagogic implications.”
  Sterling, S., Glasser, H., Rieckmann, M., & Warwick, P. (2017, 153)

• “synonymous concepts are, for example, skills and qualifications, literacy and capabilities. What they all have in common is a focus on the abilities that allow us to master even unforeseen demands and thus distinguish themselves from ‘laundry lists’ of abilities, which we typically find with certain job profiles.
  Barth (2015, 61)

• “miscommunication or misunderstanding of concepts within this field of enquiry is contributing to slow progress towards the objectives of HESD (higher education for sustainable development)”
Core Competencies in Sustainability

“functionally linked complexes of knowledge, skills, and attitudes that enable successful task performance and problem solving with respect to real-world sustainability problems, challenges, and opportunities.”

Sustainability competencies and learning activities

- Sustainability education as learning to collectively address sustainability challenges

- SDGs as an assemblage of sustainability challenges to address
Sustainability Problem—Solving

6 Core Competencies in Sustainability

- Systems Thinking Competence
- Futures Thinking Competence
- Values Thinking Competence
- Strategic Thinking Competence
- Interpersonal Competence
- Problem-Solving Competence

Source: Wiek et al. 2011 © icons by SSFT
Sustainability Problem—Solving Capacity

Pedagogy can address the noise in helping students understand and attain sustainability competence

“where terms are drawn from... established usage in the educational literature and applied for specific purposes in education for sustainable development, they need to be clearly defined with respect to their educational context”


define competencies through the activities used to master them
Connecting core competences to learner activities

Lozano et al., 2017

doesn’t display interactions between competencies and within learning activities
Pedagogy can address the noise in helping students understand and attain sustainability competence

perception as well as definition of competencies
how they are conveyed in the classroom
clarity of definition and description
how they are received in the classroom

need transparency in the use and understanding of competencies as educational objectives
# Learning and Teaching for Environment and Sustainability

What knowledge, understanding and skills do graduates from higher education need in the Environment and Sustainability field? We developed learning standards by asking stakeholders throughout Australia and around the world...

<table>
<thead>
<tr>
<th>7</th>
<th>850</th>
<th>1000</th>
<th>2500</th>
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<tbody>
<tr>
<td>7 workshops nationally (Perth, Sydney, Melbourne, Canberra, Gold Coast, Newcastle, Adelaide)</td>
<td>850 invitations to participate in an online questionnaire and online discussions</td>
<td>Communication with over 1000 stakeholders</td>
<td>Over 250 individuals actively collaborated in the development of the standards by providing over 2500 separate pieces of advice and guidance</td>
<td>Standards piloted at 3 universities</td>
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## Standards grouped into:

- Transdisciplinary knowledge
- Systemic understanding
- Skills for environment and sustainability
- Ethical practice

## Standards for:

- Bachelor degrees
- Bachelor honours degrees
- Graduate Certificates
- Graduate Diplomas
- Masters (coursework) degrees

The standards ‘are clear and comprehensive. Their purpose, significance and justification are well articulated... the invitational tone, accessible language and clear articulation of concepts and concerns is to be celebrated’.

‘ACEDDD endorses the Statement as a guide for tertiary teaching in Environment and Sustainability. The Project Team is to be commended.’

**Professor Daniella Tilbury, External Evaluator, Cheltenham, UK**

For further information, visit: [environmentLTAS.gradschool.edu.au](http://environmentLTAS.gradschool.edu.au)
<table>
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<th>DOMAIN</th>
<th>THRESHOLD LEARNING OUTCOME</th>
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| Transdisciplinary knowledge                | 1. Demonstrate a broad and coherent knowledge of:  
1.1. environments at various scales, interdependencies between human societies and environments, and sustainability  
1.2. key environmental and sustainability challenges and their drivers  
1.3. holistic systems thinking and complexity.  
| Systemic understanding                      | 2. Demonstrate an understanding of diverse approaches to environment and sustainability, including:  
2.1. disciplinary and transdisciplinary approaches to identifying and conceptualising environmental and sustainability challenges  
2.2. different frameworks for knowing  
2.3. their own and others’ values, knowledge, ethical positions and interests  
2.4. the particular values, knowledge, ethical positions and interests of indigenous peoples globally.  
| Skills for environment and sustainability   | 3. Demonstrate well-developed cognitive, technical and communication skills through:  
3.1. addressing research questions by identifying, synthesising and applying appropriate knowledge and evidence from diverse sources  
3.2. thinking critically and creatively in designing and evaluating sustainable alternatives and envisioning sustainable futures  
3.3. applying tools, methods, skills and theoretical knowledge for environment and sustainability practice  
3.4. working both independently and collaboratively  
3.5. communicating with diverse groups in various contexts using a range of written, oral and visual means  
3.6. engaging with Indigenous approaches to environmental and sustainability challenges.  
| Ethical practice                            | 4. Demonstrate an ethical professional, public and personal conduct by having capacity to:  
4.1. reflect on and direct their own learning and practice in the context of environment and sustainability  
4.2. participate constructively in decision-making consistent with principles of sustainable development.  

Learning and Teaching Academic Standards
Statement for Environment and Sustainability

support for this project has been provided by the
Australian Government Office for Learning and Teaching.

https://environmentltas.gradschool.edu.au
Figure 7.1 | Thinking only of your own personal view, how relevant is it to you that the following skills are developed through your university/college education? [2012 COHORT]
Conclusions on
Students attitudes & skills for sustainable development

- Overwhelmingly skills in sustainable development are seen as valued by employers
- Wider, core skills seen as more important/relevant than sustainability-specific skills
- Preference for improving employability skills over deepening subject knowledge changes
- Reframe existing courses rather than add additional courses
- Understand the mismatch in definitions of SD between students and academics/policy-makers will be key when developing curricula, mechanisms, and resources for delivery.
Does an academic sustainability program teach specific values, and is this made explicit?

Divergent views exist:

– the normative character of sustainability requires the acquisition of certain values (social-ecological integrity, justice, etc.).

– sustainability graduates need to know different value-laden concepts, but their role is to facilitate dialogue rather than position themselves in value-laden debates

Values and wicked issues in sustainability: the desire or need for change agents

Sustainability change agents self-identify with the desire to act for positive change, contributing to co-creating a better future

“Sustainability depends on change agents who have the skills, persistence, and resilience to contribute to the emergence of healthy ecosystems, social systems, and economies. Change requires students engage others and implement or contribute to positive change”.

(Marcus et al., 2015)
"A change agent for sustainability is an actor who \textit{deliberately tackles} social and ecological problems with \textit{entrepreneurial means} to put sustainability management into organizational practice and to contribute to a sustainable development of the economy and society”.

- Develops sustainability as a factor of success in their working environment
- Initiates sustainability projects which enact substantial change in the organization and beyond
- Transfers the vision of sustainable development through cooperation and public relations
- Works in multiple roles (sustainability expert, facilitator, catalyst and activist)

(Hesselbarth & Schaltegger, 2014, after Caldwell, 2003)
If student *self-identifies* as change agent for sustainability, deliberately tackling social and ecological problems with entrepreneurial means, ...

- How engaged should the learner be in designing and implementing the educational process?
- How important is it to articulate the underlying competences and the purposed of learning activities used to achieve them?
the NCSE core competencies consensus statement

virtual workshops through the Sustainability Curriculum Consortium, a survey of dozens of experts, and in-person workshops at meetings including AASHE, SCC, and NCSE to gather a wide range of informed, expert opinions.

produce a consensus statement on key competencies *at the program-level*. Consider programs as a whole, not individual course curricula.

*not prescriptive*, but a guide for new and evolving programs, students, administrators and employers

broad perspective including *environmental and sustainability studies and sciences programs*: holistic approach to environmental and sustainability problem-solving
Consensus Statement for NCSE endorsement
Focus on education programs that enable change management

Change management is a key theme that emerges, across all organization sizes and types. Sustainability professionals recognize the enormous task of bringing about change, and seek skills to help them do just that.

As a result, “soft” skills such as communication, facilitation, consensus building and networking are of especially high value by the group. Demonstrating financial viability and return on investment are considered important enablers of change.

Educational programs should stress these as “core” skills, and recognize subtleties between bringing about change within organizations and externally.

Tailor programs to teach “hard” skills valued by industry

Aside from planning and project management, many “hard” skills vary in importance by industry. Create tracks for professionals of various types where they can develop expertise that is specific to their type of business or organization.

Leverage skills of current professionals as educators and mentors

Many current sustainability professionals have deep experience in the field. Enlist their efforts as program planners, educators and mentors in this emerging profession.
Frameworks in general education: engaged citizens, change agents? in our programs: change agents, engaged citizens, sustainability professionals? Do we differentiate types as well as levels of competencies for general education from those in sustainability & environmental programs

Competencies Structures: differentiating lists and frameworks

Lists of individual competencies
ACEDD, Garcia et al., (2017), Lozano et al., 2017, UNECE, 2012, etc.

Frameworks
describe key competencies in sustainability (Wiek et al., 2011) that assemble and integrate individual competencies into a structured approach to problem-solving

Normative Competencies, beyond professional ethics
how to assess, while recognizing a duality in normativity. Sustainability education requires students to be able to
1) Recognize explicit & implicit values, including their own, and how these values influence decisions to facilitate collaboration
2) Reflect how their own values relate to sustainability values like the SDGs (justice, socio-ecological integrity, etc.)
References


References, continued


