

CHAPTER 12

Advancing Assessment Thinking in Education for Sustainable Development with a Focus on Significant Learning Processes

Overson Shumba, Caleb Mandikonza and Heila Lotz-Sisitka

Introduction

This position paper is developed in the context of the Fundisa [Teaching] for Change teacher education programme (www.fundisaforchange.co.za), as well as the Sustainability Starts with Teachers programmes for teacher education (www.sustainabilityteachers.org/course). Fundisa for Change is a South African programme while Sustainability Starts with Teachers is a Southern Africa Development Community (SADC) programme for teacher educators. Both these programmes seek to enhance transformative environments and sustainability education processes in teacher education. They have a strategic focus on situated and transformative learning approaches for learners to learn to ‘know the world’ and practice ‘being in the world’. The real world provides the context for learning and assessment for learning, but not enough is known about assessment of such learning.

This leads us to the questions that Fundisa for Change and Sustainability Starts with Teachers projects and case studies need to suggest answers for:

- i) What guiding conceptual and theoretical frameworks exist or can be developed for assessing knowledge, skills and competencies in

Education for Sustainable Development (ESD) processes? What is needed to contextualise them within the socio-cultural and teacher education contexts of southern Africa?

- ii) What are some of the assessment approaches and strategies for knowledge, skills and competencies relevant to the southern African context?

This chapter explores issues regarding ESD and proposed higher order and significant learning outcomes. It considers assessment of learning outcomes through case studies situated in different southern African countries. The chapter illustrates the need for innovation in assessment and for positioning *assessment as a learning process* by adapting Fink's (2003) taxonomy of significant learning to the broader southern Africa context. The two chapters that follow illustrate the relevance of innovations and reflexive assessment practices in the South African context. The first, by Mkhabela and Schudel (Chapter 13), demonstrates how higher order thinking was connected to Wiek's competencies in ESD even though the teacher was not doing summative assessment using the competencies per se. The next chapter, by Mgoqi and Schudel (Chapter 14), demonstrates the connection between *assessment as learning* and the development of higher order learning skills.

The nomenclature of learning outcomes, skills and competencies is vast and can be confusing. In this chapter, we have drawn from the Unesco International Bureau of Education (IBE) *Glossary of Curriculum Terminology* that defines learning outcomes as the 'totality of information, knowledge, understanding, attitudes, values, skills, competencies or behaviours a learner has mastered upon the successful completion of an education programme' (2013: n.p.). Unesco IBE defines 'skill' as the ability to perform tasks and solve problems, while 'competence' is a combination of knowledge, skills and attitudes appropriate to the context, making it broader than 'skill'. Unesco IBE goes further to point out that competence indicates the ability to apply learning outcomes adequately in defined contexts including education, work, personal or professional settings. It elaborates that competencies entail the use of knowledge, technical skills, and interpersonal attributes such as communication and collaboration. It also notes that competencies can relate to knowledge, skills and attitudes within one specific subject or discipline (i.e. domain-specific), or they can be general/transversal because they have relevance to all domains/subjects. In this chapter, 'skills and competencies' are dealt with together to reflect their connectedness as well as the broader, significant learning and capacities that must be developed in curricula and real-life contexts. As can be seen from the discussion below, we include values and ethics in the conceptualisation of ESD competencies.

Education in the early part of the 21st century

While educating people in the early part of the 21st century is challenging, given contemporary conditions, it also carries with it exciting prospects. Current life is

characterised by uncertainty and complexity, by economic, social and ecological challenges aggravated by the debilitating impacts of environmental and sustainability pressures, including climate change. This occurs even as rapid advances in digital and other technologies are driving what is being termed a ‘fourth industrial revolution’. There is much talk of knowledge economies that are intended to replace resource- and service-based economies, with these advances occurring while poverty levels in some parts of the world are increasing and wealth gaps between rich and poor expand (as has become highly visible during the COVID-19 pandemic). With ‘wicked’ and complex problems such as these, one is often confronted with contradictory knowledge, or knowledge that is incomplete. The skills and competencies to resolve such problems are not easy to assemble, and may not even be available; moreover, contradictory values make the problems difficult to evaluate. Wicked problems such as climate change and poverty also intersect, and have real-life consequences that differ from place to place. They manifest as local matters of concern that influence people’s lives everywhere and that require different sets of skills and competencies. Such problems characterise early 21st-century life and pose particular challenges for the types of skills and competencies developed in education systems, in that they may demand very different skillsets and competencies to those that were taught and assessed in earlier times. Consequently, they require shifts in the types of assessments used in association with these developing qualities.

In such a context, learning also has to take on new dimensions, becoming transformative, continuous and adaptive to the rapidly changing conditions and complexity of concerns, thus involving cognitive, social-emotional, action, and wider social learning dynamics (Unesco 2018; Wals 2007). The rapidly changing nature of reality also means that the skillsets people need to live in an ever-changing and unpredictable world have a shorter life (Thomas & Brown 2011). More intricate skillsets will be required that entail systems thinking and development of mindsets that allow us to reflexively learn our way to a better future and more sustainable lifestyle (Wals 2007). In this sense, Siarova, Sternadel and Masidlauskaite observed that the skills we need have evolved to become ‘transversal and multi-dimensional in nature’ (2017: 7). Given these ever-changing societal contexts and the demands for new skillsets, a different culture of learning must emerge. Thomas and Brown (2011) posited that in the new culture of learning,

the point is to embrace what we don’t know, come up with better questions about it, and continue asking those questions in order to learn more and more, both incrementally and exponentially. The goal is for each of us to take the world in and make it part of ourselves. In doing so, it turns out, we can re-create it. (2011: 38)

This background sets the scene for this positioning chapter, which focuses on the new dynamics of learning and assessment. It examines the international context and thinking around assessment *for* learning ever more complex skills and competencies

in ESD. Unesco (2018) explained that ESD is a type of multi-dimensional, inter-disciplinary and multi-modal education that seeks to address complex intersecting environmental, societal and economic concerns. Therefore, the concern is for assessment of the development and learning of new skills and competencies in the present, and for continued learning in the future (Siarova et al. 2017; Ibáñez et al. 2010). In this regard, we cast our eyes firmly on the formative functions of assessment (Mattheos et al. 2009; Price et al. 2011). We pose questions, propose a framework, and raise issues for research, innovation and concerns with regard to recontextualising the discourse on assessment in the southern African ESD context, where Fundisa for Change is becoming an escalating demand.

A focus on skills and competencies

One of the main shifts in educational thinking is towards emphasis on the multi-dimensional nature of learning, involving cognition, social-emotional engagement, normative commitments, and action orientations (Unesco 2017). These can be summarised as acquisition of skills and competencies (including psycho-social, cognitive and action aspects) for realising human well-being through effective functioning and contributing to improved quality of life for self, others and the society. Attempting to capture this multi-dimensionality, many educational reforms, especially in primary and secondary education, point to outcomes as the main intention of education. These are captured in discourses about ‘outcomes-based’ education, implying that the outcomes are pre-determined and, consequently, shape the way that learning programmes are structured. This is problematic, given the administrative burden on teachers in specifying learning outcomes (Jansen 1998) and the difficulties experienced by teachers in implementing these approaches (Chisholm 2002; Lotz-Sisitka 2000, 2002). It can also give rise to a somewhat populist and reactionary orientation that produces a dualism between knowledge and competence, thus leading to a loss of key elements such as knowledge progression in key subjects (Jansen 1998; Schudel 2012). Despite such problematic experiences with outcomes-based education, these discourses still offer useful insights into how assessment can be framed, especially if the full scope of knowledge, skills, values and competencies is to be included in such assessments.

The engagement with learning outcomes and competencies, from three southern African case studies, is discussed below in order to gain insight into assessment challenges in this region. First, in the national curriculum of Zambia, for example, it is stated:

The approach (outcome based education) seeks to link education to real life experiences as it gives learners skills to access, criticize, analyse and practically apply knowledge. Learners are given practical experiences during the teaching and learning processes that help them gain life skills. (Curriculum Development Centre 2013)

Second, the Curriculum Framework for Primary and Secondary School in Zimbabwe advocates for a competence-based approach to education (Ministry of Primary and Secondary Education 2015). This approach foregrounds the development of competencies, outcomes of the learning process that are enduring and relevant for life and work contexts. These discourses function as a call for transformed forms of education that are envisioned to enable school leavers to function more adeptly and reflexively in society in the face of ever-increasing emerging and growing challenges to the society.

The third case, South Africa, shows that these discourses, as mentioned above, are not unproblematic. Experience in South Africa has shown that superficial interpretations and poor quality engagement with outcomes-based education (OBE) can lead to further disenfranchisement of learners. There is therefore a need to give attention to the quality of engagement with these discourses, including from the perspective of knowledge, skills, values and assessment thereof.

In South Africa, the outcomes-based curriculum was discontinued to focus more directly on knowledge progression in order to provide a stronger balance between knowledge and skills. The curriculum has become more content driven rather than outcomes based. Noteworthy is the fact that the 'aims' in the Curriculum and Assessment Policy Statement (CAPS) can be traced back to the 'outcomes' of the discarded OBE curriculum and that the CAPS principles demand higher order skills and competencies for their realisation, for example, social transformation, active and critical learning, high knowledge and skills, human rights, inclusivity, environmental and social justice, and valuing indigenous knowledge systems (South Africa DBE 2011).

Consequently, the Minimum Requirements for Teacher Education Qualifications in South Africa underline both knowledge and practice, and propose knowledge of, as well as competence for, designing situational learning during teacher development programmes (South Africa DHET 2015). Furthermore, the South African National Curriculum and Assessment Policy Statement for Grades R–12 advocates that children acquire and apply knowledge and skills in ways that are meaningful to their own lives (South Africa DBE 2011). In this regard, the curriculum promotes knowledge in local contexts, while being sensitive to global imperatives. In all three countries' cases, if schools are to teach successfully for situated and multi-dimensional competencies, the challenge still remains as to how they should effectively assess the development of these competencies. In ESD, skills and competencies are learning outcomes that ultimately should lead to the well-being of the individual at the familial, communal and societal levels. The following quote bears this out:

We need to prepare students not only for employment in a sustainable economy, but also with the skills and values that will allow them to live sustainable lifestyles on this planet. This entails encouraging strong personal development as well as promoting responsible citizenship. (Bell 2016: 55)

An emphasis on such learning outcomes explicates what a learner knows, understands, and is able to do on completion of a learning process (Ibáñez et al. 2010). In ESD, it is expected that learners will develop knowledge, skills, values and competencies. As shown in the Unesco IBE (2013) definition earlier, developing skill and competency in real world contexts is important. Attainment of skills, values and competencies relate well to contextual capability (Dede 2009). Drawing on O'Donoghue (2001) (cf. with papers in Section B of this book), it is important to support the development of contextual capability. This is achieved through seeing knowledge, skills and values as integrated. What is needed for this are situated and contextual engagements that draw on learners' existing knowledge and experience. These can then be expanded through supported learning processes and open enquiry sequences. Capability, in this instance, can be understood from Amartya Sen's capability approach (Sen 1999; Walker 2005). According to Sen, capabilities are what people choose to be and do, depending on what they have reason to value. It follows then that the emergence of competence relates to personal agency, responsibility, autonomous functioning, the capacity for doing, and having the freedom to choose what or what not to do (cf. Section D of this book).

In ESD, the aim is to ensure that learners develop capabilities for creating sustainable futures by providing opportunities for them to acquire relevant skills and competencies. Education, therefore, must nurture learner capability and agency for sustainability. As an instance, the OECD Education 2030 uses the model of the 'learning compass'. This learning compass foregrounds learner agency to depict the notion that learners need to be able to navigate and confront societal challenges by themselves. Learners must have agency for their own learning, setting their own goals, and for reflecting and acting responsibly to effect change. They need to become competent to meet the complex demands of education and of life (OECD 2018). In ESD, creating learner agency becomes a sound rationale for education (Lotz-Sisitka & Lupele 2017). This is also seen in the following quote:

Agency implies a sense of responsibility to participate in the world and, in so doing, to influence people, events and circumstances for the better. Agency requires the ability to frame a guiding purpose and identify actions to achieve a goal. (OECD 2018: 4)

Learning for agency is important. This is evident in many learning and assessment frameworks that outline contemporary skills and competencies at the start of the 21st century (Dede 2009; Rieckman 2018; Wiek, Withycombe & Redman 2011). Different contexts and premises from which skills and competencies have emerged have implications for research and innovation with regard to next generation assessments.

While competency frameworks have been developed on different premises, they have commonality in the recognition of the complex changes in societies and environments mentioned above. The Unesco Commission on Education for the 21st Century produced a report, *Learning: The Treasure Within* (Unesco 1996). The report presented four pillars of learning: learning to know, learning to do, learning to live

together, and learning to be. These are now complemented by a fifth pillar, learning to transform oneself and society (Rieckman 2018). Together, these pillars suggest (i) the need for learners to acquire knowledge of the complex and interdependent issues and challenges in society (societal issues); (ii) the need to focus on learners' personal development and their empowerment; and (iii) the need to empower learners to be reflective and active citizens (personal agency). From this it is clear that learning is proposed to be a purposeful and contextualised activity with a humanistic and social focus to create agency for self-reflection and development and for acting to resolve societal issues. Many contemporary learning, competency and assessment frameworks appear to be elaborating this review of learning for agency. Wiek et al. (2011) identify key interrelated competencies to assess ESD: anticipatory, systemic working, interpersonal, normative, and strategic, which they argue 'come together' at the point of practice. In the next chapter, Mkhabela and Schudel provide a case study of how ESD can develop higher order thinking skills drawn from the official curriculum. They also highlight how, by using Wiek's competencies, we can get a sense of the way in which environmental topics in the curriculum can contribute to both higher order thinking skills and agency.

There is a connection between higher order thinking and the integrated approach suggested in Wiek et al.'s competencies. De Haan (2010) refers to ESD as 'shaping competences', which also indicates that competencies are developed via a process and in interaction with each other, as well as with knowledge, in contexts of emergence and engagement. Rieckmann (2018) aggregates the competencies for a 'sustainability citizen' profiled in the international literature as follows: systems thinking competency; anticipatory competency; normative competency; strategic competency; collaboration competency; critical thinking competency; self-awareness competency; and integrated problem-solving competency.

Rieckmann's approach to competencies complements the Unesco (1996) pillars of learning in fostering capability to engage in socio-political processes and aiming to move societies towards sustainable development. However, while specifically mentioning the need for action-orientated transformative pedagogy, there is no mention of assessments of these types of listed competencies. Giangrande et al. (2019) modified earlier frameworks, adding 'intrapersonal competencies, a self-reflective validation scheme, a focus on non-formal learning, and a special alignment with SDG4.7 requirements' (p. 1). They created a modified key competency list as follows:

- *Intrapersonal*: including, for example, self-awareness, stress management, self-reflection;
- *Interpersonal*: including, for example, communication skills, teamwork, mediation;
- *Future thinking*: including, for example, visioning, backcasting, recognising heritage;
- *Systems thinking*: including, for example, working with complex problems, promoting resilience;

- *Disciplinary and interdisciplinary*: including, for example, critical thinking, expressing multiple ways of knowing;
- *Normative and cultural*: including, for example, development of world views and perspectives, awareness of values, awareness of local context and global trends;
- *Strategic*: including, for example, planning, decision-making, implementing, and addressing challenges.

Together, Unesco (1996), Giangrande et al. (2019), Rieckmann (2018), and Wiek et al. (2011) provide frameworks that point to competencies for personal and social agency in a quest for sustainable development and lifestyles.

Learning taxonomies used for guiding assessment

We now turn to reviewing and evaluating how frameworks of skills and competencies relate to learning taxonomies used in learning and assessment. The learning taxonomy developed by Benjamin Bloom (1956) has been a popular model for developing assessments. In the Curriculum and Assessment Policy Statement in South Africa, Bloom's Taxonomy is used to guide the setting of questions to cover different cognitive levels. For example, in the Natural Sciences and Technology, items are set to reflect the following levels: cognitive levels; knowing science and technology; understanding science and technology; applying scientific and technological knowledge; evaluating, analysing and synthesising scientific and technological understanding (South Africa DBE 2011).

When it comes to ESD, there is a need to go beyond the process skills identified under each of the cognitive levels. The adaptation of Bloom's Taxonomy by Anderson et al. (2001) adds value by identifying the need to develop metacognitive competency in addition to factual, conceptual and procedural knowledge. Further, Anderson et al. revised Bloom's Taxonomy by translating the nouns into verbs and swapping the last two levels of the taxonomy to create the revised taxonomy: remember, understand, apply, analyse, evaluate and create as the highest level. Chapter 14 in this section by Mgoqi and Schudel presents a case study that used the Anderson et al. (2001) taxonomy and showed a connection between quality formative assessment (assessment *as learning*) and the development of higher order thinking in a South African context.

The work of Anderson et al. reflects a significant extension of the original Bloom's Taxonomy (Wilson 2016). This demands new kinds of assessments that lead learners to metacognitive knowledge levels where self-regulation and learning to learn are achieved. Further to this, the revision of Bloom's Taxonomy points to the possibility of basic skills such as remember, understand, or apply being learnt together with higher level cognitive processes and knowledge types, for example, procedural and metacognitive, that denote competencies. It means, too, that high level cognitive processes such as analyse, evaluate and create can be developed for factual or conceptual knowledge types and levels. It also suggests that learning

factual knowledge and the ability to apply, analyse and create solutions to problems go hand in hand (Silva 2008). This provides for a framework or taxonomy that can guide effectively innovative assessments of learning that accomplish the simultaneous learning of higher order thinking skills, as well as different knowledge types and knowledge levels, as required for competency. Often, these types of taxonomies also drive the framing of learning outcomes, and are therefore influential in the setting of learning outcomes and competence-based curricula.

The Anderson et al. taxonomy provides a useful two-dimensional characterisation of learning. However, it still lacks a holistic enough representation relevant for the realisation of the scope and types of competencies proffered in ESD discourse, and the true capability and agency (i.e. the situated, contextualised and emergent learning) that ESD aims for (cf. chapters in Section B of this book). Fink's (2003) taxonomy of significant learning is promising in this regard. It tries to present a holistic view of learning outcomes, as opposed to the linear hierarchy found in Bloom's Taxonomy. However, it is not offered as a prescription; rather, it demands criticalness, imagination and creativity among teachers to extend the learning beyond the contents of the subjects to bring personal relevance and significance to real-life contexts. This would be consistent with meeting the CAPS expectation that 'ensures that children acquire and apply knowledge and skills in ways that are meaningful to their own lives' (South Africa DBE 2011: 4). For example, Chapter 13 by Mkhabela and Schudel shows a case study that suggests that incorporating ESD perspectives into assessment is a demanding endeavour which, fortunately, pays off in the higher order thinking that it yields.

Table 1 provides a summary of the six kinds of learning that, together, constitute what Fink (2003) refers to as a significant learning experience. These six types of significant learning are not hierarchical but synergistic. Each kind of learning interacts with and relates to the other kinds of learning, adding something overall to significant learning (as is illustrated in Figure 1). Fink explains that 'achieving any one kind of learning simultaneously enhances the possibility of achieving other kinds of learning as well' (2003: 6). Significant learning is thus the totality of learning achieved when learners have experiences in some or all of the six interacting kinds of learning shown in Table 1.

Later, in Figure 1, we relate significant learning taxonomy as outlined in the framework above to the ESD learning context. This is in light of the fact that significant learning adds value to learner capabilities. Fink (2003) explains that significant learning makes a difference in how people live and the kind of life they are capable of living. This is achievable when a learner has knowledge, can see connections and applications, and can see and care about the human dimension and the planet that is his or her home. It aligns with the 'learning as connection' approach that Lotz-Sisitka and Lupele (2017) and Shumba and Kampamba (2017) have described as socio-culturally and situationally meaningful learning. This approach to learning is an important feature of enabling quality education, and is central to ESD (cf. with Schudel and Lotz-Sisitka, Chapter 1). Significant learning similarly entails seeing the

personal and societal value of what is learnt and caring about it; it means continuing to learn and act consistently with developing knowledge, skills and values, in order to improve the quality of life at the personal, familial and societal levels. Fink suggests that significant learning has a process dimension (active engagement) and an outcome dimension (meaningful and lasting change), which aligns well with the intentions of ESD. It features one or more of the following values: enhancing an individual's life; enabling the individual to contribute to the communities in his or her life, that is, familial, community, national and global; and preparing the individual for the world of work. Change resulting from significant learning experiences must thus have relevance and importance for the learner's life (Mandikonza 2019). This makes Fink's Taxonomy relevant for creating assessment frameworks in ESD education and change projects for sustainable development. It also has the potential to add to our growing but fledgling understanding of how ESD and assessment of learning outcomes contributes to educational quality and relevance.

Table 1. Summary of Fink's six kinds of learning and value-added dimensions thereof

Type of significant learning	Definition and value-added dimensions
1. Foundational Knowledge	<ul style="list-style-type: none"> • Knowing, understanding and remembering specific and valid information, ideas and perspectives, e.g., science of climate change or biodiversity, ecological systems, etc. • Value added: Provides the basic understanding that is necessary for other kinds of learning.
2. Application	<ul style="list-style-type: none"> • Learning how to engage in critical, creative and practical thinking and action, e.g., engaging in a change project. • Value added: Allows other kinds of learning to become useful.
3. Integration	<ul style="list-style-type: none"> • Seeing and understanding the connections between different things, ideas, concepts and real-life contexts. • Value added: Gives learners a new form of power, especially intellectual power.
4. Human Dimension	<ul style="list-style-type: none"> • Learning about self or others, and appreciating personal and societal value of what is learned. • Value added: Informs students about the human significance of what they are learning.
5. Caring	<ul style="list-style-type: none"> • Acquiring new feelings, interests or values that reflect caring about something or someone. • Value added: Inspires one to want to learn more and make it a part of one's life.
6. Learning how to Learn	<ul style="list-style-type: none"> • Learning how to be a better student, how to engage in inquiry, or how to become a self-directed learner. • Value added: Enables students to continue learning effectively in the future.

Source: Adapted from Fink (2003)

However, there are challenges to be tackled, especially in the global South where there does not appear to be much in the way of elaboration of contextually relevant assessment

frameworks. When we look overall at competencies being put forward as being relevant to education at the start of the 21st century (as outlined above), we see a wide spectrum in their rationality and definition that Silva (2009) conjectures could be running into hundreds of descriptors. We see also that the skills and competencies movement appears to be divided over putting the stress on either knowledge or competency. To Silva, an emphasis on what students can do with knowledge (competency), rather than what units of knowledge they may have, is the essence of the skills needed at the start of the 21st century (2009: 630). Others, however, contend that theoretical knowledge and understanding are essential to being competent, and that mental activity and skilled performance cannot be separated (Ashworth 1992). It is desirable to find or develop a framework that is able to guide on the assessment of values: this is critical to achieving agency as values and knowledge combine to shape motive to act (Kollmus & Agyeman 2002). We appreciate, as Stasz (2001) does, that some of these frameworks (e.g. Wiek et al. 2011; Riekmann 2018; Giangrande et al. 2019) being put forward for learning in an ESD context embrace socio-cultural or situative perspectives, whereas economic and efficiency perspectives dominated thinking about learning and assessment in the past (Lotz-Sisitka & Lupele 2017). While this is broadly understood, there are as yet very few assessment frameworks that allow for assessing the kind of learning described here, and in ESD texts that are guiding education at the start of the 21st century.

It is noteworthy that in the OBE systems of the three countries serving as case studies for this chapter, namely, South Africa, Zambia and Zimbabwe, values are among the learning outcomes that should be assessed. However, this has not been successfully done. In South Africa, subjects such as those in the Further Education and Training Physics and Economics curricula have very little reference to values in their assessment guidance, while others such as the Further Education and Training Life Orientation Geography curriculum work more explicitly with values in their assessment chapters.

Innovating assessment *for* learning and *as* learning

There is a need for innovative assessments that are guided by a mindset that supports the notion that we can learn to face up to developmental challenges of our time, and that as humans we *do* have agency to learn, co-learn and act, even if we are unable to change everything that needs transforming. In this regard, Dweck's (2010) 'growth mindset pedagogy and assessment for learning' is noteworthy:

... teach students to love challenges, to enjoy effort, to be resilient, and to value their own improvement. In other words, we can design and present learning tasks in a way that helps students develop a growth mindset, which leads to not just short-term achievement but also long-term success. (p. 16)

This necessitates a paradigm shift to embrace assessment *for* and *as* learning, taking us beyond assessment *of* learning, which has thus far been the dominant mode in most

formal education systems. Assessment *for* learning is well acknowledged in supporting the ongoing acquisition and continued growth of various skills and competencies (Price et al. 2011). Wiliam (2013) argues that all assessment can be made relevant for formative purposes, and counsels that ‘the term *formative* should apply not to the assessment but to the function that the evidence generated by assessment actually serves’ (p. 15). A paradigm shift in the way assessment is used to inform teaching and learning is therefore necessary. Price et al. (2011) suggest six ‘effective’ assessment strategies as follows: rubrics, performance-based assessments, portfolios, student self-assessment, peer assessment, and student response systems. Price and her colleagues suggest that these are innovative and effective strategies ‘relevant to the educational context of developing countries’ that can ‘help teachers foster a 21st century learning environment in their classrooms’. Supporting learners in learning to learn (as outlined in Fick’s 2003 notion of significant learning) can also enable assessment *as* learning, where assessing a situation reflexively can help learners to learn new things. These strong claims merit research and innovation to demonstrate the efficacy of these methods in contexts of learning in southern Africa. There is evidence that learners do learn reflexively via situated learning activities and change projects (e.g. Mandikonza 2019; Mandikonza & Lotz-Sisitka 2016), but there is, as yet, little formalised guidance on how to assess this type of learning beyond broad notions of assessment *for* learning and assessment *as* learning. This chapter tries to address this.

With respect to this, we also note that in the case study countries (South Africa, Zambia and Zimbabwe), continuous assessments are now acknowledged to contribute to grade transition and school exit assessments. In the CAPS in South Africa, for example, as much as 75% of formal assessments at Grades 4–6 are schools based; 40% at Grades 7–9; and 25% at Grades 10–12. It would seem that this presents an opportunity for innovation and adoption of rubrics, performance and other assessments that Price et al. (2011) pointed out to be relevant to developing country contexts. However, in considering these assessment perspectives, it is important to relate them to the situation of complexity that we outlined at the start of the chapter. As Lotz-Sisitka mentioned, there is a need to go beyond the technical and discipline-centred approaches to teaching and learning and ‘embrace an open-ended notion of epistemological access to enhance reflexivity, agency and responsiveness to risk and vulnerability’ (2009: 11), associated with, for example, climate change, biodiversity loss, water shortages, HIV-AIDS, Ebola, COVID-19 and other such conditions.

In Table 1 above, the framework of significant learning by Fink (2003) potentially offers a robust guide to thinking and conduct of assessment practices, more so because ESD requires assessment of skills that go beyond cognitive aspects of learning. Fink’s framework integrates the cognitive and affective learning outcomes, unlike Bloom’s approach that separates affective, cognitive and psycho-motor learning outcomes into three taxonomies. The Fink model has potential to raise the prominence of skills and competencies that go beyond the cognitive. Learning in ESD does not always follow the hierarchical order that is suggested by dominant taxonomies of learning and assessment, namely from simple to complex as in Bloom’s Taxonomy (Bloom 1956;

Anderson et al. 2001), which is widely used for guiding assessment practice and for deriving outcome statements. For example, a learner may start with implementing the reuse of plastic waste by making artefacts from it as a way of generating income. After engaging with the making of artefacts, the learner may later learn about the nature of plastic, the effect of plastic on the environment, and how humans are affecting their environment, other forms of life and, consequently, their own health through plastic pollution. Ultimately, the meaning-making process emerges out of application, where the learner becomes more theoretical and can relate to the notion of plastic pollution from an application to a cognitive and conceptual level. There is a need to assess the development of this complex interaction of knowledge, skills and values.

To address this complex demand for assessment in ESD, we adapt Fink's framework in order to be able to assess the complex and multidimensional nature of ESD learning. We start off by formulating questions that clarify what can be assessed at each of the 'petals' of the Fink model (see Figure 1, where these relate to key aspects of the framework in Table 1). Noteworthy with regard to the adaptation for ESD significant learning, is the addition of ecological dimensions to Fink's 'human dimension' petal, and an Ubuntu perspective, added to Fink's focus on 'care'. This adapts the framework to a southern Africa context where human and ecological aspects are intertwined and reinforced by an Ubuntu worldview of connectedness of the human and the ecological (Le Grange 2015).

ESD Significant Learning Assessment Model

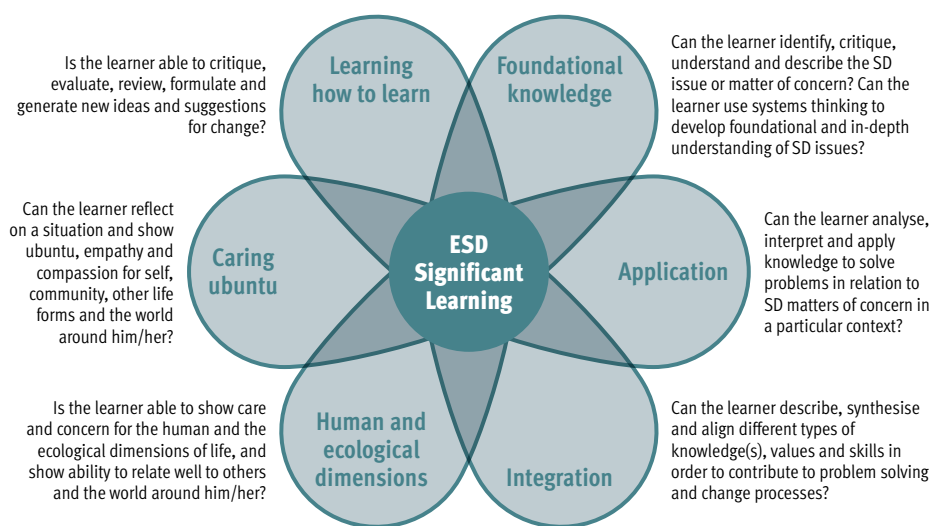


Figure 1. Adaptation (by the authors with permission) of Fink's 2003 framework for assessing significant learning in ESD processes

Table 2. Adaptation of Fink’s framework for assessing significant learning in ESD processes, applied to an ESD example

Dimensions of significant learning in ESD processes.	Questions that help to focus the assessment of significant learning in ESD processes.	Applied to an example of a learner dealing with single-use plastic waste.
Foundational knowledge	Can the learner identify, critique, understand and describe the sustainable development issue or concern? Can the learner use systems thinking to develop foundational and in-depth understanding of sustainable development issues/ concerns?	Learner explains what plastic is and how it has been made. Learner explains why single-use plastic is a problem in the environment. Learner explains how single-use plastic affects the environment, relates this more broadly to how humans are affecting their environment, other forms of life and, consequently, their own health, through plastic pollution.
Application	Can the learner analyse, interpret, and apply knowledge to solve problems in relation to sustainable development matters in a particular context? Can the learner demonstrate agency (thought and action) on a sustainable development concern in ways that seek change / transformation in and of matters of concern?	Learner innovates the reuse of plastic waste by making artefacts from it as a way of generating income (e.g. uses plastic bottles to establish small hanging food gardens). Learners show agency by developing the small hanging food garden and re-using the plastic bottles.
Integration	Can the learner describe, synthesise, relate and align different types of knowledge(s), values and skills in order to contribute to problem solving and change processes?	The learner links scientific knowledge of the problematic substances in plastics to local knowledge on how to grow food. By developing the solution of re-using the plastic bottles, learners show innovation skills.
Human and ecological dimension	Is the learner able to show self-understanding, care, and concern for the well-being of the human and ecological dimensions of life, as well as show ability to relate well to others and the world around him/her?	The learner shows an ethics of care for humans and the environment by reducing plastic pollution and growing food through the re-use of the plastics.
Caring and Ubuntu	Can the learner reflect on a situation and show ubuntu, empathy and compassion for self, community, other life forms and the world around him/her?	By growing food that others can use, the learner shows ubuntu and empathy. By reducing plastic waste, the learner shows empathy for sea creatures that are most heavily affected by plastic pollution.
Learning How to Learn	Is the learner able to critique, evaluate, review, formulate and generate new ideas and suggestions for change? Is the learner able to reflexively engage with knowledge on a continuous basis? Is the learner able to identify something he/she needs or wants to learn and to formulate a strategy to learn that? ¹	The learner is able to identify and review the problem of plastic pollution and come up with a solution, formulating an alternative and applying it to a local context, offering suggestions for change.

¹ This question is credited to Dr L. Dee Fink in a personal communication, 18 July 2020.

These questions point to what an educator needs to think about when developing knowledge on any concept and they serve as the outcomes that the learner can achieve as they interact with the knowledge. Assessment will therefore be establishing the achievement of these outcomes. In Table 2 we consider these questions in relation to the example given above of the learner engaging with the problem of pernicious plastic pollution, to illuminate the dimensions of significant ESD learning.

A cautionary note is needed when interpreting and assessing how the learner shows care, empathy and/or Ubuntu values as suggested in Table 2. It is important that the learner demonstrates these. There is a need to show that learners' actions were conducted out of empathy or out of a sense of Ubuntu and not for other reasons. The suggestion here is that assessment needs to move beyond the 'act'.² It is important also to reflect on the important issue concerning 'learning how to learn' in Figure 1. In a personal email communication, L. Dee Fink raises issues around our choice of verbs 'critique, evaluate, and generate new ideas'. He sees these terms as being a part of 'application' and clarifies his view of learning how to learn as follows:

I can see how anyone can see those [i.e. critique, evaluate, and generate new ideas in Figure 1] as helping one to learn, but I guess I mean that phrase [i.e., learning how to learn] a little differently. For example: (i) Study skills: Do students need to learn how to study better or more effectively? (ii) Using ways of generating new insights that are distinct to different realms of knowledge, e.g., the scientific method, historical analysis, etc.? (iii) But especially important in my view is helping students become 'self-directing learners'. To do this, they need to be able to do two things: (a) Identify something they need or want to learn, and (b) formulate a learning strategy for learning 'that'. (L. Dee Fink, personal communication, 18 July 2020)

Table 3 expands the possibilities for ESD significant learning further by adapting and integrating the Bloom cognitive taxonomy and Fink's taxonomy, drawing on and expanding the guiding questions in Figure 1. In Table 3, the adaptation involves expanding on the levels (Column 1) and their descriptions (Column 2) in order to harmonise more intangible and non-cognitive aspects of learning. We further integrated verbs (in Column 3) that guide the educator in stating the learning outcomes and the learning tasks.

It is hoped that in addition to proactively defining outcomes of learning, these verbs can help educators (at all levels and in all settings) to design learning tasks that assist learners to learn through assessment, thus realising the assessment *for* and assessment *as* learning processes. The framework can be used for assessment *of* learning as well as assessment *for* learning and *as* learning. As explained above, our interest is to adapt the Fink and Bloom frameworks to include ESD learning objectives that incorporate the cognitive, social-emotional and ethical, and that also take agency and wider social

² This point is credited to the editor, Ingrid Schudel, who reviewed an earlier version of the chapter.

learning into consideration. Ultimately, Table 3 provides verbs that enable the educator to create opportunities for higher order learning as well as assessment that encompasses those higher order aspects of social learning that cannot be accessed through cognitive learning processes alone.

Table 3. Adapted assessment framework for ESD significant learning

Levels	Description	Some verbs
Learning to learn; reflexive review and evaluation, transformative agency	Learning how to ask and answer questions, becoming self-directed learner, future's orientation, reflexivity. Develop one's agency for change, developing new solutions/ options for change	Critique, evaluate, analyse, act, create, reflect, review, formulate, generate, hypothesise, reflect, theorise, engage
Caring and ethics	Identifying/changing one's feelings, interests, values; showing ubuntu, empathy and care for self, others and the environment	Reflect, interpret, empathise, show care, ubuntu
Human dimensions and life appreciation (respect for and relations with cultural heritage, others and environment)	Learning about and changing one's self and community: understanding and interacting with others and the wider environment (non-human life systems); social learning	Reflect, assess, relational engagement
Synthesis and integration	Make connections among ideas, subjects, people, cultures, science and environment systems	Describe, integrate, compare, critique, align, synthesise, relate, justify
Comprehension, analysis and application	Critical, creative and practical thinking, problem-solving, reflexivity	Analyse, interpret, apply, compare, contrast, argue, solve problems
Foundational knowledge	Understand and remember, systems thinking	Identify, name, list, describe, understand

Source: Adapted from Anderson et al. (2001), Bloom (1956) & Fink (2003)

Building on the framework explicated above in Figure 1 and Tables 1, 2 and 3, we offer an example of how this can be translated into a rubric. An example of a task and the rubric is given in Appendix A. It illustrates how the consolidated framework in Table 3 can be used for assessment purposes. However, use of the assessment framework is not limited to the illustration provided in Appendix A. Depending on the purposes of the assessment, a teacher may choose to expand the rubric to incorporate other learning outcomes, or focus on only one of these outcomes highlighted in the example and then deepen it.

One should be mindful that assessments and assessment rubrics are designed for particular purposes. When using rubrics for formal assessment, the task and rubric are discussed beforehand. When learners know what is expected of them, they work to achieve the outcomes of the task, the process of which helps them to learn the intended knowledge. Using the adapted assessment framework should encourage learners to work with knowledge at a higher order to achieve significant aspects of understanding and caring for human-ecological interactions and to value and strive for sustainable lifestyles, reflexive learning and re-learning in the face of changing real-world contexts.

Conclusion

As we have argued across this chapter, there are a number of frameworks that could be used to guide assessment. We have chosen the few that speak closely to the environment and sustainability knowledge that we are working with in Education for Sustainable Development contexts (Wiek et al. 2011; Riekmann 2018; Giangrande et al. 2019). We find these frameworks to be particularly relevant for developing knowledge that is required in the mainstream schools curriculum, and we have developed an adapted assessment framework that offers a richer platform for assessing ESD learning. Proactive thinking about the learning outcomes suggested in the adapted framework offered in Figure 1 and developed further in Tables 2 and 3, together with the questions therein, may help with structuring teaching and learning processes. It can be helpful for innovating assessment processes *of* learning, towards assessment *for* learning, and also positioning assessment *as* a learning process (i.e. learners learning through the assessment process).

We have also considered the implications of key guiding frameworks that support the achievement of the United Nations objectives for Education for Sustainable Development, which have been defined for broadening education beyond a focus on the cognitive only, and to support learning in relation to the Sustainable Development Goals (SDGs) in ways that include a focus on skills, competencies and agency for change. Sustainable Development Goal 4 requires all educators to integrate this kind of education into their programmes, as it has been determined by Unesco (2014, 2016) that this is an important contributor to achieving educational quality that is relevant to the challenges and conditions of the early part of the 21st century.

This chapter has therefore been positioned to address these new challenges, and provide orientation on how a next generation of assessment practice can be constituted. We contend that some of the skills and competencies associated with, for example, collaboration and problem-solving, working with others, responsibility and community, cannot be fully learned and assessed if taken out of their contexts of local worldviews, such as Ubuntu. We need to be exploring assessment frameworks and policies for 21st-century conditions, with their requisite forms of knowledge, skills and competencies that are cognisant of socio-cultural contexts in which acquisition and learning takes place (Lotz-Sisitka & Lupele 2017; Shumba & Kampamba 2017). In conclusion, we have to concur with Elena Silva when she observes:

In the long run, new forms of assessment, as well as other yet-to-be-developed measures, will be critical for making assessment effective both for educational purposes – to ensure that teachers and students can monitor and improve the learning process – and for accountability purposes – to ensure that schools are giving all students what they need to succeed. This will require a larger investment in the development and design of assessments and assessment systems. It will also mean more coordination between policymakers, educators, researchers, and test developers, who too often work in isolation of one another. (2008: 10)

In addition, we need to research and validate more case studies in teaching, learning and assessment approaches that elicit and extend higher order skills and competencies, including digital literacies and sustainability challenges that are part of the Agenda 2030 and the SDGs. This chapter provides orientation and guidance for such a process.

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Appendix A: Sample assessment task and rubric

Table 4. Task and assessment rubric for ESD significant learning

Task	Level of Attainment of Significant Learning					Scores
	Very good (5)	Good (4)	Satisfactory (3)	Unsatisfactory (2)		
<p>Task</p> <p><i>Conduct an audit of environment and sustainability concerns/issues in your institution. Describe causes, effects and manifestations of one of the key issues, showing how these interact. Suggest alternative ways that education can be used to alleviate or eliminate one of these concerns/issues.</i></p>						
<p>Criteria</p> <p><i>Conducts audit:</i> ability to find out information and conducting of audit</p> <p><i>Foundation knowledge:</i> ability to identify, critique and describe the SD issue coherently</p> <p><i>Application and problem-solving:</i> ability to analyse, interpret, apply knowledge and demonstrate agency to solve problems</p> <p><i>Integration:</i> ability to describe, synthesise, relate and align different types of knowledge(s), values and skills in problem-solving and change projects</p>	<p>Thoroughly describes the tool used to generate data; explains how and why it was used</p> <p>Identifies, critiques and describes the SD issue coherently</p> <p>Analyses, interprets, applies knowledge and demonstrates agency to solve problems</p>	<p>Thoroughly describes the tool used to generate data; explains how but not why it was used</p> <p>Identifies and describes the SD issue coherently but without critique</p> <p>Analyses, interprets and applies knowledge but lacks agency to solve problems</p>	<p>Thoroughly describes the tool used to generate data but not how and why it was used</p> <p>Identifies and describes the SD issue without coherence and without critique</p> <p>Analyses and interprets but inadequately applies knowledge and lacks agency to solve problems</p>	<p>Inadequately describes tool and how and why it was used</p> <p>Identifies but inadequately and incoherently describes the SD issue</p> <p>Inadequately analyses, interprets and applies knowledge; lacks agency to solve problems</p>		

Task	Level of Attainment of Significant Learning				Scores
	Very good (5)	Good (4)	Satisfactory (3)	Unsatisfactory (2)	
<p>Task</p> <p><i>Conduct an audit of environment and sustainability concerns/issues in your institution. Describe causes, effects and manifestations of one of the key issues, showing how these interact. Suggest alternative ways that education can be used to alleviate or eliminate one of these concerns/issues.</i></p>					
<p>Criteria</p> <p><i>Human and ecological dimension:</i> shows concern for human and ecological well-being and for relating to others locally and globally</p> <p><i>Care:</i> shows reflectivity and cares for community, ubuntu values, and other life forms, locally and globally.</p> <p><i>Learning to learn:</i> ability to analyse, evaluate, and formulate new ideas, solutions to problems and suggestions for change or to learn better</p>	Shows care for human and ecological well-being and for relating to others locally and globally	Shows concern for human and ecological well-being but little concern for relating to others locally and globally	Shows concern for human well-being but does not show concern for ecological well-being or for relating to others	Shows concern for well-being of the human and the ecological dimensions of life, but little awareness and concern for interdependence and relating well to others locally and globally	
	Reflects on a situation; cares for community, ubuntu values, and other life forms locally and globally	Reflects on a situation; cares for community and ubuntu values but cares little for other life forms locally and globally	Reflects on a situation; cares little for community and ubuntu values and shows little empathy for other life forms	Inadequately reflects on a situation and cares little for community, ubuntu values, and other life forms locally and globally	
	Analyses, evaluates, and formulates new ideas, changes, or solutions to problems, and to learn better	Analyses, evaluates, and formulates new ideas, changes, or solutions to problems, but not effectively learning independently	Satisfactorily analyses and evaluates but inadequately formulates new ideas, changes, or solutions to problems	Inadequately analyses and evaluates, formulates new ideas, changes or solutions to problems	
Total Scores					