CHAPTER 1

Engaging Education for Sustainable Development as Quality Education in the Fundisa for Change Programme

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Introduction

Since the Industrial Revolution began in the late 18th century, development has provided humankind with numerous benefits, such as modern medicine, housing, transport and communication systems. However, progress and the contemporary model of development has also brought its problems, as non-renewable resources have been over-extracted, and large volumes of waste created, resulting in pollution that has impacted on the health of people and the environment. Most people are now aware that human actions are changing the climate in unpredictable ways. Massive over-consumption of resources and continued environmental degradation are undermining the natural systems we depend on, impacting most severely on the poor and marginalised people in our society. Societies around the world must adapt and change their practices for a low-carbon, more sustainable future.

This book shares research into how curriculum policy, teacher education programmes and teachers themselves are responding to these challenges through the integration of environment and sustainability learning or Education for Sustainable Development (ESD) throughout the South African schooling system. The children and youth who are reached through the current schooling system are those who will be directly affected by the chronic environmental damage that needs to be halted within this generation. These youngsters are going to have to be the agents of change

within their own lives and contexts. But for this they have to have a real and deep understanding of environmental sustainability, how they can adapt to change, and how they can mitigate against ecological degradation and social oppressions and exclusions.

An important aim of environment and sustainability learning is that it can give children hope that together we can build a better world. Children, teachers, teacher educators and researchers can use their imaginations and problem-solving skills to creatively develop diverse solutions to our problems, and change how we live for the better. This book should help researchers and practitioners to understand environment and sustainability issues better in order to help teacher educators, teachers, and the young people they nurture to make sense of their changing world. Through this we hope to cultivate a sense of hope, as together, all of humanity will need to explore how to live more sustainably on the Earth, ourselves included.

The book draws on a series of small-scale empirical case studies from South Africa that are nested within a coherent national teacher professional development programme. The four positioning papers leading each of the four sections in the book provide contextualisation and breadth to the case studies. The volume, overall, has the potential to resonate with and inform other national curriculum and teacher education programmes in southern Africa. The issues represented in this book are applicable across the southern African region, and resonate with wider studies in this area in southern Africa (see Lotz-Sisitka et al. 2017) as well as international educational interests in education quality in a complex and changing world.

Links between development, sustainability and education

In this introductory chapter, we position ESD in the broader educational context by rethinking education in terms of its development intentions. At the same time, we look critically at the evolution of development thinking, identifying well-being, equality and restoration of both social and planetary balances as core development considerations. By doing this we are able to raise the question: What constitutes good education? and to consider education quality in the light of a critical perspective on developmental orientations and histories.

New perspectives on education and development

The role of education in society is often at the heart of contestations of what constitutes 'good education'. A key role of education is that it is seen as central to global conceptions of human development and, for example, has been an indicator in gauging levels of human development since the inception of the United Nations Human Development Report series in 1990 (United Nations Development Programme 1990). Perceptions in these human development reports highlight that development is not just an end goal, but a process, an ongoing journey: 'Its centre of gravity has always been about more than just meeting basic needs. It is about empowering people to identify and pursue their own paths for a meaningful life, one anchored in expanding freedoms' (Conceição 2020: 6).

The indicators in the human development reports are seen as intricately interwoven and thus it is not surprising that education and quality of life are often discussed together across many fields. In 2015 the United Nations Educational Scientific and Cultural Organisation (Unesco)'s call for 'rethinking education' admitted that quality of life is not easy to frame, thus making what should be learned equally difficult to package. That is especially true in view of 'a diversity of contexts, concepts of well-being and knowledge ecosystems' (Unesco 2015: 11). What the document was clear about, however, was that 'dominant utilitarian conceptions of education should accede to the expression of other ways of understanding human well-being, and thus, to a focus on the relevance of education as a common good' (Unesco 2015: 32). The authors of this document describe 'common good' as a collective social endeavour and elaborate that a search for the common good is a participatory and inclusive process that acknowledges the above-mentioned diversities in context as well as ways of understanding and engaging in the world.

In reflecting on the evolution of the United Nations Human Development Report series, Conceição, in the most recent 2020 report, explained how, as far back as the first 1990 report, human flourishing was set as the ultimate end of development. He explained how the report asserted that 'development is not about the accumulation of material or natural resources. It is about enlarging people's ability to be and do what they have reason to value, and expanding wellbeing freedoms' (Conceição 2020: 22). The 2020 report also acknowledges past human development reports which have highlighted inequalities in human social development. These include socio-economic and gender inequality – within and across nations – as well as concerns regarding multi-dimensional poverty.

Concern for well-being and a focus on inequality have remained key to the human development report series, but Conceição warns that previous reports have been limited in placing 'people as the ultimate end of development' at the expense of consideration for planetary boundaries, and argues that 'the apposition of people and nature needs to be re-examined' (Conceição 2020: 22). Thus, for the first time, the United Nations Human Development Report engaged, in its 2020 publication, with the social-ecological challenges facing the planet. This statement from the report strongly captures this interest:

For the first time in our history the most serious and immediate, even existential, risks are human made and unfolding at planetary scale. The [report] argues that this new reality calls for reimagining the human development journey and leveraging the human development approach to support transformational social changes to ease pressures on the planet. (Conceição 2020: 22)

The 2020 report highlights how key biogeochemical cycles such as the carbon, nitrogen and phosphorous cycles, are being dramatically altered, leading to concerns about planetary imbalances that are harmful to people and to all forms of life. Further

imbalances are created as development demands outweigh the planetary boundaries (Rockström 2009). Planetary and social imbalances interact and often reinforce each other. The report argues that during times of crisis such as we are now experiencing with the COVID pandemic, those in power can leverage resources to their own advantage in a way that ‘perpetuates the pressures on the planet that further drive planetary imbalances’ (Conceição 2020: 25). The leveraging of crisis situations to further political and economic power is captured in Klein’s concept of ‘shock doctrine’ (Klein 2014). Besides these oppressive relations between people and planet, there are also social imbalances that ‘feed inequalities in human development – which ultimately are gaps in empowerment – constraining the space for deliberative reasoning and collective action’ (Conceição 2020: 24). This point highlights the important role of education in supporting deliberation and agency for a new and different world, rather than simply reproducing the knowledge and systems of business-as-usual.

The call for alternative development models is not something new to the world of environment and development, but this explicit recognition of planetary limits is new in the United Nations Human Development Reports. This draws renewed attention to arguments and debates around the risks produced via the modernist development trajectory, first raised by environment and development movements in the 1970s (Meadows et al. 1972), and carried forward in regular world summits on environment, sustainability and development, starting with the Rio Earth Summit in 1992 and followed by more recent global summits focusing on the Sustainable Development Goals in 2015. These latter goals highlight the importance of education both *as* a process of sustainable development and *in* enabling sustainable development. Goal 4 focuses on quality education, with Target 4.7 requiring governments around the world to,

by 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development. (United Nations 2015: 21)

This goal positions sustainable development as integral to quality education deliberations, which has substantive implications for current approaches to education.

The call for more sustainable development approaches requires more inclusive, less damaging economic models which need to be implemented along with environmental care and social justice principles and approaches. For example, it has been argued that ‘decoupling economic growth from emissions and material use is key to easing pressures on the planet while improving living standards’. Some argue that decoupling requires ‘green’ economies to shift ‘towards more resource-efficient and less emission-intensive production and consumption’ (Conceição 2020: 25).

Such decoupling is a worthwhile alternative to pursue, but more radical critiques from economists are asking whether ‘relative decoupling’ (when economic growth

increases at a greater rate relative to resource use and carbon emissions) is viable to achieve significant change. Jackson argues that,

resource efficiency, renewable energy and reductions in material throughput all have a vital role to play in ensuring the sustainability of economic activity. But ... it is entirely fanciful to suppose that 'deep' emission and resource cuts can be achieved without confronting the structure of market economies. (2009: 57)

Jackson highlights how a debt-driven materialistic macro-economy, a social logic and material profligacy that pushes novelty seeking and consumerism at the expense of psychological and ecological health, creates a system of an 'iron cage of consumerism ... in which no one is free' (Jackson 2009: 9).

These calls for alternative ways for humans and human systems to relate to the biophysical world on which they depend are not new to the field of education. International declarations on Environmental Education and/or Education for Sustainable Development have emerged regularly since the first meeting in Tbilisi in 1977 (followed by Moscow, Thessaloniki, Ahmedabad, Bonn and Aichi-Nagoya) and have all made this call. To amplify this movement, and as part of the Johannesburg World Summit on Sustainable Development in 2002, a UN Decade of Education for Sustainable Development (UNDESD) was declared and implemented by Unesco from 2005–2014. The UNDESD was followed by the Unesco Roadmap for Implementing the Global Action Programme on Education for Sustainable Development (Unesco 2014), and by Unesco's (2020) most recent roadmap for ESD that strengthens the focus and relationship between education and the sustainable development goals in an ESD Agenda 2030.

In these international environmental education and ESD declarations and roadmaps, the close relationship between a critical development agenda and education continue to evolve and deepen. For example, the most recent ESD 2030 roadmap argues for the importance of critical thinking and sustainability values, given 'the illusion that technologies can resolve the majority of sustainability problems', and argues that 'ESD should encourage learners to explore alternative values to those of consumer societies' as well as understand 'deep structural causes of unsustainable development ... in the context of extreme poverty and vulnerable situations' (Unesco 2020: 18).

These calls for different social-ecological models also require us to revisit transformative texts in education which provide insight not only into 'what' but also 'how' we can change. ESD needs more than simply describing limitations and planetary boundaries. This is because 'a focus on thresholds can lead to fatalism, unnecessary precaution and even perverse incentives that could contribute to their transgression' (Conceição 2020: 51). In its new ESD 2030 documentation, Unesco (2020) notes that ESD 'achieves its purpose by transforming society', and states that educational practices urgently need to shift towards supporting learners in all walks of life and sectors to 'undertake transformative actions for sustainability to shape a different

future'. This indicates a clear commitment to move beyond mere problem description in education, towards active learning and transformative learning and pedagogy. This entails a fundamental shift in the purpose and direction of education.

As the world emerges from the shock of the COVID-19 pandemic that has rocked societies around the world, it is clear that there is need for recovery in equitable ways, that involve building forward/better/together, rather than simply a return to normal 'as if going back to normal is desirable or even possible' (Conceição 2020: 4).

ESD supports transformative approaches to education that bring the need to address environmental challenges into focus, while also 'revisiting the complex mix of social and economic issues that are intertwined with the cause and impact of these problems' (Unesco 2020: 6). In a southern African context, this requires explicit engagement with social and environmental injustices, and entails a particular approach to education quality that embraces the need for societal change. Lotz-Sisitka and Lupele draw on Tilbury's description of ESD to suggest the need for a dialectical relationship between tradition and innovation in learning processes. They elaborate that 'such a form of education not only involves acculturation into existing sociocultural heritages and histories but also requires a challenging and changing of these cultures, heritages and histories in the face of new challenges outlined above' (Lotz-Sisitka & Lupele 2017: 7).

One of the primary interests of this book is to provide perspectives on education which are closely aligned with these transformative intents and associated new challenges for education systems worldwide. The book introduces the reader to ESD processes where 'reflexive critical deliberation opens the way to contemplating reimagined future possibilities that are outside the risk-producing normative practices of the day' (O'Donoghue 2017: 27). The first section of the book aligns with this perspective on ESD by highlighting the changing, socio-culturally embedded, complex and contested nature of environment and sustainability knowledge. The second and third sections explore process models and alternative assessment models for supporting active, critical and applied learning in classrooms. The fourth section of the book envisages teacher professional development in which the teacher is seen not just as a deliverer of curriculum content, but as a lifelong learner who needs to be open to and prepared for social and educational change.

ESD and new conceptions of education quality

The role of ESD in supporting quality education has been explicitly highlighted in international policy commitments as introduced above. For example, Unesco's vision of 'Education 2030' highlights the role that ESD should play in quality education, involving foundational skills; high-level cognitive, personal and social skills; and local and global contextually embedded reflexivity and responsiveness. This is evident from their description of education quality that,

fosters creativity and knowledge, and ensures the acquisition of the foundational skills of literacy and numeracy as well as analytical,

problem-solving and other high-level cognitive, interpersonal and social skills. It also develops the skills, values and attitudes that enable citizens to lead healthy and fulfilled lives, make informed decisions, and respond to local and global challenges. (Unesco 2016: 2)

Lotz-Sisitka (2012) provides a critical framing of education quality which is useful for guiding a transformative orientation to education. She proposes ‘learning as connection’ (to society and social-ecological context) as an important aspect of education quality. Learning as connection is envisaged as including and doing justice to a number of education quality discourses that shape learning orientations and, ultimately, the outcomes of education:

- *Learning as mastery*: an efficiency discourse where mastery, efficiency and learner achievement and performance are measured against national and international standards.
- *Learning as participation*: an inclusivity/participatory discourse that highlights demographic aspects of inclusivity such as access for all socio-economic groups, all genders and abilities, as well as stressing the importance of including, hearing and engaging all voices in pedagogical processes.
- *Learning as connection*: a socio-cultural discourse (drawing on the work of Vygotsky and Engeström) which emphasises the meaning that emerges at the interface between situated life experiences and existing language and meaning. At this interface, new, more expansive, and potentially transformative meanings become possible as concepts and are expanded via encounters with more abstract concepts in school curricula, as well as a wider range of discourses, experiences and activity.

Lotz-Sisitka’s argument, drawing on the EdQual research programme findings (Tikly & Barret 2011), is that, traditionally, education has been dominated by the former two types of educational quality discourse. She argues that in practice, a socio-cultural education quality discourse or a paradigm of ‘learning as connection’ acts at the interface of the first two examples – drawing them together in a relational way and creating a platform for transformative learning to emerge (see also Lotz-Sisitka & Lupele 2017), while expanding learners’ participation and relationality with the world and seeking to master basic expectations of the curriculum or other learning demands. This argument should not be confused with the concept of contextuality as argument in education, but is rather an expansive, transformative learning foundational argument for educational quality (Lotz-Sisitka & Lupele 2017).

A historical perspective on the Fundisa for Change programme

Like many national curricula around the world, South Africa's latest curriculum is rich in environment and sustainability content. Despite the agenda it provides for engaging learners in exploring opportunities for making the world a better place, environmental teaching and learning can be challenging for educators, due mainly to the dominance of existing educational models and approaches.

This book showcases research from the South African national Fundisa for Change programme, which supports the integration of Education for Sustainable Development in teacher professional development and curricula. Fundisa is an isiXhosa word meaning 'teach'. The Fundisa for Change programme thus encourages teachers to 'teach for change'. The book offers an exploration of the ways in which teachers and teacher educators engage with the complexity of environment and sustainability content knowledge, using innovative teaching methods and broadening and deepening assessment practices, thus supporting the call for quality education in service to ecological and social justice.

Before detailing the Fundisa for Change approach to ESD, it is important to touch on the curriculum policy and teacher professional development histories that have shaped the programme. Environmental education was included as a principle in the White Paper on Education and Training and the first post-apartheid curriculum as part of the national curriculum transformation process (Lotz-Sisitka 2004, 2011; Reddy 2011). This gave meaning to the Bill of Rights in the Constitution of the Republic of South Africa (1996), which highlights that every South African citizen has the right to an environment that is not detrimental to his or her health or well-being, along with the need to manage resources sustainably for current and future generations.

Since 1994 South Africa has undergone four major curriculum reforms. The first curriculum change sought to rid the school system of racially offensive curriculum materials inherited from the apartheid era (Maringe 2015). The most ambitious curriculum reform was the introduction of the first post-apartheid curriculum, Curriculum 2005 (C2005), which was built on principles of outcomes-based education. In this curriculum environmental learning was introduced for the first time in South Africa as a 'phase organiser' across subjects (Reddy 2011). Chapter 2 of this book details the further trajectory of environmental content knowledge in the changing South African curricula from this time until the release of the current Curriculum Assessment Policy Statements (CAPS). The Fundisa for Change programme engaged with CAPS design, interpretation and implementation during the period that research for this book was conducted. The CAPS curriculum is still in place today and the purpose of this book is to contribute to its ongoing improvement and development in ways that support quality teaching and learning.

In response to these shifts in the curriculum and wider educational policy, there have been a number of national teacher professional development initiatives in South Africa aimed at supporting teachers to engage with environment and sustainability knowledge and pedagogy in the curriculum. For example, the Learning for Sustainability project

was piloted in the Gauteng and Mpumalanga provinces between the years 1997 and 2000 (Janse van Rensburg 2000). Key areas of research in this programme included:

- in-depth exploration and interpretation of concepts and constructs such as ‘sustainability’;
- context, clarity and pedagogical interpretation of learning theories;
- an understanding of knowledge acquisition and learning;
- an understanding of changes required for teaching and learning in a new education system; and
- supportive professional development models and processes. (Lotz-Sisitka & Olivier 2001: 128)

This was followed by the National Environmental Education Project for General Education and Training (NEEP-GET) in 2000, which also focused on teachers’ professional development in environment and sustainability education, with the following achievements:

- improved understandings of environment, and of environment in the curriculum;
- broader exposure to, and knowledge of, available teaching and learning support materials for environmental learning;
- a more in-depth understanding of the contextual nature of environmental issues and contextual approaches to lesson plans; and
- improved understanding of active learning processes. (Lotz-Sisitka 2004: 13)

Despite these achievements, there was still an issue of superficial interpretations of the environmental focus in the learning areas (Lotz-Sisitka 2004). In later research Lotz-Sisitka acknowledged the good practices and positive influence of the above-mentioned projects, but noted that ‘very little has been achieved in ensuring that environment and sustainability issues are consistently and coherently integrated into teacher education’ (2011: 33).

The Fundisa for Change Teacher Education programme was established in 2011 as a sector-wide programme, with a more systemic approach to strengthening environmental learning through teacher education. The Fundisa for Change approach includes:

- policy and materials review and engagement,
- advocacy,
- expansion of the network of providers and the community of practice engaged with transformative environmental learning through teacher education,
- and strengthening the capacity for professional development of teacher educators and teachers.

Fundisa for Change aims to strengthen and expand the environmental and sustainability content knowledge specified in the subjects offered in the South African national school curriculum (Grades R–12). The programme supports teacher educators in universities and in the environmental sector, as well as Department of Basic Education subject specialists to prepare teachers for engaging with the environment and sustainability knowledge and skills specified in the CAPS.

Education quality perspectives in the Fundisa for Change programme

Fundisa for Change responds transformatively to education quality challenges

The 2009 review of curriculum change in South Africa commissioned by the Department of Basic Education raised a number of more general quality-related education concerns, which gave impetus to the subsequent development of the CAPS curriculum. Those that were particularly pertinent for the development of Fundisa for Change professional development courses for teachers included:

- a lack of attention to important foundational discipline knowledge and insufficient attention to progression in the different disciplines;
- insufficient time allocated to the teaching of mathematics and languages and inadequate attention given to the role of English as a medium of instruction and to the importance of ‘reading to learn’;
- the promotion of limited teaching strategies, with over-emphasis on group work and insufficient attention given to appropriate teaching methodologies in line with particular learning areas/subjects;
- and concerns that assessment tasks and criteria need to be appropriate to the subject/learning area, and also to the level at which learning is taking place. (Dada et al. 2009)

In response, the Fundisa for Change programme structured its teacher educator and teacher courses to emphasise the following as three interrelated focus areas for teacher professional development: (1) Content Knowledge (with a focus on environment and sustainability knowledge); (2) Teaching Practice (with a focus on active and transformative learning); and (3) Assessment Practice (to strengthen and transform assessment practice). Figure 1 illustrates this model, showing the Fundisa for Change course design response. The programme took a broader view of knowledge, pedagogy and assessment to include the transformative orientation outlined above, which was named CAPS++ within the programme. CAPS++ interests are those aspects that resonate with, and expand on, the curriculum. That is, aspects that are challenging and that present opportunities for dealing with complexity, criticality, active engagement and higher order thinking; all of which are necessary for the more transformative orientation to education introduced above.

Figure 1. Three foci of the Fundisa for Change teacher and teacher educator professional development courses

The focus on content knowledge responds to the problem of weak foundational subject-discipline knowledge and progression raised in the 2009 curriculum review which recommended,

a strong, discipline-based approach to school subjects; providing clear, specific, easily understood and measurable curriculum documents linked to textbooks; and providing curriculum statements that specify content at specific year levels, showing conceptual progression over time. (Dada et al. 2009: 38)

This effectiveness discourse has close links to an inclusivity discourse concerning epistemological access for learners already disenfranchised in not gaining access to the 'know that' propositional knowledge, or the 'know how' procedural knowledge of the subject disciplines (Muller 2014), thus affecting their access to powerful knowledge. These knowledge concerns are explored further in Chapter 2 (Schudel and Lotz-Sisitka). Overall, the Fundisa for Change programme has a broader interest in knowledge concerns than current subject-disciplinary boundaries. Lotz-Sisitka and Lupele (2017: 13) argued that 'in trying to create a more sustainable world, we need to have a better look at how ecosystems work and become competent system thinkers'. Such knowledge capital is essential for 'encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths' (South Africa DBE 2011: 4). Such active and critical approaches to learning are not easily judged within effectiveness approaches to education quality as standardised testing best lends itself to short and measurable responses by learners.

In support of the above, the focus on teaching practice in the Fundisa for Change model (Figure 1) emphasises pedagogies that support critical and creative thinking, active learning, and assessment practices that foreground higher order thinking. These are aligned with the tenets of a ‘learning as connection’ approach to education quality. Within this perspective of education quality, complexity and uncertainty can be explored and debated in responsive ways, thus enabling ‘a more reflexive society in which creativity, flexibility and diversity are released and used as tools to deal with the challenges of “wicked” problems’ such as those typically dealt with in environment and sustainability education or ESD (Lotz-Sisitka & Lupele 2017: 13).

This orientation also requires that curriculum be viewed as a contextualising social process (Cornbleth 1990) with locally contextualised knowledge being as important to learners as more abstract decontextualised knowledge. These two types of knowledges come together in quality meaning-making processes. Hence, the focus on context-embedded knowledge in the Fundisa for Change programme (Figure 1; see also Chapter 2 of this publication). The emphasis on contextually relatable knowledge is also influenced by an inclusivity discourse, arguing for expanding the opportunities for meaning making for all learners. This is captured in Daniels’ suggestion that teachers and learners need to engage in forms of pedagogy and learning that assist learners to make connections between their everyday knowledge and the scientific knowledge that is on offer in schools in ways that both knowledges develop (2001: 54). Furthermore, Lotz-Sisitka and Lupele argued that learners need to be supported to constantly evaluate what they are learning in relation to the real world and to situations that they have experience of. This is not a conservative form of contextualism, but rather a sophisticated dialectical relationship involving everyday knowledge and school knowledge, or formal learning and experiential learning (Lotz-Sisitka & Lupele 2017: 13).

Meaning making insists on ‘a consideration of context-rich but not context-bound explorations of local and global environmental issues and the need for adopting open-ended and futuristic thinking in the context of the dynamism of environmental knowledge’ (Schudel 2014: 96). This open-ended approach to knowledge is necessary given the Fundisa for Change acknowledgement that environment and sustainability knowledge is contested and uncertain. This understanding can be traced back to the Learning for Sustainability programme, where Lotz and Olivier argued that such local relevance is important if we are to ‘enable learners to understand, respond to, and take action to improve environments and address issues and risks, [which] are likely to be highly contextual due to the complex, diverse and localised nature of many environmental issues and risks’ (1998: 95).

Also, in response to weak national assessments in literacy and numeracy in the PIRLS and TIMMS results in South Africa, Figure 1 includes an emphasis in Fundisa for Change on pedagogies that support reading and writing to learn and which engage mathematics and numeracy skills. The former ‘requires complex cognitive processes, and a good understanding of the basic conventions of language and how to manipulate, decode and interpret symbols’ (Fundisa for Change Programme 2013: 10). The latter involves ‘doing calculations and using numbers and mathematical concepts, such as

space and time, which are important methods for learning more about the world' (2013: 10). The Fundisa for Change programme works with the understanding that language and mathematics are foundational to the process of meaning making and quality education that includes a focus on environment and sustainability education as required by SDG 4.

Teacher education quality considerations in Fundisa for Change

While the Fundisa for Change programme has worked intimately with the CAPS curriculum and its implementation, another of its objectives has been to strengthen ESD systemically in South Africa through:

- building on earlier policy and advocacy work,
- effective partnerships, and
- improving institutional capacity for teacher professional development.

The importance of effective systems for supporting ESD is highlighted by Unesco which notes the importance of ensuring 'that teachers and educators are empowered, adequately recruited, well-trained, professionally qualified, motivated and supported within well-resourced, efficient and effectively governed systems' (Unesco 2016: 2). Reddy (2011: 25) reminds us that teacher professional development is a complex system 'where varying aspects of the field impact and are in turn impacted on by other aspects and activities in the field by way of complex interactions that are self-limiting and yet open'.

The Fundisa for Change programme develops a holistic perspective on environment and sustainability-orientated learning across the education system. Influenced by the educational fields described in Bernstein's (2000) pedagogic device, the book explores a wide scope of spaces and relations which influence the integration of ESD into the schooling system.

One important relationship is how the scientific and social science research reports (that provide the primary source of knowledge) relate to curriculum, textbooks and the knowledge that teacher educators engage with as they approach the teaching of environment and sustainability topics (Column 1 in Figure 2). This environmental content knowledge (ECK) is recontextualised into curriculum and textbooks, which teachers then apply via their teaching practices with learners (Column 2 in Figure 2).

Through this process, learners come to engage with a range of environment and sustainability related topics or matters of concern (biodiversity loss, climate change, water management, healthy living and more), and through their classroom interactions and activities relate this new knowledge to their prior knowledge and develop their capabilities (knowing and being) for engaging with environment and sustainability concerns in the world (Column 3 in Figure 2).

In this regard, this book elaborates on ECK and how pedagogical content knowledge (PCK) influences the way this is taught and assessed (as depicted in Figure 2). PCK refers to how teachers use their knowledge of teaching to mediate new knowledge,

skills and values in classrooms. Many examples of classroom implementation are included in the case studies researched for this book and these illustrate how learners are being supported to come to understand, know, and practice an approach to environmental learning and change which is orientated towards more sustainable and socially just societies.

Figure 2. An illustration of the scope of the book in terms of the fields and relations across the education system which influence environment and sustainability-orientated learning

Introducing the Fundisa for Change research in this book

To strengthen the programme objective of facilitating and supporting transformative environment and sustainability-orientated learning through teacher education, Fundisa for Change launched a parallel research programme, funded by the South African National Research Foundation (NRF). The research objective was to gain insight into the processes of transformation required to integrate environment and sustainability-orientated learning into the national system of education. Furthermore, the research programme aimed at exploring the opportunities and challenges of environment and sustainability-orientated learning in the current CAPS, particularly addressing questions of quality education that have driven curriculum change in South Africa in the post-apartheid era as elaborated above.

The three foci of the Fundisa for Change courses introduced in Figure 1, as well as a fourth overarching theme of teacher professional development, became the focal

points for the research in the NRF research programme. These four themes have also been used to frame this book, which is a consolidation of research emerging from the programme.

The chapters in this book capture the experience and reflexivity of the editors and authors that have been involved both as practitioners and researchers in the evolution of curriculum innovation and teacher professional development, through Fundisa for Change, over two-and-a-half decades of radical curriculum change in South Africa.

This introductory chapter is followed by four sections. Each section leads with a positioning chapter in which the theme of the section is introduced in relation to contemporary educational and ESD literature. Each positioning chapter is then followed by between two and five empirically researched chapters that pick up particular issues and opportunities identified in the positioning chapters. A broad overview of each section is given below. Further introductions to the individual chapters are given in the four positioning chapters which head each of the four sections.

Section A begins with a positioning chapter exploring the nature of environmental knowledge and its representation as subject-specific content in the school curriculum. This knowledge is described as changing, socio-culturally embedded, complex and contested (Wals & Jickling 2009). Distinctive ways of dealing with this complexity are then discussed. These include understanding the situated nature of knowledge (Haraway 1988); the laminated nature of reality (Bhaskar & Danermark 2006); and the ideological and transformative intent embedded in environment and sustainability knowledge and discourse (Lotz-Sisitka 2016; Price 2016; Schudel 2017). The chapter is followed by case studies that relate to environmental knowledge recontextualisation in the South African schooling system, national curriculum policy, learning support materials, teacher professional programmes and classroom practice. These case studies all deal with different environment and sustainability topics in specific subjects. They include 'water' in the Natural Sciences; 'biodiversity' in the Natural and Life Sciences; 'environmental impact' in the Life Sciences; and 'climate change' across the curriculum.

Section B begins with an exploration of active and critical learning in school classroom practice and emphasises how a focus on dialectical thinking (Bhaskar 1993; Schudel 2017) can expand and deepen the notion of active learning in schools. The positioning chapter is followed by case studies illustrating the power of innovative pedagogies employed in the field of environment and sustainability education or ESD in South Africa, and the elaboration of the notion of pedagogical progression for the mediation of complex concepts and research/field-based strategies in ESD. These chapters explore how active, critical and situated pedagogies interface with environment and sustainability-orientated disciplinary knowledge as it manifests in the CAPS curriculum. Contemporary post-Vygotskian theories of learning (Edwards 2015) are engaged and expanded upon in understanding this interface. Another important theoretical framework used in both this section and the previous one, is practice architecture theory (Kemmis & Heikkinen 2011; Schatzki 2012) which helps authors to theorise and describe the learning interactions – the doings, sayings and

relationships of teachers and learners as these emerge from situated learning pedagogical practices. The theory helps authors explain that practices emerge from three practice architecture dimensions, namely the cultural-discursive, the material-economic, and the social-political.

Section C begins with a positioning chapter discussing the importance of developing an appropriate framework for assessing environment and sustainability learning. The chapter begins by reviewing the tendency to move towards competencies in education systems, an influence that is affecting formal education systems across the world, including in southern Africa. The chapter considers the implications of this for assessment practice in environment and sustainability-orientated learning, and focuses on recent developments in assessment theory, especially the work building on assessing higher order thinking as it has evolved out of Bloom's Taxonomy of Learning. The chapter also proposes that there is a need to expand beyond the cognitive framings of assessment and take this work further. It works to provide an adapted version of Fink's (2003) model of assessment of significant learning. It discusses how assessment strategies employed in the field of ESD can support the development of higher order thinking in classroom contexts while also assessing socio-emotional, ethical and applied dimensions of learning, all of which are significant in ESD. This is followed by case studies highlighting the relationship between higher order thinking and the development of curriculum competencies, as well as the role of formative assessment in contributing to quality education in ESD.

Section D begins with an exploration of teacher professional development in ESD in the international and national contexts. This work indicates the importance of giving attention to teacher professional development when introducing new curriculum knowledge, pedagogy and assessment practices, as is proposed by the strong emphasis on integrating ESD into education and training systems worldwide (Unesco 2015, 2020). The chapter shares some of the innovative approaches and models that have been developed in southern Africa and the Fundisa for Change programme to support the integration of ESD into teacher education. This is followed by Fundisa for Change cases describing the development of teacher pedagogical content knowledge, the emergent nature of teaching practice, the importance of professional learning communities in furthering ESD, and the evaluation of teacher professional development in ESD.

Conclusion and taking this research further

In all chapters in this book, the urgency of responding to the environmental crisis is emphasised. There is global agreement that integrating environment and sustainability concerns into education is one of the important longer-term approaches for enabling a more sustainable world order. Hence, as argued via the SDGs, and Target 4.7 of SDG 4 (Unesco, 2030), this needs attention within the schooling system. Building foundational knowledge and encouraging the experience of engaging proactively and positively with environment and sustainability concerns is now recognised as being a critically important dimension of what constitutes quality education. Thus, while

the book is relevant to researchers and policymakers in South Africa, it also holds relevance for other scholars and policymakers around the world who have an interest in understanding the dynamics of SDG Target 4.7.

The book argues that we need more knowledgeable teacher educators and teachers to enable quality education with adequate nuance and depth in the schooling system. It outlines the importance of developing and trialing innovative approaches to classroom teaching and assessment that embrace principles of situated, dialectical and social learning for social-ecological change. The book further argues that there is need to give attention to content knowledge, teaching practice and assessment practice, as well as teacher professional development, in enabling ESD to become a key feature of quality education.

The book also recognises that this is not easily done, especially in a complex and changing education system that is already under pressure. In this regard, the chapters' arguments and empirical cases trace engagements with the dynamics of a changing South African curriculum as it has evolved in the post-apartheid era – an era that also embraces the necessity of human rights, social justice, a healthy environment and inclusivity as cornerstone principles of the curriculum (South Africa DBE 2011) while simultaneously insisting on epistemological access, access to social justice, and a more equitable participation in the economy for all citizens. Ultimately, the book argues that we need to focus on the needs of both people and planet through quality teaching and learning.

To this end, *Teaching and Learning for Change: Education and Sustainability in South Africa* draws on a range of theoretical framings that enable thinking and informed practice and acknowledge the complexity and contestation of environment and sustainability challenges. These include situated, relational and dialectical perspectives on transformative, critical and quality teaching and learning. Theoretical framings also include a focus on higher order thinking and assessment of significant learning. The theoretical perspectives are grounded in an understanding of the significance of cultural-historical contexts for teacher professional development programmes and classroom practices. Thus, the book illustrates a rich collection of theoretical ideas that have been tried and tested in research processes, showing their potential to inspire and deepen further cutting-edge research in the field.

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