Chapter 22

Lessons learned and future research directions in educating for sustainability competencies

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Abstract
Transformation towards sustainable development requires people who are motivated and capable of challenging current systems. But what competencies are needed to facilitate and implement effective change for sustainability? This question has been central for the past decade to scholars interested in sustainability and education for sustainable development leading to the development of generic sustainability competence frameworks. As the field of sustainability competencies is consolidating, important criticisms are raised about the lack of conceptual clarity of the competencies proposed and how these can be developed, supported and assessed. In addition, the discourse has been dominated by North American and European perspectives leading to a cultural bias in the definition and interpretation of these competencies. Also, considering how social and institutional structures can hinder or facilitate the development of people's capacities in relation to sustainability, little attention has been paid to the need to contextualize competencies within socio-cultural and institutional settings. Furthermore, with COVID-19 accelerating and mainstreaming e-learning, challenges are presented in terms of what online pedagogies can be used to support the acquisition of these competencies. In this chapter, we capture some lessons learned from recent work and suggest some future directions in order to instigate new developments in this area.

Introduction
Transformation towards sustainable development requires capable people 'willing to' challenge the *status quo* (Shephard, Rieckmann and Barth, 2019), as well as to engage in different ways of thinking, acting and living (Sterling, 2001). A broad agreement exists that education and learning can help us to explore alternative lifestyles (UNESCO, 2004; Tilbury, 2011), but there is also an acknowledgement that what we have learned to date does not prepare us for the challenge of sustainable development (UNESCO, 2020). While most of the official formal education curricula aim at empowering citizens to become critical, empathic and active change agents towards more sustainable, socially just and equitable societies, implementation remains a challenge (Cebrián, Junyent and Mulà, 2020).

Signs of progress have emerged during the past years, demonstrating that a change in education is possible. From early childhood to higher education, theoretical models and practical efforts to embed Education for Sustainable Development (ESD) through whole-school approaches have been documented (UNESCO, 2014). Evidence also exists showing that teaching and learning

methodologies are changing. Knowledge transmission pedagogies are being challenged across the different formal education levels and are slowly being replaced by active methodologies supporting more student-centered, participatory and democratic learning processes (Sterling, 2001; Tilbury, 2011; Lozano *et al.*, 2017). However, these practices remain niches and far from mainstream efforts (Ryan and Tilbury, 2013) and, often, although innovations are introduced, the values underlying the education process are untouched. Education reforms are no longer useful if we want learners to engage in transformative processes that fundamentally challenge their thoughts, feelings and actions (Morrell and O'Connor, 2002; O'Sullivan, 2003). These transformative experiences require a fundamental questioning of the purpose of education and the role of educational institutions (Sterling, 2001; UNESCO, 2015), as well as disrupting learning approaches by using more critical, emancipatory and relational pedagogies (Wals, 2020).

We agree with Sterling *et al.* (2017) that sustainability competencies can be a starting point to leverage pedagogical transformation and stimulate fundamental systemic changes in educational organizations. Competence-based approaches are also aligned with the ambitions of Agenda 2030 (target 4.7 calls for supporting learners "to acquire knowledge and skills needed to promote sustainable development") (UN, 2015) and UNESCO's vision spelled out in its "ESD for 2030" Framework and Roadmap (UN, 2019; UNESCO, 2020). Planning with sustainability competencies in mind leads us to ask critical questions about what, where and how we learn, as well as to assess whether learners can fully develop as human beings and contribute to creating more attractive sustainable futures for all.

The last decade has seen increasing research interest in defining what 'knowledge, capacities and skills, motives and affective dispositions' are needed to facilitate societal transformation (Rieckmann, 2012, p. 129). Generic sustainability competence frameworks have been proposed (Rieckmann, 2012; UNESCO, 2017), together with more specific frameworks for schoolchildren (de Haan, 2006), higher education students (Brundiers *et al.*, 2021; Lozano *et al.*, 2017; Wiek *et al*., 2016; Wiek et al., 2011), sustainability entrepreneurs (Mindt and Rieckmann, 2017) or educators (Sleurs, 2008; Strachan, 2012; UNECE, 2012; Bertschy, Künzli and Lehmann, 2013; Rauch and Steiner, 2013; Cebrián and Junyent, 2015; Vare *et al.*, 2019).

In relation to educators, the existing frameworks have focused on defining the ESD competencies that should be developed through teacher education (Bertschy *et al*., 2013; Cebrián & Junyent, 2015; Rauch & Steiner, 2013; Sleurs, 2008), and on the ESD competencies that educators from any field and education level should possess (UNECE, 2012; Vare *et al*. 2019). All these frameworks are concerned with educators' abilities and behaviours while the ones focused on teacher education tend to include differentiations between teachers' individual ESD competencies and the type of learning and competencies that teachers should promote within the school context as members of the school.

One criticism of the recent literature is the lack of conceptual clarity and rich description of the competencies that have been proposed (Glasser and Hirsh, 2016; Sterling *et al.*, 2017). Designing competence-based education requires clear pedagogical and assessment strategies on how learners develop and are willing to use these competencies to contribute to a collective social transformation of our societies towards sustainability. In addition, competencies must be appropriately contextualized within a socio-cultural and institutional setting, considering how the social and institutional structures can hinder or facilitate the development of people's capacities in the area of sustainability.

In this chapter, we capture some lessons learned from the work carried out in the past years and suggest some future directions in order to instigate new developments in this area.

Conceptual terminology and rich descriptions of competencies are needed
The focus on competencies in the field of sustainability education has attracted attention from academics, policy-makers and practitioners across the world from a diversity of backgrounds and cultural contexts, leading to several instances of terminological and conceptual confusion. Sterling *et al.* (2017) argue that to move forward further clarification and appropriate use of terms are needed. Words with subtle nuances like 'competences', 'competencies', 'capabilities', 'attributes' or 'generic skills' are often used in the literature equivalently. Around the world, some countries prefer to use specific terms over others and, in other countries, some of the subtleties in meaning among terms do not exist. For example, in Australia, 'capability' is more frequently used than competence or competency, and in the UK there is a preference towards the use of 'skills'; in Spain, there are no differences between 'competence' and 'competency' which are both translated as *competencia*. In this chapter, we understand sustainability 'competence' as the overarching term that refers to the knowledge, skills, attitudes and values necessary to effectively perform tasks, solve real-world sustainability challenges and support the transformation of processes and systems. We also understand that this competence can be broken down into a set of different 'competencies' (in singular, 'competency').

In addition, in some of the work published there is no specific distinction between 'sustainability' and 'ESD' competencies, leading to another level of academic misunderstanding. In our view, sustainability competencies refer to the knowledge, skills, attitudes and values that enable one to act in a sustainable manner in real-world situations (Wiek *et al*., 2011), while ESD competencies refer to educators' competencies to foster sustainability competencies through ESD processes and practices (Vare *et al*., 2019).

Although the competencies' approach is popular across the globe, there are many scholars that have criticized its discourse as being instrumental, utilitarian and market-oriented (Edwards, 2016). Some authors, like Lotz-Sisitka *et al.* (2015), suggest that adopting the capabilities approach (Sen, 1993) might be more useful in order to re-think learning and pedagogical development. Lozano *et al.* (2012) stress that the capability approach is more interested in people's values, freedom and agency, as opposed to the competencies approach that has a stronger focus on solving concrete problems of specific demands. This resonates with the idea of O'Donoghue *et al*. (2007) that sustainability should be considered a challenge to be fully taken on, rather than a problem that needs to be solved.

We acknowledge that the capability approach is powerful due to its value-based orientation, but also endorse the decision of the experts participating in the study conducted by Brundiers *et al.* (2021) to retain the word 'competency' in view of its broad use in the context of education and sustainable development. In addition, in their philosophical hermeneutic analysis of ESD papers, Shepard *et al.* (2019) remind us that the concept of competence, as defined by the ESD community, has always been centered on values and been underpinned by ideas related to freedom of choice and learners' self-determination. An important conclusion of their work is that whether using one or another approach, we cannot assume that those who have developed sustainability competencies decide to use them in every context. Therefore, it becomes fundamental to engage children from early ages to understanding the need for change and support them throughout life, in different ways and through different strategies, to develop and use their sustainability knowledge and skills in all possible situations.

Curriculum design and development must support education around sustainability competencies

Much of the current debate on sustainability competencies revolves around the design of curricula and educational programs. Glasser and Hirsh (2016) point out that consensus is needed on, first, what competencies must be fostered and, second, how these competencies can best be supported and assessed. Most of the frameworks defined so far have been developed based on literature reviews and expert opinions and, with some exceptions, presented as lists of complex ideas (Wilhelm, Förster and Zimmermann, 2019) difficult to achieve and assess (Brundiers *et al.*, 2021). Timm & Barth (2021) stress that only recently have the first research projects examined empirical evidence regarding how sustainability competencies contribute to both successful teaching and implementation of ESD, thus illustrating the need to accelerate research in this area.

With the aim of connecting competencies with pedagogical approaches, Lozano *et al.* (2019) conducted a research survey with European Higher Education lecturers (see also Chapter 17). The authors concluded that competencies must be supported by a combination of methods and, when using more traditional approaches (such as lectures), educators should reflect on how best they can support the development of the competencies. As a contribution, this paper presents a matrix that connects what methods can be more effective to teach the different competencies identified. Although a valuable study, the findings must be interpreted openly so that the critical creativity of educators is not hindered through the use of 'another list', this time of teaching and learning methods.

The existing literature is full of studies that have documented how methods like problem- or inquiry-based learning have been used to foster sustainability competencies (Thomas, 2009; Wiek *et al.*, 2014). Although the results of their implementation are positive in terms of competence development, it seems that these efforts are not really having the transformative effect that we seek in our societies. Recent research into transformative learning for sustainability calls for the development of more hybrid and engaged pedagogies involving multiple actors and voices (Lotz-Sisitka *et al.*, 2015; Wals, 2007), the creation of open and transdisciplinary learning spaces (Bürgener and Barth, 2018), and the exploration of the dialectics between cultural tradition and innovation (Tilbury and Mulà, 2009; Tilbury, 2011). This requires building bridges between formal, non-formal and informal learning, creating social learning spaces to confront diversity of values and ideas, challenging the role of and relationships between educators, learners and stakeholders and rethinking assessment of learning. In other words, it implies challenging how the learning process and the curriculum are traditionally designed (especially challenging Eurocentric perspectives) and reconsidering how sustainability competencies can best be fostered.

A significant challenge described in the literature is finding appropriate paths to assess student sustainability competencies (Cebrián, Junyent and Mulà, 2020). To start with, we believe it is important to consider Sadler's (2013) point about the risks of decomposing competence into a set of competencies – a common practice in the sustainability field. While defining a set of manageable competencies simplifies the assessment exercise and facilitates judgements of whether or not each competency has been achieved, it obscures how an individual performs the different competencies together as a whole (see also discussion on 'the RSP palette', Chapters 2 and 4). For Sadler, essential to the assessment of competencies is how students are able to 'orchestrate' them independently and proficiently within different contexts (p. 11). Analyzing the whole (*is the student competent in relation to sustainability?*), and not only the parts (*has the student fostered each of the different sustainability competencies defined?*), has certain benefits. Firstly, it solves the problem related to defining the boundaries between competencies. There is an inevitable overlap of ideas and principles among the different sustainability competencies proposed, which makes it difficult to assess competencies as separate blocks (for example, it is difficult to perform a strategic competency without

performing a future thinking competency). Second, seeing the whole and not the parts in isolation opens a window for greater criticality and creativity in the assessment process. It provides the opportunity for learners to perform other competencies (not pre-defined in the assessment exercise) which can be instrumental in a particular context.

The field of assessment of sustainability competencies is developing slowly and most experiences documented so far tend to focus on assessing individual competencies, failing to demonstrate, with rich descriptions, how learners perform them together as a whole. A study recently published by Redman, Wiek and Barth (2021) provides a picture of the different tools utilized to assess learners' sustainability competencies (see Chapter 21). The authors propose a typology of eight assessment tools divided into three groups: (i) self-perceiving (scaled self-assessment, reflective writing and focus group/interview); (ii) observation (performance observation, regular course work and conceptual mapping); and (iii) test-based approaches (scenario/case test and conventional test). Surprisingly, and responding to Mogensen and Schack's (2010) calls for particular attention to self-evaluation, self-assessment methods were disproportionally represented among the articles reviewed. This could be explained as being in the context of summative rather than (trans)formative assessment. Cebrián *et al.* (2020) argue that more research is needed on the latter to support student learning in more meaningful and effective ways (Black and William, 1998) and to guide educators to do a better job (Popham, 2008).

Finally, it is worth mentioning the work of Holdsworth *et al.* (2020) as it offers another approach to assess sustainability competencies in higher education. The authors present a framework to explore how higher education graduate sustainability capabilities are applied in professional settings in the workplace after graduation. Although a complex and tedious approach to implement, it provides educators with useful data that can show whether graduates are applying the competencies in real contexts. Further research in this direction, also exploring how competencies are used in personal and community contexts (and not only professional settings), can further support the process of designing and facilitating learning for sustainability processes.

The context in which sustainability competencies are defined and developed is important
One does not need to undertake a rigorous systematic review to realize that the sustainability competence discourse is dominated by North American and European perspectives. In addition to the terminological confusion and the lack of consensus on what competencies are needed, scholars have recognized that there is an obvious cultural bias in the sustainability competence frameworks available in the literature (Rieckmann, 2013; Bürgener and Barth, 2018; Brundiers *et al.*, 2021). The review carried out by Sterling *et al.* (2017) also shows that the majority of articles published in this area refer to higher education contexts, with only a few publications addressing early childhood, primary, secondary or adult education. There are practically no experiences that refer to informal and community-based forms of learning.

Some examples of work have contributed to include different cultural voices in the definition of sustainability competences. An example is Rieckmann's (2010) PhD thesis that presents a joint discourse of European and Latin American experts. In his study, minor differences are revealed between participants from both parts of the world. Europeans put more emphasis on the need of competencies related to 'empathy' and 'change of perspective' and Latin Americans on 'cooperation' and 'participation'. Another example is the study developed by Demssie *et al.* (2019) who question whether sustainability competencies proposed to date are universally relevant; they offer an Ethiopian and 'base of the pyramid' perspective. Involving 33 experts from academia and industry, the authors conclude that several competencies such as 'systems thinking' may be considered universal, whereas others such as 'competence to utilize indigenous

resources for sustainability' could be considered context specific. In another study, the same authors (Demssie *et al.*, 2020) explore opportunities to embed indigenous knowledge systems in mainstream modern (westernized) education in Ethiopia with a view to developing sustainability competencies. The results highlight that using indigenous learning approaches requires more open, collaborative and community-based pedagogies, aligned with transformative learning approaches. Along the same lines, Dai and Hwang (2019) carried out empirical research on bamboo crafting courses in universities and determined that knowledge and skills learned are better brought into play when contextualized in social practice which, in turn, helps students to develop cultural self-confidence.

It is also important to note that certain competencies that are likely to be considered universally relevant (e.g., critical thinking) might be interpreted differently in different socio-cultural contexts. Rather than seeing this as a problem, we should use it to enhance intercultural dialogue on sustainable development and enrich our own cultural understandings. As pointed out by Yoneyama (2012) and other authors of post-colonial literature, the often-claimed perceived weaknesses of certain competencies among people from a particular culture create a divide between regions and cultures. This leads to seeing people from other cultures as 'the other', rather than embracing the richness that every individual can bring to the transition towards sustainability. Tilbury and Mulà (2009) state that intercultural dialogue is central to sustainable development as it implies understanding, respecting and forging links among cultures, as well as exchanging and co-creating knowledge to seek and re-invent more creative ways to live together.

In order to cultivate sustainability competencies, there must also be a social and institutional environment that allows them to occur. Following up with the example of critical thinking, critical pedagogies are commonly used to engage students in debating provocative and sometimes uncomfortable issues, as well as to empower and support them in order to bring about social justice and transformation (McLaren, 1994). This requires a social context that helps people to engage in these types of debates freely, but also institutional structures and educational systems that encourage and reward educators who use this critical approach. The positive side is that a focus on sustainability competencies can, at the same time, influence the social context in which they are operationalized. As Sterling *et al.* (2017) argue, competencies are a vehicle to catalyze pedagogic transformation, institutional learning and structural change, speeding up the process of embedding sustainability institutionally. We must, thus, interpret the competence approach as a more complex endeavor than just supporting individuals' knowledge, skills and attitudes, since it also represents an effort to transform broader systems towards sustainability.

Finally, competencies might be expressed differently depending on the discipline and knowledge areas, as well as on the different educational forms and levels (Sadler, 2013). Therefore, even if we managed to reach a consensus on what sustainability competencies are needed, rich descriptions that contextualize them in the particular cultural and educational setting where they are operationalized are essential.

Further research and experimentation are needed to explore how sustainability competencies can best be developed through online learning
Before COVID-19, there was already high adoption of e-learning and educational technologies across the different education areas and levels (Lim *et al.*, 2013; Panigrahi, Srivastava and Sharma, 2018), pointing to the urgent need to explore the implications in relation to learning for sustainability and the development of sustainability competencies. The pandemic has forced everyone to move to online learning. While some think that we should move away from this due

to its negative impacts on equity and quality as well as due to the ecological impact of digitalization, others believe that a new hybrid model of education will materialize, bringing more benefits in comparison to the old one (Hohlfeld *et al.*, 2017; Zhang *et al.*, 2020).

The value of online learning for sustainable development has been recognized internationally (Leicht *et al.*, 2018; UNESCO, 2014). Amongst others, e-learning shows the potential to reach students who otherwise would not be able to participate in person and in real-time education, supports international, intercultural and intergenerational dialogue on sustainability topics and provides access to a wide range of resources (Ally, 2008). However, a review on Massive Open Online Courses (MOOCs) on climate change showed that there is an emphasis on knowledge transfer approaches and a lack of adequate pedagogical mechanisms to contextualize transformative action learning and assess sustainability learning outcomes (Lotz-Sisitka, 2014). Thus, after many years and efforts to support active, participatory and social learning approaches, there is a risk of going back to where we were before.

There are several challenges that the sustainability educator faces when designing online courses from scratch or adapting programs that used to be facilitated face to face. The recent Erasmus+ project *Pushing the boundaries of Online Transformative Learning* (OnTL) (2019-20) will identify some of these specific challenges and explore the potential and limitations of virtual environments on empowering students in transformative action. Educators of adult learning and higher education from across the world (primarily Europe) will design and carry out a wide variety of experiments trying out different pedagogical approaches, assessment methods, apps, tools, etc. with different program settings and characteristics (short- and long-term courses, small and large groups, etc.) to critically reflect on how best we can support learners in the development of their sustainability competencies. This is an area which requires further attention, as there are practically no studies that have analyzed the implications of teaching and learning online in relation to sustainability learning and the development of sustainability competencies.

Concluding remarks

Significant progress in ESD has been achieved over the last decades; however, the state of its integration is still disparate across different regions and education levels and between education institutions. In order to create transformative learning environments and experiences that facilitate the development of sustainability competencies, whole-institution approaches towards embedding sustainability are needed, embracing the estates and operations, the curriculum, pedagogy, the organizational structure and ethos.

Competence-based education entails moving from teacher-centered to student-centered approaches in combination with community and transformative learning processes that facilitate the development of sustainability competencies and lead to empowered and active change agents. In this context, the design and inclusion of ESD competencies within teacher education programs and through continuous professional development is critical to embed ESD processes and practices holistically through all education levels.

Several ESD scholars have made an effort to conceptualize sustainability competencies, skills, capacities or learning outcomes; however, no agreed or validated framework exists that transcends education levels, examples of good practice, single case studies or specific comparisons amongst universities. Further efforts are needed to develop common sustainability competencies' frameworks that can be tested and contextualized in different education levels and sociocultural settings. The operationalization of the term sustainability competencies remains as its main challenge. Further empirical research is critical to obtain evidence on

innovative pedagogical and (trans)formative assessment approaches and strategies that lead to meaningful student learning and sustainability competencies' acquisition. Exploring how this learning takes place in other settings, such as non-formal, informal and community-based learning, and in professional contexts and the workplace, would provide a rich overview to make more informed pedagogical and curriculum decisions.

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