



**University of
Zurich^{UZH}**

Sustainability Team

Competences for Sustainable Development and for Education for Sustainable Development

ELTT Handout Series – Part III

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Abbreviations

ESD	Education for sustainable development
SD	Sustainable development
UNECE	United Nations Economic Commission for Europe

1 Competences for sustainable development

As described in the first handout in this series, sustainable development (SD) affects various interrelated areas of our life as like environmental, societal, cultural and economic aspects. This interconnectedness makes sustainability processes highly complex and challenging. Thus society needs to be equipped with the right set of skills and competences to cope with those challenges and have the capability to steer development towards sustainability.

Accordingly, students at higher education institutions need to have the opportunity to acquire specific competences relating to sustainability, in addition to more general competences such as critical thinking (see Wiek et al., 2011a, 204). Teaching approaches aiming at supporting students in the acquisition of competences emphasize what students should have learned and be able to do at the end of the course ("output-oriented"), in contrast to traditional approaches that tend to focus on the contents of the teaching ("input oriented") (Sleurs, 2008, 39f.; De Haan, 2007, 29).

Scholars define the concept of "competences" differently. However, as Baartman et al. (2007, 115) point out, most of these definitions mention "*connected pieces of knowledge, skills and attitudes that can be used to adequately solve a problem*". Many definitions also refer to a work situation (Baartman et al. 2007, 115). According to de Haan (2007, 29f.), competences can be determined in relation to specific challenges, tasks and intentions. Thus, a specific competence may involve not only cognitive aspects but also emotional and social aspects (de Haan, 2007, 30). These emotional aspects may in turn be linked to the "attitudes" mentioned by Baartman et al. (2007).

1.1 Key competences for addressing sustainability challenges

In order to identify competences relevant for SD, close exchange with practitioners is suggested in order to learn which competences are relevant for SD, support

SD processes in practice, and which competences students require (Wiek et al., 2011b, 11).¹ Providing students with this possibility can help them identify which competences they themselves need to improve on. Universities can enable this by inviting people working in the area of SD to classes, or by for instance. This can also be arranged by university careers services or other university bodies.

Besides taking into account the experience from practitioners, it is also crucial to consider the interests of the students. According to Mochizuki and Fadeeva (2010, 399), if the required competences are identified only by researchers, politicians and private sector actors and do not take into account students' interests and beliefs, there is a risk for a "dogmatic exercise".

Questions:

- Would it be helpful for my students to discuss relevant competences with people actually working in the field of SD? If so, who could I approach who is working in this field?
- What are my students' interests? How can I learn more about their interests?

The literature identifies a range of competences as relevant for solving sustainability challenges (for an overview, see Wiek et al. 2011a, 208; Hesselbarth and Schaltegger, 2014, 27). For example, Wiek et al. (2011a, 206ff.) identify five key competences, reproduced in Table 1 below.

¹ Hanning et al. (2012) compare the competences for SD addressed in teaching and those required by the engineering industry, for example.

Table 1 Key competences and their definitions (Wiek et al., 2011a, 207ff.)

Competence	Definition	Relevant for...
Systems thinking competence (p. 206)	<i>"ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features (...)"</i> (p. 207)	...understanding complex sustainability problems and the interaction of various aspects.
Strategic competence (p. 206)	<i>"ability to collectively design and implement interventions, transitions, and transformative governance strategies toward sustainability"</i> (p. 210)	...developing strategies and measures for addressing sustainability problems, which consider relevant contexts (i.e. context of target group, political context).
Normative competence (p. 206)	<i>"ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets."</i> (p. 209)	...being able to see the lack of sustainability in a certain situation (leading to the sustainability problem) and for defining what would constitute a sustainable scenario for this situation.
Anticipatory competence (p. 206)	<i>"ability to collectively analyze, evaluate, and craft rich "pictures" of the future"</i> (pp. 207, 209)	...developing scenarios and envisaged outcomes which guide the design of interventions.
Interpersonal competence (p. 206)	<i>"ability to motivate, enable, and facilitate collaborative and participatory sustainability research and problem solving."</i> (p. 2011)	...working together with other stakeholders in all steps of sustainability problem solving processes.

Another important concept with regards to competences for SD is what are known as "Gestaltungskompetenzen". This refers to the ability to:

"apply knowledge of sustainable development and to identify the problems of non-sustainable development. This means drawing conclusions on environmental, economic and social developments in their interdependence, on the basis of analyses of the present and studies of the future, and then using these conclusions to take decisions and understand them before implementing them individually, jointly and politically. (...)" (transfer-21, 2007, 12; see also de Haan, 2007, 31)

Questions:

- How do Wiek et al.'s key competences apply to my field of work? (For more examples from actual practice, see Wiek et al., 2011b, 6ff.)
- What other competences are important for addressing sustainability problems in my own field of work?
- Which professions do my students intend to enter? What specific competences might they need so that they can later address sustainability issues in these professions?

Further reading:

- For more on "Gestaltungskompetenzen", see de Haan (2007, 32).
- For more information on "Gestaltswitching" and approaches to transformative learning, see Wals (2010).

Interestingly, the importance attached to specific competences can differ depending on geographical regions. For example, in a survey-based study, Rieckmann (2011, 133) found that respondents from certain Latin American countries (Chile, Ecuador, Mexico) put much greater weight on the ability to cooperate in diverse groups than respondents from Germany and Great Britain. Other competences, such as the ability to think critically and the ability for systemic

thinking, were perceived as very important by both groups (Rieckmann, 2011, 133). Such differences and the reasons behind them should be considered when deciding which competences are being focused on in courses and curricula and what approach should be taken to support the students in doing so.

Further reading:

- For a discussion of the competences required for sustainability management, see Hesselbart and Schaltegger (2014): Educating change agents for sustainability – learnings from the first sustainability management master of business administration.
- For an overview on the scientific discussion in regard to sustainability competences in higher education, see: Wilhelm, S., Förster, R., Nagel, U., Wülser, G., Zingerli, C. (2015): Shaping the Future: Sustainability Competences in Higher Education.
- For a discussion of the competences required for SD in management programs, see Lambrechts et al., (2012): The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management.

1.2 Developing competences for SD

Universities and individual lecturers need to determine how they can best help students acquire the key competences required for SD. This may be through their regular teaching and research activities, summer schools, transdisciplinary teaching and learning, or by other means.

Competences can be acquired through both formal and informal learning processes. Formal learning processes include lectures and workshops. Here, interdisciplinary approaches can be helpful for students (Barth et al., 2007, 419). Moreover, providing room for "self-directed" learning – e.g. student projects (Barth et al., 2007, 420) – can trigger the acquisition of important competences, such as interpersonal and strategic competences.

Transdisciplinary projects provide room for students to interact with practitioners while working together

towards solving real life challenges. The students learn directly from those working in the field and can develop competences such as systemic thinking. (Geoff Scott from the University of Western Sidney described such a transdisciplinary project in the second ELTT webinar.) Another example can be found at University of Graz, Austria. In Environmental System Sciences Studies, students from five different disciplines (Geography, Business Management, Economics, Chemistry and Physics) develop common mandatory transdisciplinary courses that run in close collaboration with local and regional NGOs, public or private institutions (USW, 2015). Courses are related to local and regional challenges. Practitioners from the region contribute with their experience and expert knowledge. Topics vary from challenges and solutions connected with food waste to sharing economy, from social equity to cultural exchange.

Informal learning processes at universities may include students' involvement in student organizations or simply discussions with their fellow students. Involvement in student organizations gives students an opportunity to test out ways to achieve the objectives of different projects in an interdisciplinary manner, with the support of other students (Barth et al., 2007). In so doing they focus on SD-related topics, gain project-management skills in real-life situations, and learn how to overcome potential challenges. These competences will be needed when they come to address SD-related challenges in their future professional lives.

Where appropriate, lecturers can help such organizations attract more students by highlighting their work during classes or providing them with an opportunity to present themselves during classes. To this end, lecturers need to be aware of what initiatives are taking place at their own university.

Questions:

- What kind of learning environment does my class offer? Are there other environments that could be interesting for my field of work?
- Are there any student organizations at my university that deal with topics related to my field of work?
- Are there ways in which I can acknowledge or support the potential involvement of students in such organizations?

1.3 Assessing the acquisition of competences

Determining to what extent students have developed competences for SD is no easy task. However, it is essential for those involved in SD programs to reflect upon what students have acquired during their studies (see also Wiek et al., 2011b, 11).

Different approaches are possible, here. Options include multiple choice tests, presentations, essays, broad assessments, and so on. Tests (e.g. multiple choice tests) are usually more standardized than broader assessments such as simulated real-life situations where students can use the materials they would actually have available to them in a real-life professional situation (Baartmann et al., 2007, 116). An example of such an assessment would be for students to work on a project proposal for a project aimed at reducing emissions resulting from deforestation. For a detailed comparison between tests and broader assessments, see Baartman et al. (2007, 116f.).

The standardized approach of testing by itself does not sufficiently reflect the competences required for addressing SD challenges, in which different perspectives need to be considered when solving problems. Baartman et al. (2007, 117) therefore suggest using a combination of tests and assessments to determine to what extent students have developed the required competences. They suggest that such assessments should meet the criteria outlined in Table 2 below.

Criterion	Description: The assessment should...
Authenticity	...be designed to reflect situations that students might encounter in their future jobs, to ensure that they have the competences they will need.
Cognitive complexity	...require strong cognitive skills. Students could be required to provide a reasoning for their response, for example.
Fairness	...give all students the same opportunities and apply an appropriate scope for the knowledge and skills tested. (Baartman et al. provide various understandings of this criterion.)
Meaningfulness	...be designed in such a way that the assessed person perceives the questions as meaningful and can identify them as relevant to his or her interests. The assessment should also be meaningful for the lecturer and future employers.
Directness	...not require any translation into practice but allow for immediate interpretation of results.
Transparency	...provide all participants (students as well as assessors) with information about assessors, assessment criteria and objectives of the assessment.
Educational consequences	...consider potential effects (both positive and negative) on learning and teaching.
Reproducibility of decisions	...consist of several parts assessing the acquisition of competences, so as to avoid decisions being based only on the performance in one assessment.
Comparability	...be comparable between the tested persons. This criterion is linked to fairness and transparency.
Cost and efficiency	...be designed in such a way that potential additional costs arising from the assessment compared to traditional tests are commensurate with their additional benefits.

Table 2 Criteria for competence assessments (adapted from Baartman et al., 2007, 120f.)

Another important aspect when determining whether students have acquired a specific competence can be

seen by looking at an example of one of the sub-competences of the above-mentioned *Gestaltungskompetenzen*, namely the "ability to show empathy and solidarity with the disadvantaged"² (de Haan, 2007, 32). De Haan (2007, 36) argues that one should not assess whether a student is actually acting in solidarity, but rather whether he/she is in principle able to do so. The decision about to what extent the student wishes to act in line with his/her competence should remain with the student him- or herself (de Haan, 2007, 36) and should not be assessed.

Questions:

- What methods did I use in the past to determine to what extent students have acquired what has been addressed in class?
- How could assessments be conducted in my field of work?
- What worked well in the assessments that I conducted in the past? Which aspects were difficult?

For more information on the assessment of competences, see:

- Baartman et al. (2007): Evaluating assessment quality in competence-based education: A qualitative comparison of two frameworks.

2 Competences for education for sustainable development

According to Sleurs (2008, 39), competences are "learnable but not teachable". This makes helping students acquire competences for SD a challenging task for educators. Furthermore, inter- and trans-disciplinary courses that can trigger the acquisition of such competences differ from conventional mono-disciplinary courses. Lecturers therefore need additional competences in order to provide such courses.

Different studies have identified various competences in the area of education for sustainable development (ESD) required by lecturers. The competences identified by UNECE (2013) on the basis of the Delors report were briefly introduced in the first handout (Warland, Mader, 2015). UNECE structures the competences along the four pillars of learning outlined in the Delors report (International Commission on Education in the Twenty-first Century, 1996, 22f.), namely: learning to know, learning to do, learning to live together, and learning to be. It then relates them to three key aspects of SD: "holistic approach", "envisioning change", and "achieving transformation" (see Annex I, UNECE, 2013, 15; Warland, Mader, 2015).

Several competences in the area of "learning to do" refer to the ability to provide students with the required formal or informal learning setting for developing competences for SD (see Section 1.2). Examples are the ability of lecturers to allow space and time for experience and idea-sharing by using participatory approaches, and their ability to use their own university as a living laboratory for conducting research in order to provide students with room for learning (UNECE, 2013, 15).³

With regard to lecturers' competences for ESD, it is not only important what a lecturer teaches but also the "sort of person they are" (UNECE, 2013, 6). Lecturers can be role models for students – ideally, role models for acting sustainably. If lecturers do not seem to identify with what they are teaching, students might be less inspired to act in line with what they have learned about SD. This is closely related to the competence of "learning to be" – another of the four pillars identified in the Delors report (International Commission on Education in the Twenty-first Century, 1996, 23).

In a somewhat different approach, Sleurs (2008, 43) identifies the various roles of lecturers, namely: as a teacher within an institution for education, as a person in society, and as an individual. These roles require three general competences: teaching, networking, and reflective visioning. While all three competencies may be relevant for all three roles, the closest links between them are as follows:

² Translation made by the authors.

³ For an example of conducting research within one's own built environment, see ETH (2015).

- As a teacher within an institution for education: Competences related to communicating and teaching (general competence of "teaching")
- As a person in society: Competences related to working and interacting with others (general competence of "networking"; Sleurs, 2008, 26f., 43)
- As an individual: Competences related to picturing future developments/objectives and to reflecting (general competence of "reflecting, visioning")

Besides these general competences, Sleurs (2008, 41f.) identifies five areas of teachers' competences for ESD providing a detailed description of their sub-competences relating to each of the three roles of the lecturer, namely:

- "Knowledge" (for sub-competences, see Sleurs, 2008, 48)⁴
- "Systems thinking" (for sub-competences, see Sleurs, 2008, 60f.)
- "Emotions"⁵ (for sub-competences, see Sleurs, 2008, 67f.)
- "Ethics and values" (for sub-competences, see Sleurs, 2008, 54f.)
- "Action" (for sub-competences, see Sleurs, 2008,)

The UNECE and Sleurs frameworks differ in terms of structure, yet there is a great overlap of competences identified.

Questions:

- Where are my strengths with regard to the competences identified by UNECE and Sleurs?
- Which of these competences would I like to develop further? What challenges does this involve?

Institutions of higher education are called upon to provide professional training programs for educators to support the development of their competences with regard to teaching sustainability. However, in a study of 33 countries in Europe, the European Commission Academic Network Initiative "University Educators for Sustainable Development" found that professional

development programs on ESD in higher education are few and far between (UE4SD, 2014).

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⁴ This is closely related to "learning to know" and the topics introduced in the first and second ELTT handouts (Warland, Mader, 2015; Mader, 2015).

⁵ For a critical view, see Bertschy et al., 2013, 4.

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4 Annex I Educators' competences for ESD

Table 3 Educators' competences for ESD. Source: UNECE, 2013, 15.

	Holistic approach Integrative thinking and practice	Envisioning change Past, present and future	Achieving transformation People, pedagogy, and education systems
<p>Learning to know</p> <p>The educator understands...</p>	<ul style="list-style-type: none"> • The basics of systems thinking • Ways in which natural, social and economic systems function and how they may be interrelated • 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 people think, live and work • Their own thinking and action in relation to sustainable development 	<ul style="list-style-type: none"> • The root causes of unsustainable development • That sustainable development is an evolving concept • The urgent need for change from unsustainable practices towards an advancing quality of life, equity, solidarity and environmental sustainability • The importance of problem setting, critical reflection, visioning and creative thinking in planning the future and effecting change • The importance of preparedness for the unforeseen and a precautionary approach • The importance of scientific evidence in supporting sustainable development 	<ul style="list-style-type: none"> • 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
<p>Learning to do</p> <p>The educator is able to...</p>	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Critically assess processes of change in society and envision sustainable futures • Communicate a sense of urgency for change and inspire hope • Facilitate the evaluation of potential consequences of different decisions and actions • Use the natural, social and built environment, including their own institution, as a context and source of learning 	<ul style="list-style-type: none"> • Facilitate participatory and learner-centred education that develops critical thinking and active citizenship • Assess learning outcomes in terms of changes and achievements in relation to sustainable development
<p>Learning to be</p> <p>The educator is someone who...</p>	<ul style="list-style-type: none"> • Is inclusive of different disciplines, cultures and perspectives, including indigenous knowledge and world-views 	<ul style="list-style-type: none"> • Is motivated to make a positive contribution to other people and their social and natural environment, locally and globally • Is willing to take considered action even in situations of uncertainty 	<ul style="list-style-type: none"> • Is willing to challenge assumptions underlying unsustainable practice • Is a facilitator and participant in the learning process • Is a critically reflective practitioner • Inspires creativity and innovation • Engages with learners in ways that build positive relationships
<p>Learning to live together</p> <p>The educator works with others in ways that...</p>	<ul style="list-style-type: none"> • Actively engage different groups across generations, cultures, places 	<ul style="list-style-type: none"> • Facilitate the emergence of new world-views that address sustainable development • Encourage negotiation of alternative futures 	<ul style="list-style-type: none"> • Challenge unsustainable practices across educational systems, including at the institutional level • Help learners clarify their own and others world-views through dialogue, and recognize that alternative frameworks exist

ELTT Partners

The ELTT program is offered by the Sustainability Team of UZH in collaboration with the UZH Faculty of Science and the Faculty of Economics, Business Administration and Information Technology. International partner organizations support ELTT with their expert input and provide a platform with some hundred universities that are eager to exchange experience:

- COPERNICUS Alliance – European Network on Higher Education for Sustainable Development
- Global RCE Service Centre at United Nations University – Institute for the Advanced Studies of Sustainability
- GUPES: Global University Partnership for Environment and Sustainability - UNEP
- IAU – The International Association of Universities

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