United Nations
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Sustainable
Development
Goals

Guidebook on Education for Sustainable Development for educators

Effective teaching and learning in teacher education institutions in Africa

Education 2030

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UNESCO Education Sector

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United Nations Educational, Scientific and Cultural Organization

Education Sector

Education 2030

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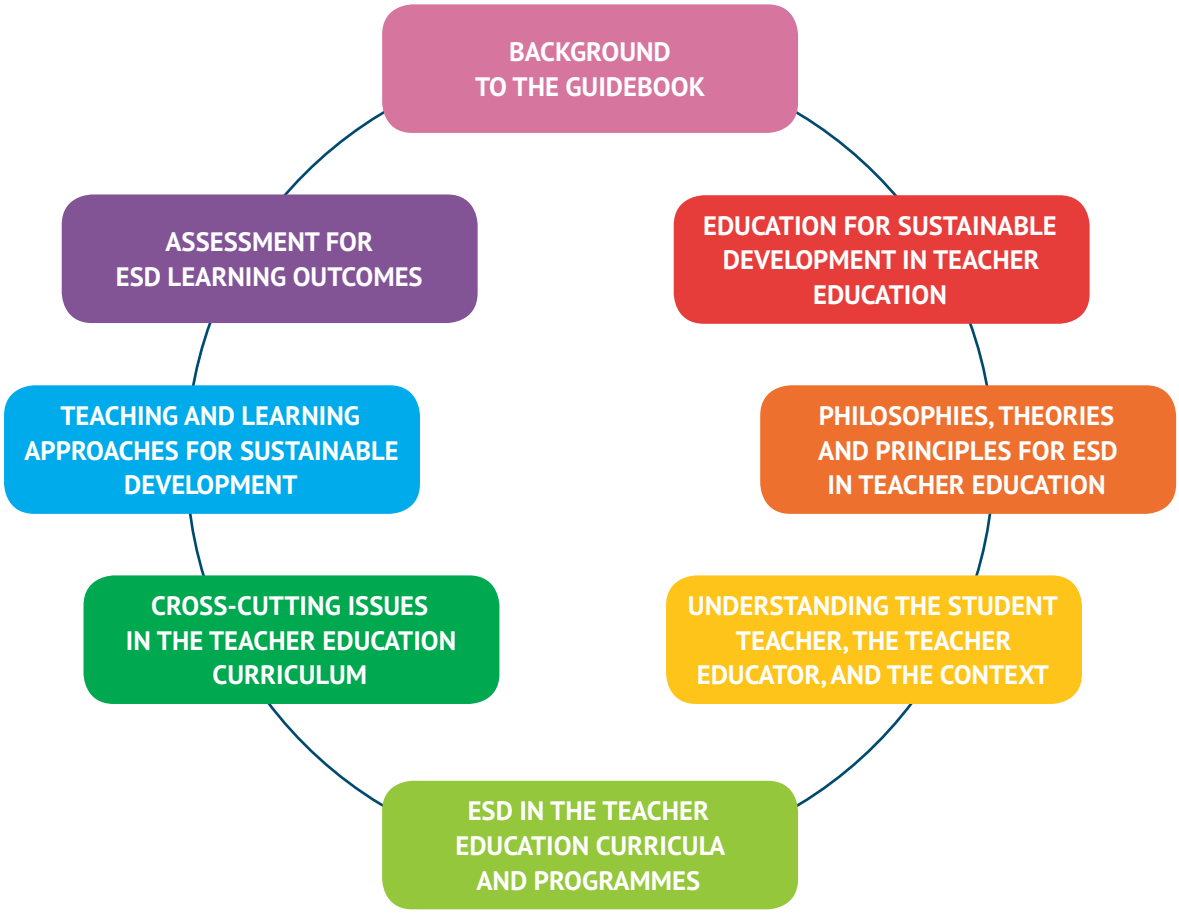
The Guidebook



Foreword

Education for Sustainable Development (ESD) empowers citizens to take informed decisions and responsible actions for environmental integrity, economic viability and a just society for both present and future generations. It is holistic and transformational and addresses learning environment, contents and outcomes as well as pedagogy.

Teachers have a crucial role to play in integrating ESD in education and bringing about real and lasting change in society. They help shape the worldview and attitude of learners and develop their potential and skills to tackle the real-life challenges surrounding sustainable development.

Since the launch of the United Nations Decade for Education for Sustainable Development in 2005, and the follow up Global Action Programme (GAP), significant progress has been made in embedding ESD in global education agendas, national policy and plans, and curricula. The Global Action Programme identified teacher education as one of its five priority action areas. Despite this, many teachers are still not sufficiently empowered to translate the concept of sustainability into practice.

In 2015, new focus was placed on the importance of teachers as part of the 17 Sustainable Development Goals (SDGs) adopted by the international community. The Sustainable Development Goal 4, on inclusive and equitable quality education, contains targets which aim to substantially increase the supply of qualified teachers with emphasis on their training, recruitment, deployment, remuneration, motivation and management, and which underline the importance of acquiring knowledge and skills to promote sustainable development.

To be effective in translating sustainability into educational content and pedagogical approaches, student and in-service teachers, and teacher educators themselves must be conversant with contemporary issues of sustainable development.

The guidebook on Education for Sustainable Development for Educators: Effective teaching and learning in teacher education institutions in Africa has been conceived as a tool to mainstream sustainability into all aspects of teacher education and training with useful information concerning teaching, learning and assessment approaches to help achieve the ESD goals and learning outcomes.

I hope you will find it useful in enhancing institutional capacity and transforming the culture of teacher education institutions, which are key to the achievement of the Sustainable Development Goal 4 and Education 2030 Agenda.

Stefania Giannini,
Assistant Director-General for Education

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List of acronyms and abbreviations

ADEA	Association for the Development of Education in Africa
AMCOST	African Ministerial Council on Science and Technology
AU	African Union
BREDA	Regional Bureau for Education in Africa, UNESCO Dakar
CoP	Communities of Practice
CSO	Civil society organization
DESD	Decade of Education for Sustainable Development
ECCE	Early Childhood Care and Education
EE	Environmental Education
EFA	Education for All
ESD	Education for Sustainable Development
ESSA	Education for Strong Sustainability and Agency project
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Statistics Division of FAO
GAP	Global Action Programme
GHESP	Global Higher Education for Sustainability Partnership
GMES	Global Monitoring and Evaluation Survey
GHG	Greenhouse gas
HEI	Higher Education Institution
HIV/AIDS	Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome
ICTs	Information and Communications Technologies
IEEP	International Environmental Education Programme
IIS	International Implementation Scheme
INSET	In-service Education and Training
MDGs	Millennium Development Goals
MESA	Mainstreaming Environment and Sustainability in African Universities
NACTE	National Council for Technical Education
NGO	Non-governmental organization
PRESET	Pre-service Education and Training
REEP	Regional Environmental Education Programme
SADC	Southern Africa Development Community
SDGs	Sustainable Development Goals
SIDA	Swedish International Development Cooperation Agency
ST2EEP	Secondary Teacher Training Environmental Education Project
TVET	Technical Vocational Education and Training
UNCED	United Nations Conference on Environment & Development
UNDESD	United Nations Decade of Education for Sustainable Development
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAT	Unit based sustainability assessment tool
WSSD	World Summit on Sustainable Development

Glossary and conceptual clarification of terms

Action competencies. Combinations of knowledge, skills, attitudes, values and the motivation to act successfully and responsibly in dealing with unsustainable practices in the curriculum, and in teaching and learning in the school and in the community.

Action research. Research conducted by practitioners, learners and community members to identify and elaborate problems, planning and implementing courses of action, and evaluating the actions and evidence to show that the problem is alleviating.

Adjectival education. Description given to educational initiatives that focus on an aspect or challenge of sustainable development, for example, gender education, human rights education, democracy education and so on, without addressing holistically all dimensions of sustainable development.

Afrocentric philosophy. Way of thinking from an African perspective based on the principles of inclusivity, cultural specificity, critical awareness, commitment and political awareness.

Assessment for ESD learning. Entails ongoing evaluation and provides feedback on learning that focuses on the application of acquired knowledge and skills in actions that contribute toward sustainable development in the community.

Assessment of ESD learning. Entails evaluating and providing feedback at the end of some activities to ascertain knowledge, skills and attitudes about sustainable development.

Banking approach. Teaching and learning approach whereby information is given to the student without providing opportunities for the student to question the information or explanations.

Capabilities. People's potential functioning, that is, 'beings' and 'doings' that make up people's valued well-being.

Capability approach. Approach adopted from Amartya Sen that seeks to remove obstacles such as illiteracy, ill health, lack of civil and political freedoms that impinge on what a person can do and become in life to have a good quality life.

Change projects. Activities and actions taken to study and change unsustainable practices identified in institutions and in communities.

Community of practice. Relates to a group of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly.

Critical pedagogy. Pedagogy associated with questioning the status quo and practices that are unsustainable and that aims to empower practitioners and people to change unsustainable practices and relationships in institutions and societies.

Critical theory. Theory of how current society exploits, dehumanizes and denigrates certain groups of people. The theory entails critical questioning of the underlying causes of inequalities and lack of opportunities.

Cross-cutting issues. These are environmental, economic, social and cultural issues or general principles that feature in and affect all spheres of sustainable development. Examples of cross-cutting issues include climate change, gender equality, poverty and general principles, like democracy.

Curriculum. Includes what, why and how students should learn to acquire the knowledge, skills, values and attitudes to be successful and responsible citizens in their lives. It includes the official and formal curriculum prescribed by an institution or government, and the unofficial, informal or hidden curriculum drawing from the institution's total environment.

Curriculum design. Process of planning and putting together in some meaningful way the component parts of a curriculum, the content to be learned, teaching and learning resources, and the assessment modalities.

Curriculum review. Processes that lead to modification or adaptation of the curriculum to make it current and more effective and relevant in light of new developments in knowledge, innovation and technology, and society.

Education about sustainable development. This is education to promote knowledge and awareness of the facts concerning sustainable development.

Education for Sustainable Development. This is education that goes beyond knowledge and awareness of the facts concerning sustainable development, that is, to develop the life skills and competencies, attitudes and values needed to decide and participate in practical actions that contribute towards sustainable development.

ESD pedagogies. Active and participatory pedagogies that include the use of drama, play, music, poetry, debate, discussion and value clarification, and interdisciplinary learning. They engage learners in asking questions, in thinking in terms of systems and relationships, in evaluating and interrogating risks, and in clarifying values that relate to sustainable societies.

Expansive learning. Entails collaborative learning in which new and emerging problems are analysed, and solutions are planned and implemented. Expansive learning aims to change and transform the situation and to create, disseminate or multiply best practices.

Feedback. Giving inputs from assessments that indicate to the learner how they are doing with respect to learning goals.

Feed-forward. Using feedback to reflect and take appropriate action to close the gap between the current performance level and the learning goal.

Glossary and conceptual clarification of terms

Formal education. Education provided by institutions such as schools that are recognized or mandated to do so by relevant local or national authorities.

Formative assessment. Evaluating learning outcomes as they are developing throughout the course of a learning activity with the purpose of providing feedback to aid further learning.

Indigenous pedagogies. Teaching and learning approaches and the philosophies on which they are based associated with indigenous knowledge systems and values. These include participatory group methods.

Learning as connection. Learning in which concepts, examples and issues are linked to experiences and practices in local contexts.

Learning for sustainability. A lifelong process that entails acquiring knowledge and developing the skills, attitudes, values and motivation to change one's lifestyle and to participate in activities and projects that contribute towards sustainable development.

Mainstreaming ESD. Entails embedding ESD or sustainability principles, values and practices into the institution's regulatory policies, operations, management and governance processes, as well as into the curriculum, teaching and learning, research and innovation, and into the institution's engagement with the community.

Multi-method approaches. Thinking that encourages practitioners to recognize and use a variety of alternative methods and techniques for teaching, learning and assessment activities and experiences.

Ontology. World view that is concerned with what things are, i.e. the nature, properties and values in a given set-up.

Pedagogic devices. Plans, strategies or procedures a teacher uses to facilitate the reorientation of teaching and learning towards ESD goals.

Reflective practice. A process by which practitioners stop, think, analyse and evaluate their decisions, actions and practices in relation to impact and guiding theories.

Reorienting teacher education towards sustainable development. Reforming and changing visions, policies and strategies to ensure that every aspect of teacher education embeds or addresses ESD principles, knowledge, skills, perspectives and values.

Summative assessment. Evaluating the attainment of learning outcomes at the end of the learning activity.

Sustainable livelihoods. Entails social and economic activities and the means of living that do not compromise social cohesion, overconsumption, wasteful and inequitable exploitation of resources, and therefore can stand the test of time.

Sustainable local practices. Practices in the institution or local communities that carry principles, values and technology, which are likely to complement or promote ESD knowledge, skills, competencies and values.

Systems thinking. An approach to problem solving and innovation that relies on analysing how things and issues relate as part of the whole system and how it functions, i.e. how environmental, economic and sociocultural issues relate to sustainable development.

Teaching and learning in a multicultural context. Entails using a variety of teaching and learning approaches specifically to cater for different learning and teaching styles that reflect the diversity in gender, ethnic and racial backgrounds, and interests of learners.

Ubuntu. An example of an African moral and ethical framework carrying key African values, involving collective personhood and collective morality. Ubuntu promotes pro-social behaviour, togetherness and responsibility.

Whole-institution approaches. Also known as whole-school approaches involving the entire institution and all departments or units, its staff and its students working together to create a sustainable institution, making it a microcosm of a sustainable society by practising what it teaches.

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Chapter 1

Background to the Guidebook

Overson Shumba

Chapter 1

BACKGROUND TO THE GUIDEBOOK

Overson Shumba

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1.1 Introduction

In Africa, reorienting education so that it becomes relevant, not only in imparting subject matter knowledge but also developing life skills and the skills required for contributing towards creating a sustainable society, is urgent (ADEA, 2012). This is important given the myriad of interconnected economic, environmental, social and cultural issues that have created more poverty and more vulnerability. We can name the challenges and risks posed by climate change, deforestation, desertification, and increased risks associated with diseases such as HIV/AIDS, malaria, and in 2014, the outbreak of Ebola. In the Second Decade of Education for Africa (2006–2015) and in the Science, Technology Innovation Strategy for Africa 2024, the African Union envisioned that it was through education and the development and application of science and technology that issues such as these could be tackled to achieve sustainable development. This convergence of education and science and technology for sustainable development is seen in the United Nations Agenda 21 published at the end of the Earth Summit in 1992 in which Chapter 35 focuses on 'Science for sustainable development' and Chapter 36 focuses on 'Education, Public Awareness and Training'. Since 2005, the United Nations Decade for Education for Sustainable Development (UNDESD 2005–2014) has shown ESD as a useful framework for quality education. UNESCO states that "ESD provides an integrating and coherent focus for education" (UNESCO, 2009b; p. 18). This guidebook is a resource to help clarify the concept and principles of ESD for teacher educators and teachers in Africa so that through their own creativity and inventiveness, they can mainstream ESD in their professional practices and in teacher education institutions.

"Education for Sustainable Development was born out of a very simple idea: reaching sustainability will require more than legal frameworks, financial resources and green technologies, it also needs us to change the way we think – change that can best be obtained through education".

Irina Bokova, former Director-General of UNESCO in the foreword of *Tomorrow Today*.

1.2 Motivation for an ESD guidebook for Africa

In Africa, Education for Sustainable Development (ESD) is embraced for its potential to transform education policies and practices. This was witnessed when the Ministers of Education in sub-Saharan African countries signed a commitment to implement the UNDESD on 28 March 2006 in Libreville, Gabon. They committed to implement the UNDESD in the context of the African Union Second Decade on Education in Africa 2006–2015. Their commitment acknowledges that Education for Sustainable Development "... contributes to sustainable livelihoods and sustainable lifestyles, environmental sustainability and health promotion and gender equality" (p. 1). They also stressed the need to integrate African cultures, knowledge systems, languages, and ways of life into the principles of sustainable development.

Box 1.1 is an extract from the action plan of the Second Decade of Education for Africa to show the importance of Education in Sustainable Development.

BOX 1.1

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN AFRICA

Education is a critical sector whose performance directly affects and even determines the quality and magnitude of Africa's development. It is the most important means at our disposal to develop human resources and to impart appropriate skills, knowledge and attitudes. Education forms the basis for developing innovation, science and technology in order to harness our resources, industrialize and participate in the global knowledge economy, and for Africa to take its rightful place in the global community. It is also the means by which Africa will firmly establish a culture of peace, gender equality and positive African values. (AU, 2006; www.nepad.org)

The Association for the Development of Education in Africa (ADEA) *Triennial on Education and Training in Africa* held in Ouagadougou, Burkina Faso, 12– 17 February 2012 endorsed the conception that:

> Education for Sustainable Development (ESD) is about building a critical mass of citizens who are not just informed and trained, but who are above all capable of using their achievements to bring about the economic, social, cultural and political changes required for sustainable development.

The AU and ADEA views on the relevance of ESD as a framework to reorient educational policies and practices are consistent with those of UNESCO, which stresses that ESD learning is for everyone to learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation (ADEA, 2012). The challenge is to reorient education, including teacher education, to address sustainability. Many leaders in Africa have raised this expectation. Two illustrative examples are statements made by Nelson Mandela, first post-apartheid President of South Africa and Kofi Annan, former Secretary-General of the United Nations (activity 1.1).

Follow up this activity by examining the case studies of ESD in teacher education in Africa in box 1.2.

ACTIVITY 1.1

BRAINSTORMING

Brainstorm the following quotes.
1. What is the central message for sustainable development and what needs to change in Africa?
2. How do these messages relate to the idea of educating for sustainability?

"Education is the most powerful weapon which you can use to change the world"
– Nelson Mandela

"Education is a human right with immense power to transform. On its foundation rest the cornerstones of freedom, democracy and sustainable human development"
– Kofi Annan

For more information *Source*: www.brainyquote.com

BOX 1.2

CASE STUDIES OF TEACHER EDUCATION IN AFRICA

Africa has made tremendous strides in developing educational programmes that are reoriented towards ESD. Some examples are given below, but there is still need for widespread practice of ESD principles in these programmes.

EXAMPLE 1: The Fundisa for Change Programme in South Africa

This programme aims to prepare teachers to engage meaningfully and effectively with ESD. Through workshops, the programme focuses on upgrading teachers' knowledge in science, the environment, society and sustainability. It also embraces ESD pedagogies such as: investigative methodology, participatory and experiential learning by doing and community problem-solving, as well as the values and ethics needed for a sustainable future. Fundisa supports change-oriented learning. Three core aspects of teaching, which are subject knowledge, teaching practice and assessment practice, are emphasized. The programme has also generated a number of resources including a core text Methods and Processes to Support Change-Oriented Learning. This resource is distributed through Share-Net, Howick, South Africa.

For more information: http://www.fundisaforchange.co.za/wordpress/wp-content/uploads/2013/08/Methods-Processes.pdf

EXAMPLE 2: Tanzania (Mwanza) & Finland (Tampere) Partnership

Five primary schools in Mwanza Municipality in United Republic of Tanzania responded to the call by the government to integrate ESD through actions. The five schools are in partnership with five schools from Tampere city in Finland as part of a wider network between the two cities. The integration of ESD in the school pupils' activities are characterized by adopted teaching learning methodologies that are mainly learner centred, bringing the learner to the fore. In the five schools in Mwanza, learning has paved the way for pupils' active participation in "learning-by-doing, peer-work and other participatory methods in class-situations, use of natural-material and music in teaching, use of teaching aids and materials, on learning difficulties, supportive learning environment, career guidance and pupil support services, home-school cooperation". These activities have seen greening activities such as planting trees and garden maintenance where pupils make their own compost from waste and plant leaves and grass. In 2012, the Tanzania Institute of Education formalized ESD goals by integrating it in the school curricular.

For more information: http://tamperemwanza.blogspot.dk; https://www.facebook.com/tamperemwanza

EXAMPLE 3: Zimbabwe's ST2EEP programme

The Secondary Teacher Training Environmental Education Project (ST2EEP) was introduced to three secondary school teachers colleges in Zimbabwe in 2003. This was a partnership between the Ministry of Higher Education and the Flemish Association for Development, Cooperation and Technical Assistance (VVOB). The purpose of the programme was to integrate environmental education (EE) and to support EE activities through teacher training. The main objective was to allow colleges to develop their own local EE curriculum. The programme was centred on participatory approaches and it encouraged learner-centred methodologies. Even after the funding ended in 2008, ST2EEP continued to operate as a strong local project that is able to organize EE activities in teachers colleges and schools. ST2EEP and UNICEF are currently involved in a national livelihoods training programme for primary schools.

For more information: www.outcomemapping.ca/download/simonhearn_en_st2eep.pdf

1.3 Rationale of the guidebook

A sub-Sahara Africa regional workshop held in in Bamako, Mali, in December 2009 explored the theme 'Reorienting teacher education in sub-Saharan Africa to address sustainability'. It stressed the importance of providing support and resources to teacher educators and teachers in order to enhance their capacity to reorient their professional work towards ESD learning and to 'become the agents of change towards a more sustainable, economically viable and just society for all'. Teacher educators and teachers

require support to transform their pedagogical perspectives as well as their professional practices. This guidebook has been written to provide support to teacher educators and teachers to help them reorient their practices using ESD lenses and thus mainstream ESD principles and values to achieve effective teaching and learning. As shown above, ESD is very important. The sub-Sahara Africa Regional Strategy on the Decade of ESD (UNESCO, 2006) carries the vision that (emphasis in italics added by the author):

> ESD should create new avenues for the emergence and development of a *new type of knowledge and skills* as well as some *sustainable local practices*. The approach to ESD should be designed basically as the means to *develop a critical thinking* that induces a change of attitudes and behaviours among children, the youth and adults in schools and within the community. Finally, one of the major challenges that ESD should meet is the training of trainers with a view to a *profound change in the ways of thinking, attitudes and behaviours for a sustainable development* (UNESCO, 2006).

This guidebook challenges teacher educators and teachers to take up the challenges posed in the above quote. It takes guidance from ADEA to urge teacher educators and teachers to proactively contribute towards mainstreaming ESD by carrying out the following actions:

i) Reorienting educational policies
ii) Restructuring education provision
iii) Conducting extensive curriculum reform
iv) Reviewing the actual quality of teaching and learning to make them more effective and to ensure continuous impact on the environment and society (ADEA, 2012)

This is important because in Africa, teacher education institutions, teacher educators and teachers are key change agents in the community and in society. They need to model ways of thinking, attitudes and behaviours for learners under their tutelage for a sustainable society. They also have a broad influence on policy and practice in education and development. As such the UNESCO Chair on Reorienting Teacher Education to Address Sustainability points out how crucial they are as key change agents in transforming education and society, so that a sustainable future is achievable. Teacher educators and teachers hold key responsibilities with regard to the delivery of quality education at all levels (box 1.3).

BOX 1.3

ESD AND TEACHER EDUCATION

Teacher education institutions and teacher educators are key change agents in reorienting education to address sustainability. Teacher education institutions fulfil vital roles in the global education community with the potential to bring changes within educational systems that will shape the knowledge and skills of future generations. Teacher education institutions serve as key change agents in transforming education and society, so such a future is possible. Teacher education institutions:

- educate new teachers;
- provide professional development for practising in-service teachers by updating their knowledge and skills;
- create teacher education curricula;
- carry out research;
- contribute to textbooks;
- provide expert advice to local schools upon request;
- provide expert opinion to provincial and national ministries of education; and
- educate and certify headmasters, principals and other school administrators.

Source: http://unesdoc.unesco.org/images/0014/001433/143370e.pdf (UNESCO, 2005)

This guidebook will provide support and serve as a resource to enable teacher educators and teachers to promote and implement ESD concepts, principles and values more effectively. This guidebook provides clarification of ESD and the required reorientation of curriculum, teaching, learning and assessment. It draws on case studies, African examples and best practices, where relevant. It provides examples of resources and reading materials to further develop one's knowledge and professionalism. It is expected that promoting the teaching and learning that embraces ESD principles will be based on a deep understanding and knowledge of sustainable development issues. As such, it is important for the teacher educators and teachers to acquaint themselves with basic scientific knowledge and facts surrounding sustainable development issues. At the same time they must engage in activities that lead to sustainable development (see example in case study 1.1).

CASE STUDY 1.1

ECO-SCHOOLS IN AFRICA

Eco-schools such as found in Kenya and South Africa engage whole schools in appropriate activities for the environment. Eco-schools apply the following four key components of environmental action learning:

- Development of a school environmental policy within the school's development plan, along with an 'eco-code' involving the schools and the communities; this would produce an environmental audit and the establishment of a plan of action.
- Development of local curriculum teaching and learning resources within the context of school syllabi aimed at enhancing students' understanding.
- School-community cooperation aimed at promoting collaborative efforts in solving common problems through local environmental projects.
- Development of school networks and exchange programmes to promote the dissemination and exchange of information through visits, the local press, newsletters, television, radio and the internet.

For more information: "Promoting critical knowledge, skills and qualifications for sustainable development in Africa: How to design and implement an effective response by education and training" Meeting report , ADEA (2012) systems. Triennale on Education and Training in Africa, Ouagadougou, Burkina Faso, 12–17 February 2012

1.4 Purpose and objectives of the guidebook

This guidebook is a resource that teacher educators and teachers may use with creativity and reflection to improve the quality in teacher education and reorient their work for ESD learning. As such, this guidebook, together with other resources for ESD, seeks to contribute towards achieving the following general aims.

1. Increase the capacity of teacher educators and teachers to integrate ESD concepts and principles in the curriculum and in teaching and learning.
2. Illustrate pedagogical principles and processes that need to be integrated into teaching and learning to achieve ESD learning.
3. Strengthen the integration of ESD in curricula and in teaching and learning by teacher educators and teachers who are already ESD practitioners.

More specifically, through seven chapters that follow this introduction chapter, the guidebook aims to contribute towards the following more specific objectives.

1. To clarify what needs to be oriented and mainstreamed to achieve ESD learning (chapters 1 and 2).
2. To provide a clarification of ESD as a holistic framework of quality education and lifelong learning (chapter 2).
3. To clarify the range and variety of philosophies, theories and principles relevant for ESD learning in Africa (chapter 3).
4. To profile the student teacher, the teacher educator and the African culture, context and settings for ESD learning (chapter 4).
5. To demonstrate the integration of ESD in teacher education curricula and in teaching and learning (chapter 5).
6. To demonstrate ESD mainstreaming through case studies of a range of cross-cutting issues in the teacher education curriculum (chapter 6).
7. To demonstrate through case studies a range and variety of teaching and learning approaches, methods and techniques for ESD learning (chapter 7).
8. To demonstrate through case studies a range and variety of assessments suited for ESD learning in teacher education (chapter 8).

1.5 Target and audience of the guidebook

The guidebook has been written to support teacher educators and teachers in Africa to reorient their curriculum and teaching so that ESD learning is achieved. This involves work in committees that advise curriculum development and reviews, examinations and national assessment, and school communities. Its chapters are also relevant to educational policy-makers, curriculum developers and national examination boards. All those who read and use the guidebook are reminded to use it as a source of inspiration and motivation to think and act critically as they reorient their pratictices with an ESD perspective.

1.6 Teaching and learning in a changing world

Reorienting teaching and learning, and other educational practices towards sustainability is necessary for a number of reasons. First, reorienting towards ESD is necessary to tackle the quality and relevance of education in Africa, which has been questioned quite frequently (do activity 1.2).

ACTIVITY 1.2

REFLECT ON THIS QUOTATION

Find and peruse the blog by Justin W. van Fleet published on 17 September 2012 under the title "Africa's Education crisis: In School but Not Learning".

Africa on the eve of the twenty-first century: …"While the need for high-level human resources has become increasingly crucial to rapid socio-economic, cultural and technological advancement, higher education institutions throughout Africa are fast deteriorating both in quality and quantity".

Reflect: Can an ESD perspective in teacher education help change the situation described in the quotation?

Second, there is a need to critically reflect on pedagogy with an ESD perspective (box 1.4). We must adopt critical pedagogies and try to link teaching and learning processes with local culture, social, ecological and economic experiences and aspirations (Manteaw, 2012). Such critical pedagogies include ground learning and knowledge creation in local places and experiences in Africa. They create better links between educational institutions and communities and thus situate learning to local sustainable development contexts (Lotz-Sisitka, 2013).

Thirdly, it is important to see ESD as requiring us to adopt new approaches, processes and principles that will lead to new types of learning (Box 1.4).

BOX 1.4

PRINCIPLES AND PROCESSES RELEVANT AND ESSENTIAL IN ESD

a. Interdisciplinary and holistic learning for sustainable development embedded in the whole curriculum, not as a separate subject;
b. Values driven by stressing and making explicit, and interrogating values and principles underpinning sustainable development;
c. Critical thinking and problem-solving as outcomes of learning to address sustainable development;
d. Multimethod approaches of teaching, learning and assessment to develop knowledge, attitudes, values and action competencies to tackle local unsustainable practices;
e. Participatory decision-making in which learners are engaged and participate in decisions on how they are to learn;
f. Applicability and transfer of learning experiences in everyday personal, familial, community, and professional life.
g. Local relevance by addressing local as well as global issues, and communicating in both language(s), i.e. the language learners most commonly use and languages used in other cultures.

In reflecting on the contents of box 1.4, consider also the following features of 'learning' for ESD (Tilbury, 2011). Learning for ESD goes beyond gaining knowledge, values and theories related to sustainable development. It also entails:

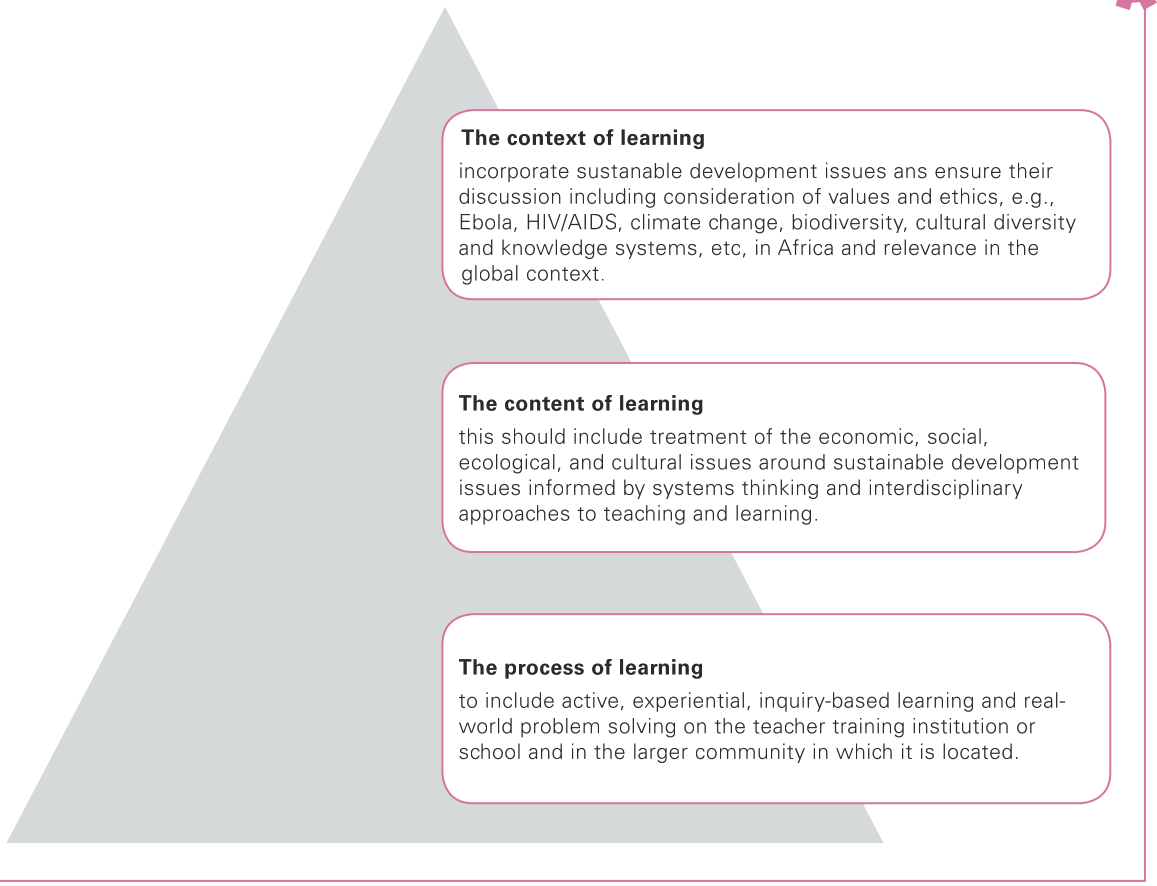
1. learning to ask critical questions;
2. learning to clarify one's own values;
3. learning to envision more positive and sustainable futures;
4. learning to think systemically;
5. learning to respond through applied learning; and,
6. learning to explore the dialectic between tradition and innovation (Tilbury, 2011; p. 8 and p. 9).

It is these kinds of ESD learning that lead to educational, economic and environmental change, and ultimately to social change leading to a better quality of life and sustainable development.

Fourthly, in ESD, teacher educators and teachers need to fundamentally change their own perspectives and learning cultures as well as the learning cultures in their institutions. There needs to be a change in the context and content of learning and the entire process of education, as explained in figure 1.1. ADEA indicates the importance of fundamental changes in ESD by stating as follows:

> "… simply expanding the quantity of education and lifelong learning will not be sufficient to advance sustainable societies. The quality of education and training, including appropriateness and relevance, must be enhanced. Thus ESD has come to strengthen the agenda for improvement of quality by focusing on the importance of learners effectively acquiring core skills needed for life and work" (ADEA, 2012).

FIGURE 1.1 THREE AREAS TO REORIENT EDUCATION TOWARDS ESD



The activities that follow ask teacher educators and teachers to think through the needed fundamental changes and what they must do to reorient their work towards ESD. Professor Stephen Sterling of the University of Plymouth suggests tackling eight questions to realize a fundamental change in perspective and learning culture (UNESCO, 2012) (activity 1.3). The *Saber Tooth Curriculum* demonstrates the need for life skills to cope in the light of a fundamentally changed environment and society (activity 1.4). O'Brien *et al.* (2013) identified four clearly different approaches that lead to fundamentally changing education (stop and reflect on activity 1.5).

ACTIVITY 1.3

QUESTIONS FOR CHANGING PERSPECTIVES AND LEARNING CULTURE THROUGH ESD

Study the eight questions that Professor Stephen Sterling suggests for a fundamental change of perspective and learning culture through ESD.

1. Holistic: How does this relate to that? What is the larger context here?
2. Critical: Why are things this way, in whose interests?
3. Appreciative: What's good, and what already works well?
4. Inclusive: Who/what is being heard, listened to and engaged?
5. Systemic: What are or might be the consequences of this?
6. Creative: What innovation might be required?
7. Ethical: How should this relate to that? What is wise action? How can we work towards the inclusive well-being of the whole system – social, economic and ecological?
8. Practical: How do we take this forward with sustainability in mind as our guiding principle?

Discuss how each of these eight questions can help us to envision what needs to change in teacher education to effectively mainstream ESD.

Source: UNESCO, 2010; p.33.

ACTIVITY 1.4

WHAT AND WHY DO WE NEED TO REORIENT?

You are encouraged to access and read The Saber-Tooth Curriculum written in 1939 by Harold Benjamin under the pseudonym J. Abner Peddiwell. This satirical book presents an imagined curriculum for a Palaeolithic society and environment that experienced a major ice age, which created a serious climate and environmental change. The curriculum, rotating around fish-grabbing, horse clubbing and fire raising to chase off saber tigers, successfully prepared people for the present, and adequately gave them knowledge and life skills for adapting to, coping with, and managing changes in their environment. The book suggests that students must "live what they learn".

(i) Discuss how far this scenario is relevant to our fast changing times?
(ii) What are the critical issues for reorienting curriculum and pedagogy in teacher training institutions?

For more information see: https://cse101.cse.msu.edu/visitors/saber.php

ACTIVITY 1.5

APPROACHES TO ESD LEARNING IN TEACHER EDUCATION

The following are some approaches to ESD suggested by O'Brien et al. (2013).

(i) Critically discuss which of the following approaches would work best.
(ii) How would you engage other members of staff in the institution to appreciate these approaches?

- *A reformist approach* – whereby education can be changed by creating new arenas and methods for promoting multi- and interdisciplinary interactions. A revolution in this sense requires institutional and curricula changes.
- *A political approach* – entailing a critique of mainstream education that calls for deep structural changes in the way that education is carried out. A revolution from this perspective requires approaches that challenge dominant structures and paradigms including the approach to educating students by filling them with facts and expertise.
- *A social approach* – focusing on education as a means to inform and educate citizens who can participate effectively in democracy and the creation of a just society. This type of revolution emphasizes the development of human agency through dialogical, participatory approaches that engage students with practical 'real world' problems.
- *A perspectival approach* – drawing attention to the importance of recognizing that there are different approaches and understandings of education. A revolution in this sense involves transforming teachers and administrators, as well as students. It can be considered as a reflexive process of continuous change.

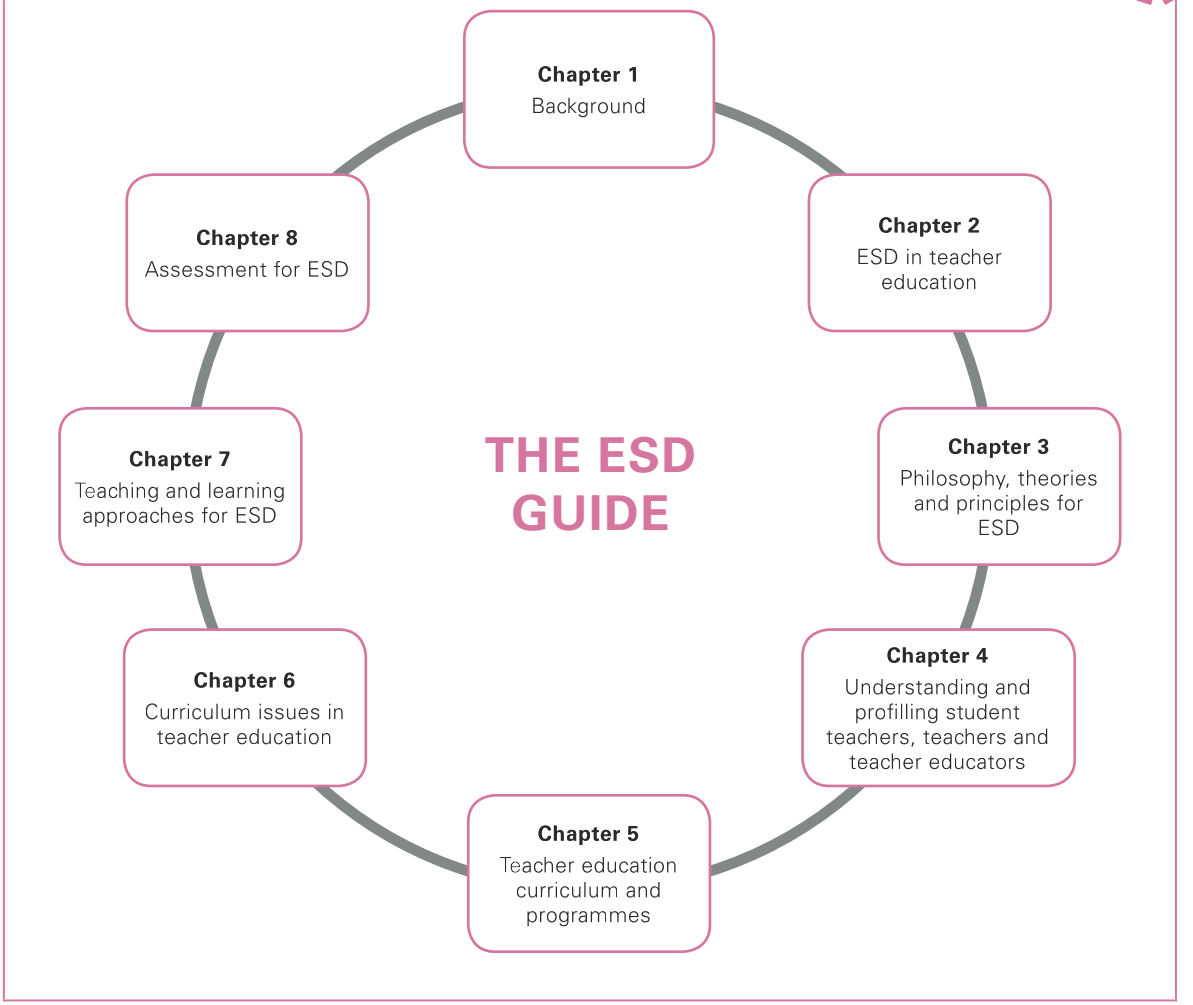
For more information: O' Brien et al., 2013.

This guidebook encourages educators and teachers to be reflective and critical as they try out ESD principles in their professional work. In reading this guidebook they will find a satisfying range and variety of philosophies, theories and principles relevant for ESD learning in Africa, and they are encouraged to find more examples. Applying an ESD perspective, the guidebook provides an opportunity for teacher educators and teachers to transform what they do.

1.7 How to use this guidebook

The guidebook is intended to serve as a user-friendly resource from which teacher educators in Africa may draw inspiration, best practices and practical ideas to reorient their professional work to support ESD learning. Each chapter in figure 1.2 is complete. They present information that clarifies concepts and provides case studies, illustrations and activities, and identifies three annotated resources or references for further exploration and/or reading. It is expected that the reader will choose to read and study the whole guidebook to appreciate the overall scope and rationality of ESD learning. More importantly, to appreciate the holistic changes needed to be undertaken in curriculum, teaching and learning methodologies, and in assessment approaches.

FIGURE 1.2 THE GUIDEBOOK AND ITS CHAPTERS



- The guidebook may be used as a reference for guidance on specific areas of teaching, learning and assessment. For example, teacher educators or teachers, and anyone else interested only in concepts and general issues of ESD in teacher education, can draw inspiration by reading the introductory chapters 1 and 2.

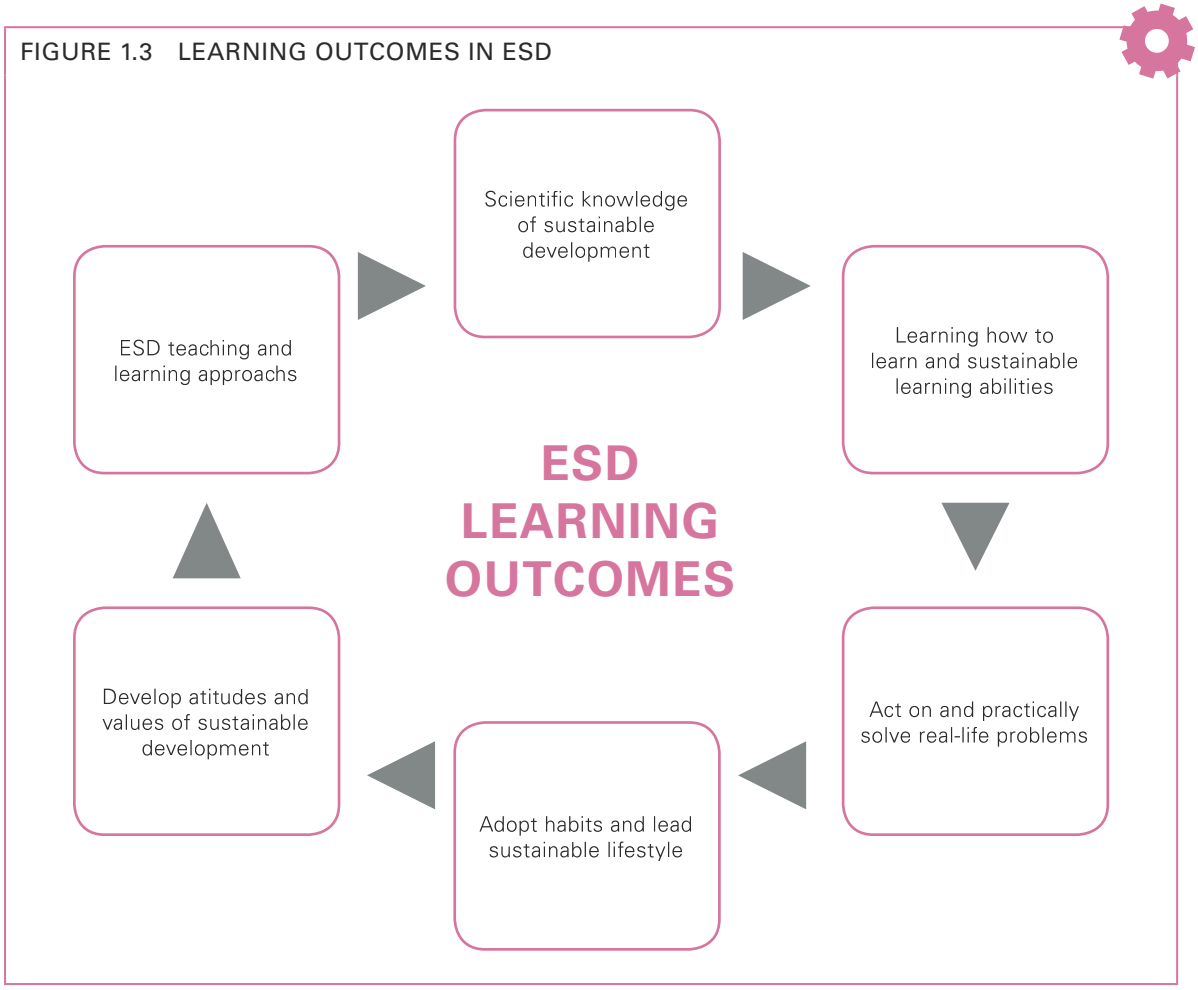
- Those wishing to understand issues relating to the student teacher, the teacher educator and the context or mainstreaming ESD in the curriculum, and programmes of teacher education could review chapters 4 and 5, respectively.

- They may consult chapter 6 to appreciate examples of cross-cutting issues, chapter 7 for teaching and learning methodologies, and chapter 8 for assessment of and for ESD learning.

"Knowledge is power. Information is liberating. Education is the premise of progress, in every society, in every family." – Kofi Annan

It is important for all readers and users of this guidebook to realize that its content is not prescriptive, it is not meant to tell practitioners what to do in every circumstance and situation. It is a resource that challenges practitioners to be creative and innovative. The hope is that each chapter gives sufficient background so that readers will gain confidence on their own and with their colleagues to explore further how to achieve ESD learning. Figure 1.3 shows learning outcomes for teachers on how to effectively deliver ESD programmes.

FIGURE 1.3 LEARNING OUTCOMES IN ESD



1.8 ESD and science education

This guidebook urges teacher educators and teachers to seriously consider three issues:

1. The opportunities that science education provides for ESD. Science and mathematics are important carrier subjects for sustainable development concepts. The information and data from the sciences informs issues such as climate change, biodiversity, environmental degradation, health and nutrition, energy and others.
2. The opportunities for science education in ESD. ESD provides a context in which science education must take place, thus increasing relevance for learners. This can contribute towards better enrolment levels and better achievement and favourable attitudes in science courses.
3. Values such as respect for evidence, open-mindedness, objectivity, criticalness and questioning are important and develop in both science education and ESD.

Every opportunity must be taken therefore to ensure that scientific information and scientific approaches are involved when examining sustainable development issues. This creates a win-win situation where scientific understanding accrues and ESD principles and practices spread. Why is this important to do globally and in the context of Africa?

First, science and technology are vital for sustainable development. For example, Agenda 21 dedicates Chapter 35 to 'Science for sustainable development' (UNCED, 1992). The African Union established the African Ministerial Council on Science and Technology (AMCOST) in 2003 as a high-level platform for developing policies and setting priorities on science, technology and innovation for African development. Africa's Science and Technology Consolidated Plan of Action (CPA), which AMCOST oversees, aims to enable Africa to harness and apply science, technology and related innovations in order to eradicate poverty and achieve sustainable development.[1] Further to this, the Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024) contributes toward the six priority areas in the AU Agenda 2063 (box 1.5).

BOX 1.5

AU AGENDA 2063

The six priority areas are:

- Eradication of Hunger and Achieving Food Security
- Prevention and Control of Diseases
- Communication (Physical and Intellectual Mobility)
- Protection of our Space
- Live Together – Build the Society
- Wealth Creation

Second, science and technology pervades all our lives. For example, Sjøberg (2002) observed:

> Scientific and technological knowledge, skills and artefacts 'invade' all realms of life in modern society and writes as: the workplace and the public sphere are increasingly dependent on new as well as upon more established technologies. So, too, are the private sphere and our leisure time. Scientific and technological knowledge and skills are crucial for most of our actions and decisions, as workers, as voters, as consumers, etc. Meaningful and independent participation in modern democracies assumes an ability to judge the evidence and arguments associated with the many socio-scientific issues that appear on the political agenda.

1 For more information: http://www.nepad.org/humancapitaldevelopment/news/1581/advancing-science-and-technology-africa.

This quote recalls the importance that must be placed in understanding science and technology, and ensures that teachers, teacher educators and the learners' understanding of sustainable development issues includes a scientific perspective. It also shows why education for sustainability must be seen through a science-technology-environment-society framework (Zoller, 2013) in which higher learning is aimed for. This guidebook encourages the use of scientific thinking, reasoning and problem-solving, while at the same time taking on board appropriate and relevant philosophies, principles and values drawn from Africa's cultures.

CASE STUDY 1.2

SCIENCE EDUCATION AND SUSTAINABLE DEVELOPMENT ISSUES

The Zimbabwe Environmental Science syllabus for primary school teacher education institutions was designed to equip student teachers with environmental science knowledge, skills and attitudes to make them aware and sensitive to environmental issues. The following are examples of the type of questions that are covered in the final examination questions papers for student teachers.

1. Describe how greenhouse gases play an important role in determining climate and climate change. Why are CO_2 emissions from human activities regarded as so significant in climate change?
2. Explain why reforestation promotes practices that will reduce global warming.
3. A study of the accident at Fukushima nuclear power plant in Japan in 2011 would lead to the conclusion that technology could cause problems throughout the world. Discuss.
4. Describe how a Grade 5 teacher can engage learners about waste management in the school.
5. Explain how the shortage of clean water for household use resulted in a cholera outbreak in Zimbabwe in 2008.
6. Discuss how water pollution impacts on the hydrological cycle.
7. Discuss the relationship between biodiversity and ecosystems, and identify human activities that have impacted on these.

Analyse the questions and for each, identify five scientific concepts that the question covers.

BOX 1.6

MATHEMATICS IN THE REAL WORLD

Mathematics and statistics find many applications in real life problem-solving and contributes a great deal when dealing with issues affecting sustainable development. Here are some examples:

1. Mathematical modelling is quite important to understand and predict the dynamics of infectious diseases, malaria epidemiology, continuous and discrete population models, and for modelling changes and risk in climate, biodiversity and so forth.
2. Mathematical equations such as quadratic equations are used in determining the areas of parabolic mirrors, satellite dishes and reflecting telescopes, and many questions involving distance, time and speed, and other rates of change.

1.9 Summary

This chapter has provided an introduction and background to the guidebook as a resource for teacher educators, teachers, policy-makers and curriculum planners to mainstream ESD learning. It has emphasized the relevance of ESD as a good and relevant framework for quality education in Africa that allows for the inclusion of African perspectives, examples and contexts in dealing with the global issues of, for example, climate change, biodiversity changes, HIV/AIDS, Ebola, equality and justice, and so on. The chapter has clarified the purpose and objectives of the guidebook, emphasizing creativity, initiative and reflection when used to support ESD learning. It also emphasized the importance of active teaching and learning in the teacher training institution in order for active learning of ESD to cascade into the school system. Chapter 2 provides a more detailed clarification of the concepts around ESD and ESD learning in teacher education and teacher training institutions.

1.10 Further reading and resources

UNESCO. 2005. *Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability***.** http://unesdoc.unesco.org/images/0014/001433/143370E.pdf
The introduction will give the reader a good insight into the important role of teacher educators and teachers in transforming education and society towards ESD learning. Some case studies of best practices in teacher training institutions are provided.

Benjamin, H. (Foreword to Peddiwell, J.A.) 1939. *Saber-Tooth Curriculum*. (New York, McGraw-Hill). http://www.nassauboces.org/cms/lib5/ny18000988/centricity/domain/57/thesabertoothcurriculumshort.pdf
Presents an imagined curriculum of a Palaeolithic society and environment that experienced a major ice-age, which created serious climate and environmental change. The curriculum rotates around fish-grabbing, horse-clubbing and fire-raising to chase off saber tigers, which successfully prepared people for the present and adequately gave them knowledge and life skills for adapting to, coping with, and managing changes in their environment.

UNESCO. 2010. *Tomorrow Today* (UNESCO and Tudor Rose).
https://sustainabledevelopment.un.org/content/documents/923unesco6.pdf
The book *Tomorrow Today* comprises contributions of international experts on ESD who provide innovative teaching and learning approaches, as well as the background and rationale for mainstreaming ESD perspectives today, on how to secure a sustainable future. The reader will find useful insights provided by leading academics, educationists and practitioners who explain ESD and how ESD is a relevant framework for quality education. The book also provides a background to the United Nations Decade of Education for Sustainable Development.

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Smith, T.A. 2013. The dominant/marginal lives of young Tanzanians: Spaces of knowing at the intersection of children's geographies and development geographies. *Geoforum,* Vol. 48, No. August 2013, pp. 10–23.

Sjøberg, S. 2002. Science and technology education: Current challenges and possible solutions. Jenkins, E. (ed.), *Innovations in Science and Technology Education,* Vol VIII. Paris, UNESCO. http://folk.uio.no/sveinsj/STE_paper_Sjoberg_UNESCO2.htm

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Chapter 2

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN TEACHER EDUCATION

Overson Shumba

Chapter 2

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN TEACHER EDUCATION

Overson Shumba

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2.1 Introduction

Reorienting teacher education by mainstreaming education for sustainable development (ESD) in the curriculum is as important in Africa as it is globally. It was, for example, in the Sub-Sahara Africa Regional Strategy for the DESD (UNESCO, 2006) that envisioned mainstreaming ESD, which would create new avenues for the emergence and development of *a new type of knowledge and skills as well as some sustainable local practices*. Teacher educators and teachers need to understand the meaning of ESD to effectively mainstream its principles into the curriculum and in teaching and learning. In this chapter, the teacher educator and teacher will be given a background to ESD in teacher education. It must be read with the idea to make a change in the actual quality of teaching and learning to make them more effective and to ensure continuous impact on the environment and society (ADEA, 2012).

2.2 Objectives

The following are the key objectives of this chapter.

1. To provide a brief historical background to the development of ESD as a framework for quality education.

2. To explain and clarify ESD and allied concepts relevant in teacher education and teaching and learning.

3. To explain the meaning of ESD cross-cutting issues and the relevance of tackling them in teacher education and in teaching and learning.

4. To demonstrate the many ways of tackling ESD issues with an emphasis on reorienting the curriculum, teaching, learning and assessment.

5. To elaborate the concepts of assessment, feedback and feed-forward, and their relevance for ESD learning.

Subsequent chapters 3 to 8 provide more detailed guidance on how to actually improve the quality of the curriculum, teaching, learning and assessment.

2.3 Historical development of ESD

ESD brings together two constructs 'education' and 'sustainable development'. How did education and sustainable development come together as 'education for sustainable development'? In 1972, the International Commission on Education led by Edgar Faure published a report *Learning to Be: The World of Education Today and Tomorrow* (UNESCO, 1972) in which the Faure Commission recommended 'remoulding education' so as to help create a learning society capable of building its democracy, building equality and building its sustainable future.

Also in 1972, the United Nations Conference on Human Development, held in Stockholm, led to the Stockholm Declaration. The Stockholm Declaration considered the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment. Thus, Principle 19 recommended environmental education (EE) as an approach to education that addressed issues of environmental quality. It maintains that education in environmental matters, for young people as well as for adults, is essential in order to broaden the basis for enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. Both the UNESCO's report on *Learning to Be* and the Stockholm Declaration thus drew attention to the fact that education and development were relevant for human well-being reflected in the quality of people's lives.

In 1975 the Dag Hammarskjöld Foundation proffered a new vision of sustainable development in its publication *What now: Another development*. The report presented a new vision of sustainable development that was human need-oriented, self-reliant, endogenous in origin and values, ecologically sound, and based on structural transformations for equitable and democratic participation in decision-making (Max-Neef, 1991). In the 1980s and 1990s environmental education was joined by a myriad of adjectival educations: population education, gender education, democracy education, peace education, human rights education, sexuality education and others. All these show the importance of education in addressing issues that contributed to unsustainable development. This was reinforced in 1975 by the launch by UNEP of the International Environmental Education Programme (IEEP) and the Conference on Environmental Education that produced the 'Belgrade Charter – A global framework for environmental education'. Unfortunately EE and emerging adjectival educations were being tackled separately as if they were independent; the concept of sustainable development was not fully problematized and understood in its complexity as it is today.

In 1987 sustainable development was given a higher profile by the World Commission on Environment and Development (Brundtland Commission) when it published *Our Common Future* in 1987. Sustainable development was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This concept of sustainable development was popularized at the Earth Summit, the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. The Earth Summit delivered: (i) the Rio Declaration, carrying 27 principles intended to guide future sustainable development around the world; and (ii) Agenda 21, a 40-chapter blueprint to prepare the world for the challenges of the twenty-first century. Chapter 36 of Agenda 21 spells out four goals of education, training and public awareness for sustainable development (see box 2.1). ESD thus has firm roots in Agenda 21.

BOX 2.1

FOUR GOALS OF CHAPTER 36 OF AGENDA 21

- Promote and improve access to quality basic education so that citizens acquire the knowledge, skills and values they need to improve the quality of their lives in their communities.
- Reorient education programmes from pre-school to university so that the education provided leads to acquiring more principles, knowledge, skills, perspectives and values related to environmental, societal and economic sustainability.
- Develop public understanding and awareness of sustainability to ensure active, knowledgeable and responsible actions of citizens locally, nationally and internationally.
- Provide training to businesses, industry and all sectors of the workforce in sustainability practices so that they may adopt sustainable modes of production and consumption.

Adapted from the IIS (UNESCO, 2005*a*).

Ten years after the Earth Summit, the World Summit on Sustainable Development (WSSD) in 2002 recommended the declaration of a United Nations Decade of ESD (UNDESD) to improve the quality of education and to reorient its goals towards sustainable development as a major priority. The UNDESD was launched in 2005 and the decade concluded in 2014 with the World Conference on ESD at Aichi-Nagoya, Japan, where it was celebrated under the theme 'Learning Today for a Sustainable Future'.

Table 2.1 summarizes how ESD has developed since the 1970s.

TABLE 2.1 SOME IMPORTANT MILESTONES IN THE DEVELOPMENT OF ESD

Major output	Year	Major conference
More ecological concerns, limited sustainability thinking and values, ESD and SD concepts		
Environmental Education (EE) and quality education, learning to be	1972	UN Conference on the Human Environment, Stockholm & Faure International Commission on the Development of Education
International Environmental Education Programme (IEEP)	1975	United Nations Environment Programme IEEP
Belgrade Charter: A Global Framework for EE and DHF's What now: Another Development	1975	Belgrade Conference on Environmental Education and Dag Hammarskjöld Foundation (DHF)
Tbilisi Declaration on EE	1977	Intergovernmental Conference on EE (ICEE)
Our Common Future and International Strategy for Action in the Field of EE and Training for the 1990s	1987	Brundtland Commission and International Congress on Environmental Education and Training, Moscow (Tbilisi +10 years)
World Declaration on EFA, Jomtien, Thailand	1990	World Conference on Education for All (EFA)
UNCESD, Agenda 21, Rio de Janeiro, Brazil	1992	UN Earth Summit
Learning the Treasure within - Four pillars of quality education	1996	Delors International Commission on Education for the Twenty-first Century
Millennium Declaration and Millennium Development Goals (MDGs)	2000	UN Millennium Summit
Values and Principles for a Sustainable Future and Dakar Framework of Action on EFA	2000	Earth Charter Initiative & World Education Forum, Dakar, Senegal
ESD evolves – Ubuntu Declaration	2002	WSSD – Johannesburg Plan of Action
Mainstreaming environment and sustainability in African universities (MESA)	2004	MESA Initiative in Africa
DESD Launches – ESD for Quality Education	2005	UN Decade of Education for Sustainable Development

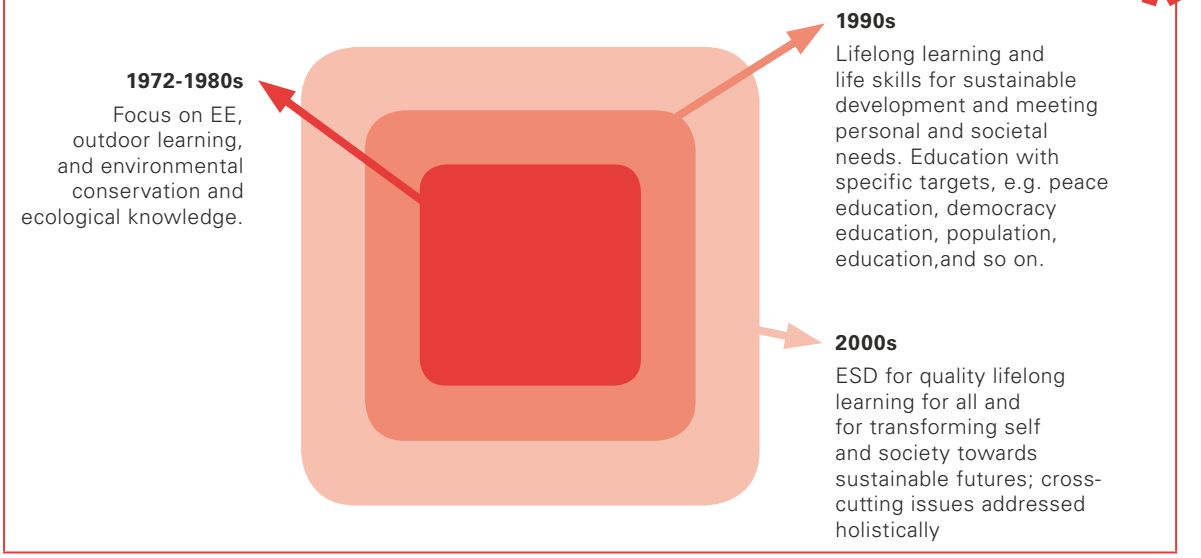
Major output	Year	Major conference
ICEE – Ahmedabad Declaration	2007	Tbilisi+ 30 years
WCESD Bonn Declaration and AAU Abuja Declaration on ESD in HEIs	2009	WCESD & Association of African Universities Conference (AAU), Abuja, Nigeria
ADEA and lifelong learning and ESD	2012	Triennial on Education and Training in Africa, Ouagadougou, Burkina Faso
Rio + 20 – The Future We Want and Tbilisi Communique	2012	Rio + 20 UN Conference and Tbilisi +35 Intergovernmental Conference
Aichi-Nagoya Declaration on ESD	2014	WCESD, Aichi-Nagoya
Global Action Programme on ESD (GAP)	Post-2014	Global Action Programme on ESD and UN Sustainable Development Goals (SDGs)
Wider and holistic view of ESD as framework for quality education and lifelong learning, and sustainability thinking and values to permeate personal and professional decision-making, lifestyles and practices		

The meetings and declarations in table 2.1, which have taken place since 1972, are important in understanding how ESD has developed. The teacher educator and the teacher must also answer questions based on table 2.1, such as the following:

1. What are the conceptual shifts that took place in understanding ESD?
2. What are the changes and transformations in the curriculum and in teaching and learning practices associated with the shifts in understanding of ESD?
3. Where is your country or your institution in terms of policies and practices associated with ESD?

Figure 2.1 summarizes some of the conceptual shifts towards ESD.

FIGURE 2.1 CONCEPTUAL SHIFTS TOWARDS ESD



Both table 2.1 and figure 2.1 illustrate the international community's commitment to ESD as a framework for quality education and lifelong learning to create sustainable futures. The Rio+20 Conference held in Rio de Janeiro, Brazil, on 20–22 June 2012 declared *The Future We Want*, which in paragraph 233 committed the international community to pursue ESD beyond the UNDESD. In November 2014 the World Conference on Education for Sustainable Development in Aichi-Nagoya, Japan, endorsed the Global Action Programme (GAP) on ESD to strengthen and scale-up ESD action and learning. It pursues two objectives: (1) integrating sustainable development into education; and (2) integrating education into sustainable development through five priority action areas (box 2.2).

BOX 2.2

THE FIVE GAP PRIORITY ACTION AREAS

1. Advancing policy: Mainstream ESD into both education and sustainable development policies to create an enabling environment for ESD and to bring about systemic change.
2. Transforming learning and training environments: Integrate sustainability principles into education and training settings.
3. Building capacities of educators and trainers: Increase the capacities of educators and trainers to more effectively deliver ESD.
4. Empowering and mobilizing youth: Multiply ESD actions among youth.
5. Accelerating sustainable solutions at local level: At community level, scale-up ESD programmes and multistakeholder ESD networks.

For more information see UNESCO 2014, http://unesdoc.unesco.org/images/0023/002305/230514e.pdf

Before clarifying ESD concepts and principles in the context of teacher education, let us do activity 2.1 to reflect on our institutions with respect to the GAP, and with respect to ESD. It is important to continue thinking about issues associated with the GAP and with mainstreaming ESD in our institutions as we work through all the chapters in this guidebook.

ACTIVITY 2.1

REFLECTION ON THE GAP

Download the GAP: http://unesdoc.unesco.org/images/0023/002305/230514e.pdf

and the MESA Unit based sustainability assessment tool (USAT): http://www.unep.org/Training/docs/USAT_Tool.pdf

1. Use the MESA USAT to picture how your institution is doing with regard to ESD?
2. Reflect on your institution with respect to the GAP and its five priority areas. What actions are your institution taking or planning to take to advance the GAP?

2.4 Clarifying ESD in the context of teacher education

ESD is derived from the two terms 'education' and 'sustainable development'. A good way to understand ESD is to understand the two terms independently. Sustainable development rests on the three pillars: environment, economy and society, i.e. that for overall sustainable development there must be a balanced consideration of economic sustainability, environmental sustainability and societal sustainability (UNESCO, 2010). At the base of these pillars is 'governance' of which education is a part (Scoullos and Malotidi, 2004). Education improves one's capabilities and hence raises prospects for better adaptation to the environment, while raising prospects for better health, nutrition and livelihoods, i.e. a better quality of life. Governance reflects not only the degree of equitable access to quality education for all, but also the level of democratic participation of all citizens in decisions and actions that contribute to sustainable development.

Quality education and the degree of democratic participation in decision-making in society's institutions makes sustainable development possible. Governance is an important base therefore for sustainable development and for initiatives to transform society towards the path of sustainable development. The relation between pillars of sustainable development, education and governance is not a simple one. As an example, education is the base for sustainable development that strengthens, and that is strengthened by, good governance. Scoullos and Malotidi (2004) consider education and overall governance as the base for sustainable development. Sustainable development is recognized by the quality of life among citizens. There will be social equity, a healthy environment, and a sustainable economy in their communities, and all citizens will be well educated. Education develops the knowledge and awareness for creating attitudes, values and mind-sets, as well as competencies and skills for good governance, social equity, a healthy environment and a sustainable economy. Quality education accessed by all helps to build a culture of peace, a society with social cohesion and green economies that apply clean technologies for production.

ACTIVITY 2.2

REFLECT ON EDUCATIONAL ASPECTS IN ESD

The ESD Lens (UNESCO, 2010) recommended that the reorientation of education must equally focus on societal, environmental, economic and cultural aspects of sustainability. This leads to five learning goals.

1. Societal aspects – an understanding of social institutions, democratic and participatory systems, and their role in change and development.
2. Environmental aspects – an understanding of, and respect and care for, ecological systems and their life-giving support properties, and a commitment towards integrating environmental concerns into personal and social decisions and actions.
3. Economic aspects – develop skills to earn a living and maintain a sustainable economic system that supports the well-being of people, protects the environment and assesses the personal and societal levels of consumption out of concern for the environment and for social justice.
4. Cultural aspects – an understanding of the cultural values (including faith based values) that influence and shape individual lifestyle choices and that influence societies to pursue or choose not to pursue sustainable development alternatives.
5. Governance aspects – an understanding of the processes, structures and values for equal and active participation in making responsible decisions as individuals, as communities and as institutions that contribute towards sustainable development and towards building a sustainable society.

Discuss the following questions with colleagues taking into account the ESD perspective.

a. What is the importance of these pillars in education for teachers and student teachers?
b. In what ways can your institution adjust its programmes to integrate these pillars into learning opportunities for pre-service and in-service teachers?
c. What are the internal governance structures of your institution and how effective are they to support change towards sustainability?

2.5 ESD and culture

Culture is an underlying dimension of sustainable development (UNESCO, 2010). Culture reflects a group's collective set of values defined by social habits, beliefs, language, knowledge and technologies that can be used to explore the environment. It is through education and learning that culture is transmitted, reproduced and transformed; it is through learning in the context of one's culture that new values and lifestyles that acknowledge sustainable living may be developed.

ACTIVITY 2.3

EXAMINE LOCAL BELIEFS AND PRACTICES IN RELATION TO ESD

ESD provides opportunities to learn in a cultural context and to examine some local beliefs and practices.

1. Identify examples of local beliefs and practices that: (a) promote, and (b) threaten environmental, social and economic sustainability in communities where your institution is located.
2. Suggest ways to address certain cultural beliefs and practices that undermine sustainability in your community?

African societies rely on social learning approaches that reflect pedagogical practices that are relevant for introduction into teacher education. Learning is generated from role-play, simulation, games, dramatization, storytelling, song and poetry, and other group learning methods. These methods are communal and group-based. They are learner centred, participatory and discursive, making them relevant for conveying sustainability messages and values. These learning methods will encourage learners to question unsustainable values and practices in their communities. The values they can develop are an aspect of globalization.

2.6 ESD and cross-cutting issues

Issues such as human rights, peace and human security, gender equality, cultural diversity and intercultural understanding, health, HIV and AIDS, and new forms of governance are social issues but with implications for economic and environmental aspects. Dealing with environmental issues, such as water, energy, agriculture, biodiversity, desertification, deforestation and climate change, is quite important but so is the consideration of social and economic aspects. It is important in ESD that learners acquire increased awareness and knowledge of environmental, economic, social and cultural issues as they relate to the broader goal of sustainable development. It is important to address those issues in a cross-cutting manner.

Cross-cutting issues include environmental, sociocultural or economic issues or general principles. They impact on the quality of life and the health of a community and sustainable development, e.g. HIV/AIDS and Ebola. They can be principles associated with the integrity of the environment, i.e. the Earth Charter principles. Moreover, cross-cutting issues touch on the general principles or conditions that underlie and affect the potential for achieving sustainable development in an organization or in a community. The issues alluded to above can be and must be addressed through all subjects in the teacher education curriculum. Cross-cutting issues will feature differently in different cultures and national contexts. Read case study 2.1 and reflect on cross-cutting issues in your national context.

ACTIVITY 2.4

CROSS-CUTTING ISSUES IN THE CURRICULUM IN ZAMBIA

In Zambia, cross-cutting issues have been identified as 'national concerns' and are required to be an integral part of the curriculum at all levels of the education system in order to ensure holistic development of the learner. Examples are environmental education, climate change, life skills, governance issues, gender equality, human rights, population and family life education, reproductive health and sexuality, HIV/AIDS education, health and nutrition, and entrepreneurship education and training (national syllabuses issued by the Curriculum Development Centre in 2010 stipulate this).

1. Analyse your national education policies and the national curriculum to identify cross-cutting issues. You may also look at national Vision and National Development Plan documents.
2. How can these cross-cutting issues be dealt with in the curriculum at the level of teacher training and at the school level?

CASE STUDY 2.1

GENDER MAINSTREAMING IN UGANDA

One strategy has been built on the observation that in Ugandan society women are more responsible than men for family welfare with respect to food, childcare and homecare. Men on the other hand generally provide for family education, family security, and finances for construction and infrastructure in the home. Women generally are considerably more committed to family upbringing, and the government, recognizing this, put in place schemes to support and empower women to achieve this goal. Examples of such schemes include:

- Provision of low interest loans from the Savings and Credit Cooperative Society; and
- Boosting production at the family level by supplementing family income through agricultural projects whereby the government provides seeds or animals for free to households.

Further to this support, basic information is provided on gender issues, including on family management, gender-based violence and financial management.

2.7 Lifelong learning and life skills

Lifelong education permits people to continue learning in formal, non-formal and informal settings, in this way it bridges learning across all three settings. This permits the continual acquisition of skills necessary to apply and adapt to changing situations. Quality education is reflected in five pillars of learning for sustainability learning: (i) to know; (ii) learning to do; (iii) learning to be; (iv) learning to live together; and (v) learning to transform oneself, peers and society (UNESCO, 1996; UNESCO, 2010) as outlined below.

- Learning to know – entails acquisition of instruments of understanding and finding out, or learning how to learn.
- Learning to do – entails application of learned knowledge in everyday life to act creatively and responsibly. Learning involves learner questioning of and engagement with local sustainability practices.
- Learning to be – entails the development of the whole person, including personality, self-identity, self-knowledge, self-fulfilment etc., in a lifelong learning process.
- Learning to live together – entails changing one's lifestyle, having respectful relationships and respecting the rights of others, valuing difference and diversity, valuing social inclusion, conflict resolution and mutual understanding. Learning includes consideration and questioning of equity, fairness and social justice in the distribution of resources and opportunities within and between generations.
- Learn to transform oneself and society – entails being self-critical and having knowledge, values and skills to change one's lifestyle and serve as an agent of change for a sustainable future. This includes competencies and abilities to reflect on and act together with others to learn from sustainability practices and to change unsustainable practices.

The pillars of learning are 'life skills'. A life skills approach is called for to transform teaching and learning by developing the psychosocial skills and practical competencies associated with the pillars of learning. A life skills approach centres on students' preparedness to get involved as citizens in discussions, decisions and actions involving sustainable development issues, and personal and societal lifestyle choices. It also focuses on values clarification and values analysis so that our own behaviour and actions are consistent with sustainable choices and practices. The challenge is to ensure that pre-service and in-service teachers acquire life skills and that they develop competencies to use a life skills approach in their professional work within school communities.

ACTIVITY 2.5

EXPLORING TEACHING AND LEARNING WITH YOUTHXCHANGE GUIDEBOOK SERIES

The YouthXChange Guidebook Series focuses on ESD themes and has been developed by young people and people who work with them, including educators, teachers and trainers. Let teachers experiment using the resources available from the YouthXChange Initiative website:
http://www.youthxchange.net

They may download the *YouthXChange Guide* and individual chapters, as well as the guidebook on *Climate Change and Lifestyles* as a resource for their classrooms.
Available from: http://www.youthxchange.net/main/download_guide.asp

What activities can be incorporated into lessons?

How can the guide be used to model a life-skills approach with pre-service and in-service teachers?

Encourage students to become members of the YXC network and to subscribe to the e-bulletin.

2.8 ESD and values clarification

The ESD learning pillars and outcomes outlined above are also about values and ethics for sustainable development. Values and ethics predispose us to make decisions that are responsible, to act in ways that are either sustainable or unsustainable. Value clarification is when we can relate what we think and do to our values; it creates self-awareness and makes us conscious of our actions as to whether or not they are responsible or not. The *Earth Charter* provides one useful framework for ESD values and ethics. If you examine the Earth Charter at www.earthcharter.org you will notice that it defines the principles for building just, sustainable and peaceful societies in the twenty-first century by emphasizing respect and care for the community of life, the protection and restoration of ecological systems and their biological diversity, the adoption of patterns of production, consumption and reproduction that safeguard earth's regenerative capacities, human rights and community well-being. At the same time it ensures social and economic justice by acting to eradicate poverty, ensuring that economic activities and institutions promote equitable and sustainable human development, gender equality and equity, and upholding democracy and promoting a culture of tolerance, non-violence and peace. These principles set the parameters for living sustainably together and for transforming societies to become more sustainable.

ACTIVITY 2.6

REFLECT ON THE EARTH CHARTER

Acquiring the values associated with the Earth Charter is a major aspect of ESD learning.
It is important to compare the values in the Earth Charter to those held in an African value framework, e.g. Ubuntu.

- Which aspects of the values in the Earth Charter are consistent with values in African frameworks?
- Why are the relevant values in the Earth Charter and in African philosophical frameworks to develop among pre-service and in-service teachers?
- How are 'value clarification approaches' supportive of 'life skills approaches'?

The values in the Earth Charter are consistent with values held in many African philosophies of which Ubuntu is an example. *Ubuntu* provides for many African communities the values that support sustainable development and living together sustainably. It is human-centred and promotes social cohesion, solidarity and collective agency when confronted with the challenges and issues of development. It nurtures respect for people and for nature and the management of its resources. Learning is informed by this philosophy that is premised on social lifelong learning; the basis for intergenerational learning among people in the family and in communities.

"Ubuntu ... It speaks to the very essence of being human. When we want to give high praise to someone we say, 'Yu, u nobuntu': he or she has Ubuntu. This means that they are generous, hospitable, friendly, caring and compassionate. They share what they have and are able to go the extra mile for the sake of others. I am human because I belong, I participate, I share. A person with Ubuntu is open and available to others, affirming of others, does not feel threatened that others are able and good; for he or she has a proper self-assurance that comes with knowing that he or she belongs in a greater whole. We believe that a person is a person through other persons, that my humanity is caught up, bound up, inextricably, with yours. When I dehumanize you, I inexorably dehumanize myself."

Reverend Desmond Tutu, former Archbishop of Cape Town.

Quoted from: http://www.livingvalues.net/ubuntu.html

2.9 Assessment of and for ESD learning

ESD learning is concerned with empowering teachers and learners to become not only knowledgeable but competent and motivated to participate in changing unsustainable ways of living. Pre- and in-service teachers therefore require new competencies to support learners in acquiring life skills and values. Teachers too should have demonstrable knowledge, skills and values, and hence the importance of assessment. Assessment entails documenting learning and must be reoriented to reflect ESD principles; traditional assessment approaches and perspectives will simply be inadequate for new forms of learning that reflect ESD learning. Assessment of ESD learning is quite important in this regard: (i) to ascertain that teachers have achieved ESD learning and that they have the pedagogical competency and confidence to handle ESD learning through the curriculum; and (ii) to ascertain that learners achieve ESD learning. Chapter 8 is dedicated to assessment for ESD learning.

2.10 Reorienting teacher education by mainstreaming ESD

Reorienting teacher education by mainstreaming ESD requires many fundamental changes in the rationale of education and in the content and approaches of the curriculum, teaching, learning, and assessment (UNESCO, 2005b). In Chapter 36 of Agenda 21, 'reorienting teacher education towards sustainable development' is one of three priority areas for promoting education, public awareness and training. The International Implementation Scheme of the DESD (UNESCO, 2005a) explains that reorientation entails "questioning, rethinking, and revising education from pre-school through university to include more principles, knowledge, skills, perspectives and values related to sustainability in each of the three realms- environment, society, and economy" (p. 29). The chapter demonstrates that reorienting teacher education to mainstream sustainability will lead to redefining professional standards and practices. This will place a demand on teacher education institutions such that all or some of the following characteristics are needed to produce pre- and in-service teachers and should thus feature strongly in teachers and educators' attitudes:

- Integrates ESD principles and values.
- Uses or interrogates local and culturally appropriate examples of sustainability issues.
- Promotes lifelong learning and develops life skills.
- Employs relevant approaches in pedagogy and andragogy.
- Creates links between formal, non-formal and informal education.
- Promotes applied learning and community-based change projects.
- Interrogates dialectic between tradition and innovation.
- Uses assessment and feedback to evaluate values, life skills and higher-order thinking skills.

2.11 ESD and whole-institution approaches

ESD is action focused and hence the envisaged fundamental changes in policy and practice must be action oriented. ESD requires whole-institution approaches (also whole-school approaches) for effective implementation. The entire institution, its management, its staff and its students must reorient its values, ethos and practices to reflect ESD principles. The Global Action Programme on ESD beyond 2014 promotes whole-institution approaches in mainstreaming ESD (UNESCO, 2014). ESD ensures that the teaching and learning processes and the operations in the whole institution implement sustainable practices. In whole-institution approaches, sustainability concerns and values formally taught and tackled must be reflected and reinforced in day-to-day practices of the institution (Shallcross and Wals, 2007). The institution must therefore transform itself to become a community of practice (chapter 3) and a microcosm of a sustainable society in its policies and practices.

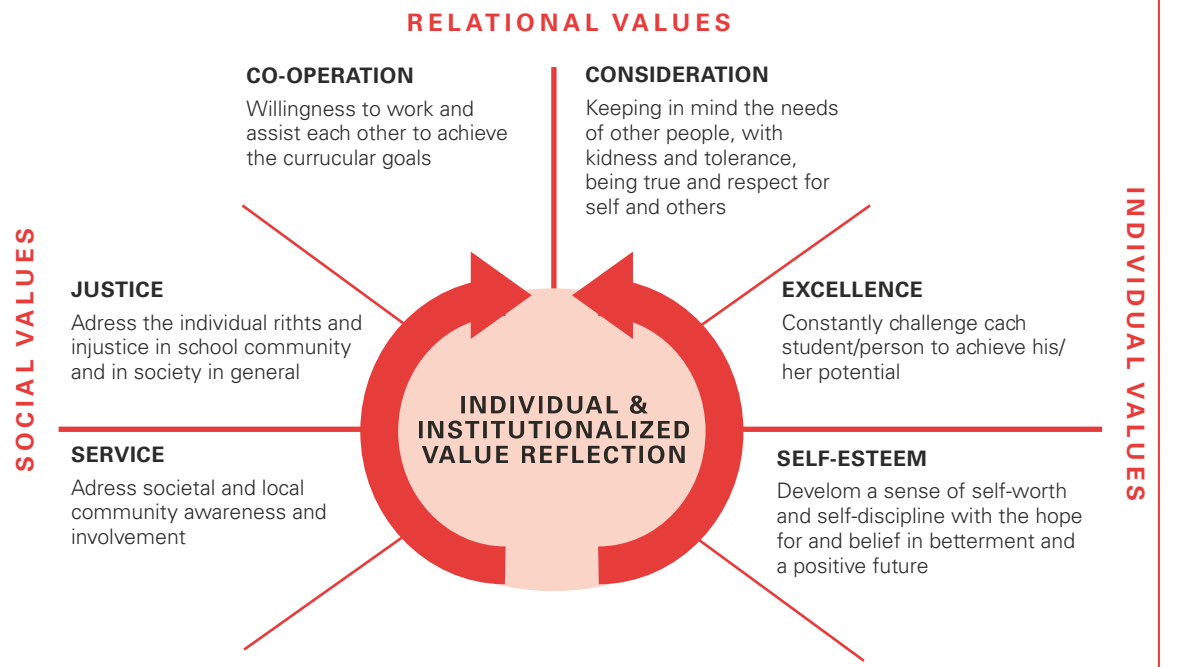
This 'whole school approach' takes everything into consideration: day-to-day operations (energy use, catering, staff and student mobility, decision-making) curriculum, pedagogy and community links (involvement of parents and other stakeholders and resources, using the community as a living learning laboratory) (UNESCO, 2012).

UNESCO. 2012. Shaping the Education of Tomorrow. 2012 Report on the UN Decade of Education for Sustainable Development, Abridged. Paris, UNESCO.

http://unesdoc.unesco.org/images/0021/002166/216606e.pdf

The eco-schools programme (www.ecoschools.org) demonstrates how a sustainable society can be created through the use of whole-institution approaches (chapter 6 takes this further). Shallcross and Wals explain that in whole-institution approaches, the "values and attitudes advocated in the classroom become habituated in the daily actions of teachers, pupils, and support staff". Figure 2.2 shows pedagogical values that are associated with whole-institution approaches (Husu and Tirri, 2007). These values are relevant for teachers and teacher educators to contemplate; they are essential in creating a community of practice that is characteristic of institutions undergoing 'holistic' transformation by mainstreaming ESD.

FIGURE 2.2 FRAMEWORK OF WHOLE-INSTITUTION PEDAGOGICAL VALUES



Source: Husu and Tirri, 2007. (Also see: http://www.sciencedirect.com/science/article/pii/S0742051X06001995)

2.12 Envisioning change in teacher education

ESD is presented throughout the guidebook as a vision of quality lifelong education for all. It is a vision and process of education that helps students better understand the world in which they live, addressing the complexity and interconnectedness of problems they encounter in real life. Teacher education reoriented towards ESD must empower everyone, learners young and old, and teachers, pre- and in-service, to appreciate issues that undermine sustainability, to envision sustainability, and to have the motivation and competencies needed to act, together with others, in culturally appropriate and locally relevant ways to redress the problems and improve the quality of life at personal, familial, community, national and global levels.

All students can envision change towards sustainable societies by doing activity 2.7. In this activity, pre- and in-service teachers and their learners envision sustainable societies for Africa and simulate changes resulting from mainstreaming ESD. Envisioning better and sustainable societies requires that we engage ourselves in seriously questioning the status quo with respect to unsustainable behaviours, lifestyles, consumption and production. Giving opportunities to identify issues and to create and enact group presentation approaches can yield many benefits for ESD learning. For example, Tilbury (2011) identified four types of change (social, educational, economic and environmental) that ESD can bring about in society. What changes can result in teacher education after mainstreaming ESD?

ACTIVITY 2.7

ENVISIONING CHANGES FOR SUSTAINABLE SOCIETIES

Sustainable societies – What may these sustainable societies look like in 5, 10, 15, 20, 25 or 50 years time? What could be the criteria of sustainability? Here are some headline issues you may add to the list: poverty, gender-based violence, climate change, deforestation, squatter camps, water and sanitation and so on. What should a sustainable Africa be like? What is the role of educators and teachers to realize sustainable societies for Africa? What must education for the twenty-first century do for Africa?

Social change – Let groups of teachers identify a social issue, e.g. gender-based violence, teen pregnancies, drug abuse and so on. Let them research or survey the prevalence and opinions of people in the community on the issue. Using what they find about the issue, create for example a drama, poem or debate to bring up the issues and changes. What local beliefs, values or practices need to be tackled?

Economic change – Let groups of teachers identify a project to improve the employability of youths, e.g. car washing, organic gardening, art and crafts marketing and so on. Let them analyse and report the merits and demerits of local work schemes from an ESD perspective. They may write a newspaper article, a blog, or even create a poster for display.

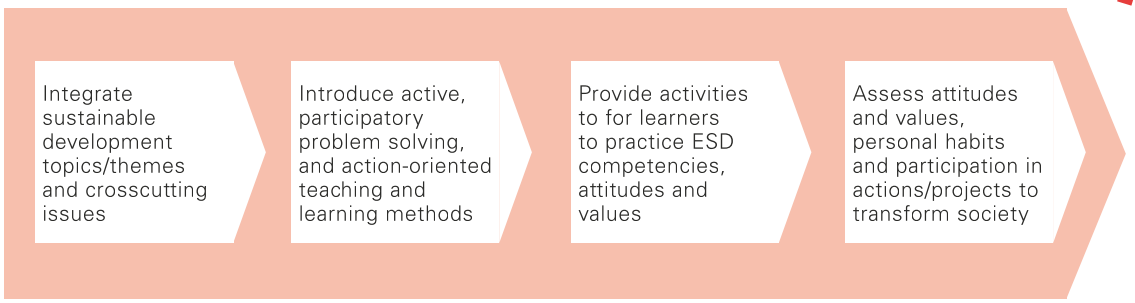
Environmental change – Let groups of teachers find a carbon calculator on the internet to use with their students to estimate the carbon footprint of their institution. They must propose and implement some change project to reduce the carbon footprint.

Educational change – Let groups of teachers analyse opportunities for using group and display learning methods to tackle cross-cutting issues with specific content subjects. What innovations have they introduced, for example, using poetry, drama, debate and so on in mathematics, sciences, technical subjects and others subjects? How do these methods support learning objectives in the syllabuses of these learning areas? What opportunities exist to use ICTs such as games, social media applications like WhatsApp, Facebook and others?

2.13 Summary

Educators and teachers are key agents aiding societies to learn their way out of unsustainable lifestyles and practices. There is need therefore to make fundamental changes to all aspects of their professional education, development and practices. This chapter has highlighted the historical background to the development of ESD in teacher education. It has also explained and clarified the meaning of ESD, taking into account the integration of cross-cutting issues in teacher education teaching and learning. In the process, the importance of an ESD perspective and the importance of a whole-institution approach were also highlighted. It is maintained that ESD touches every aspect of education, including planning, policy development, programme implementation, finance, curricula, teaching, learning, assessment and administration (UNESCO, 2012). The fundamental changes suggested, sought and implied in this guidebook should lead to the development of pre- and in-service teachers who are knowledgeable and competent in modelling sustainability principles, thinking, values and action to inform their students, peers and the surrounding communities. Figure 2.3 aptly summarizes this.

FIGURE 2.3 WHAT NEEDS TO BE DONE WHEN REORIENTING TOWARDS ESD



Chapter 3 explains the theories and philosophies relevant for an African-centred pedagogy in ESD.

2.14 Further reading and resources

Earth Charter Commission. 2000. *The Earth Charter*.
http://www.earthcharterinaction.org/invent/images/uploads/echarter_english.pdf
Provides a useful framework of values. Will be relevant for teaching and learning for value clarification.

UNESCO. 2010. *Education for Sustainable Development Lens: A Policy and Practice Review Tool*. Paris, UNESCO. http://unesdoc.unesco.org/images/0019/001908/190898e.pdf
This presents a set of tools with relevant sections to review teacher education curriculum, pedagogy, learning outcomes and assessment. African experts were involved in its review.

UNESCO. 2005. *Teaching and Learning for a Sustainable Future*. Paris, UNESCO.
CD-ROM and website: http://www.unesco.org/education/tlsf

This is an important resource through which to learn the concepts and practices associated with ESD. It can be used to support teaching and learning in teachers colleges and schools.

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Chapter 3

PHILOSOPHIES, THEORIES AND PRINCIPLES FOR ESD IN TEACHER EDUCATION

Charles Chikunda

Chapter 3

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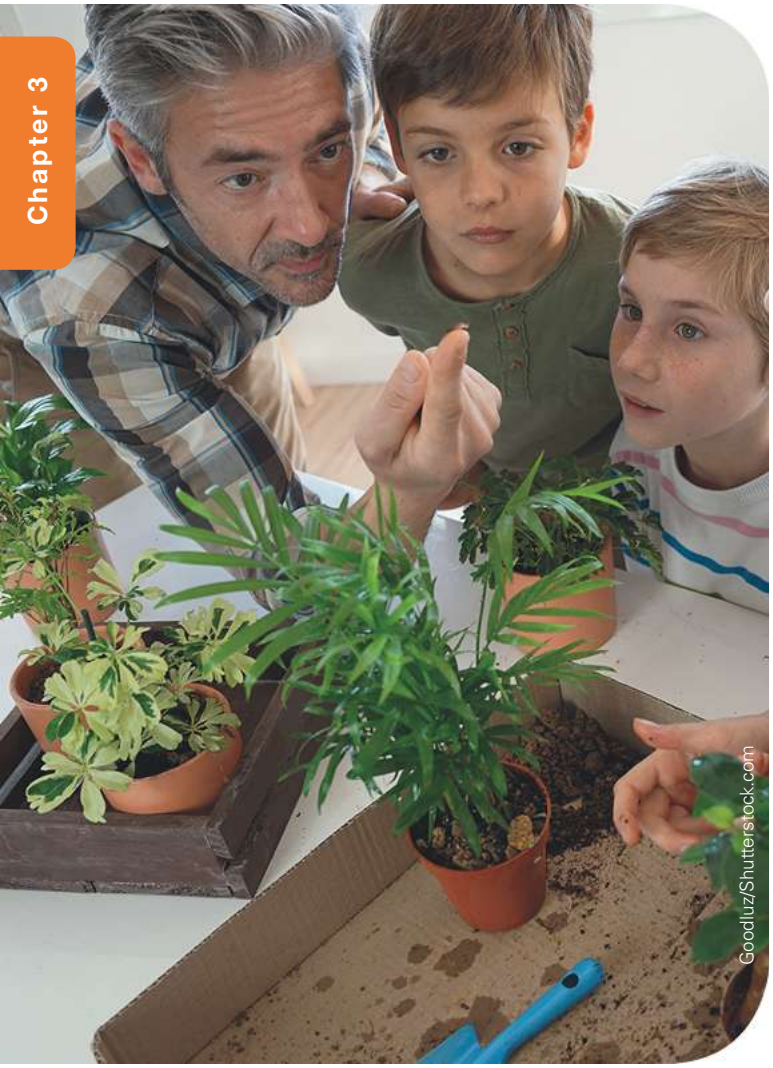

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3.1 Introduction

Theories and philosophical lenses have been developed to understand and explain curriculum processes and learning in general. While all have something to offer, some are more useful to education for sustainable development (ESD) than others. Chapter 2 discusses the rationale of ESD mainly with regards to the thrust it gives to teacher education. We discuss philosophies and theories and the principles derived from them that support the ESD agenda. In this chapter, we also look at ESD as a philosophical lens to education. We take this direction because the theories and philosophical lenses will help teacher educators and teachers understand the background and importance of ESD to society. Philosophies and theories will also motivate the teacher educators and teachers to critically reflect on their practice.

3.2 Objectives

By the end of this chapter the teacher educator and teacher will be able to:

1. Describe and apply ESD as a philosophy of learning.
2. Describe and use theories and philosophies that inform ESD in teaching and learning.
3. Explain the pedagogical contributions of these theories and philosophies to ESD.

3.3 ESD as a philosophy of learning

We begin this chapter with an analysis of case study 3.1 followed by activity 3.1 based on the same case study.

CASE STUDY 3.1

LUCY'S WATER STORY

Lucy is a teacher from Kandiga in Ghana. "A decade ago, I had to get up at 3 a.m. every day to collect water from a river 5 km walk away, which was the main water source for many communities. The earliest I returned was 10 a.m. which meant I was often late for work… In my community women were expected to provide water every morning for their husbands. The lack of water often resulted in quarrels, wife beating or even divorce. Fetching water took up most of the women's day. During their dark dawn journey to the river, some women were bitten by snakes, others fell down from fatigue. Girls were expected to carry water and so very few enrolled in schools. Sanitary facilities were generally non-existent. Diarrhoea, dysentery, guinea worm and cholera were rife and often resulted in death because we didn't have health facilities." The situation in a nearby village was not very different. The main sources of water in this village came from hand dug wells. Though there is a dam about 6 km away it is polluted by human activities and animals, with no purification processes carried out prior to the use of the water for domestic purposes. During the dry season, November through to April, women and children wake up as early as 4 a.m. to stay at the hand dug wells waiting on the well and scooping the water with a small calabash until their bucket is full.

For more information:http://heartbeatforafrica.org/i-love-lucy/

In the twenty-first century, we are living in a period of rapid global change in economic, social and ecological systems. There are changes towards consumerism, demands for ecosystem services like water and food, growth and industrialization and technological development, increasing equities and inequalities, new health issues, changes in disease distribution, changes in climate, land degradation, biodiversity loss, and so forth. Amidst all this, too many communities in Africa remain entrapped in poverty and in some cases bad governance and conflict (Chikunda and Mandikonza, 2014).

ACTIVITY 3.1

REFLECT

With a partner, reflect on the water story from Ghana.

a. Make a list of challenges that you can understand from the story.
b. Categorize the challenges as biophysical, social and economic.
c. Reflect on these challenges and respond to the following questions:
    i. How do you think your education (from primary to tertiary level) has prepared you to grasp such challenges and participate in coming up with solutions?
    ii. What changes would you want to see in the education system that could better prepare young people to face challenges like those depicted in the story?
    iii. As an educator how would you involve your students or colleagues in water resource mobilization within their environments?

For more information: http://heartbeatforafrica.org/i-love-lucy/

ESD as a philosophy of education aims to reorient thinking in the whole education process in response to such complexity. ESD qualifies to be a philosophy of education because it cross-examines and transforms education aspects such as ontology, epistemology, logic, ethics and much more. Ontology is concerned with what things are, that is, concerned with identifying – in the most fundamental terms – the kinds of things that actually exist in the education system. Principal ontological questions for ESD include understanding the nature of education in a country, the features of the system and what governs them, and what knowledge is valued in the system.

ESD pushes for ontological transformation (transforming the way we understand the world to be) by, for example, looking at the world through other lenses other than Western capitalist lenses to see the world as an interlinked, complex socio-ecological system. ESD thrives in coordinating learning towards sustainability; an understanding that the creation of a sustainable world that includes humanity depends on fundamental changes in our socio-economic systems as a whole, supported by a critical reorientation of our principles, values, behaviours and lifestyles. (UNESCO, 2005)

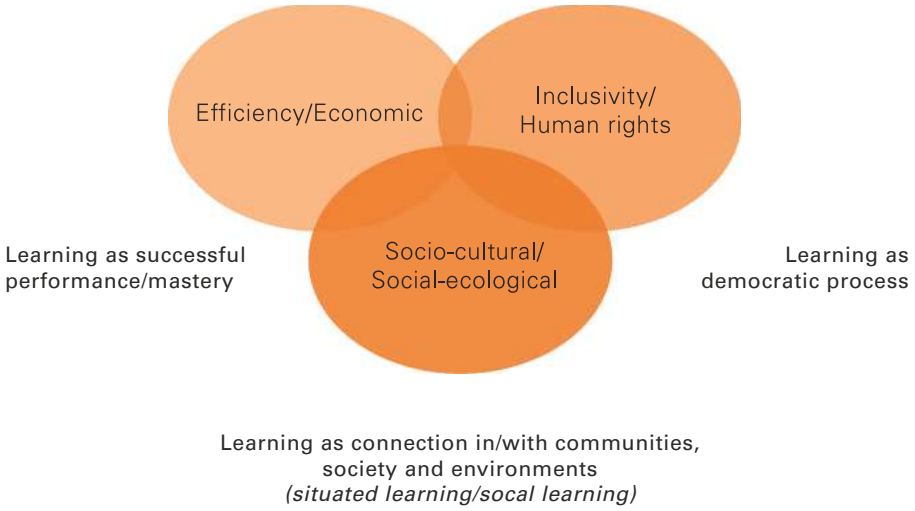
On the other hand, the epistemological concerns of ESD relate to the nature of knowledge itself, its possibility, scope and accessibility to the learner. More broadly, ESD epistemology interrogates, in an education system, the systematic ways we determine whether something is good or bad. Principal epistemological questions for ESD include:

- How do we go about knowing things in a given education system?
- How do we separate true ideas from false ideas?
- How do we know what is true?
- How can we be confident when we have located 'truth'?

Ethics, or 'moral philosophy', of ESD are concerned primarily with the question of the best way for schooling or educating. ESD entitles children and adults alike to education that offers them considerable opportunities to live well in a context of increasing social and ecological risk. ESD therefore brings in broader moral questions in education that are normally not attended to in a business as usual education set-up. Questions relating to sustainability, such as interrogating the morality of girls dropping out of school because of early marriage or because of gender role expectations as shown in the case study above, are some of the issues. The reasonableness of the education will be judged in ESD lenses on whether the process of education is contributing to sustainable societies, for example, through poverty reduction, environmental protection, social justice, education for all, and many other issues.

From this description we can see that ESD urges teachers to go beyond the traditional subject content mastery and to embrace values in their teaching. Lupele and Lotz-Sisitka's three intersecting traditions in figure 3.1 is a summary of ESD thinking as a philosophy of learning.

FIGURE 3.1 THREE INTERSECTING TRADITIONS



Source: Lupele and Lotz-Sistika; 2012, p40. Reproduced with permission

Historically, learning has been driven mostly by the economic segment with curriculum emphasis focusing on learning for the job market, and thus focused largely on learning as successful performance/mastery (figure 3.1). In most cases, especially in Africa, content mastery is compromised because concepts are taught out of 'familiar' contexts and seem irrelevant and detached from everyday life. The democratic process in learning, which includes human rights and inclusivity and brings in issues of sustainability like gender, ethnicity, race, environmental protection and many other issues, is either completely ignored or treated as end-of-the-day business. Learning as connected in/with communities again is treated peripherally in most cases. ESD therefore questions the sensibleness of having the ontology, epistemology and morals of school practices shaped only by functionalist and instrumentalist views that see education only in light of preparing young people for the world of work.

ACTIVITY 3.2

REFLECT

With the ESD philosophy in mind, reflect on your teaching or your education during your school days.

- Revisit the 'what' (ontology) and the 'how' (epistemology) aspects of your education and evaluate them in view of the three intersecting traditions (figure 3.1).
- Make a list of some changes that you would want to see in the curriculum for it to be more relevant to the needs of the country.

To round off this section we can point out that the transformative agenda of ESD creates a space for critical thinking and action. In this case the teacher is seen as a member of the intellectual and professional community. He or she is a constructionist who is called upon to reflect on work practice (curriculum practices), bring in intellectual critique on oppressive social structures, and come up with new knowledge of practice that hopefully will introduce rationally organized curriculum practices that contribute towards the construction of a rationalized society.*

3.4 Philosophies and theories that inform ESD

This section discusses education theories and philosophies in relation to how they equip teachers with the pedagogic devices necessary for ESD learning. We take a closer look at the theories and philosophies that facilitate ESD to achieve its goal of reorienting thinking in education in general with a specific focus on teacher education. A compendium of such theories and philosophies can be assembled under subgroups of Afrocentric philosophies, critical and systems theories, and theories of adult learning. It is important that for each theory we try to unlock the pedagogic principles relevant for ESD.

3.4.1 Afrocentric philosophies

Afrocentric philosophy is a way of thinking from an African perspective based on the principles of inclusivity, cultural specificity, critical awareness, commitment and political awareness (Van Wyk, 2014, p.40). African scholars such as Asante, Kincheloe, Nyerere and others challenge the notion that Eurocentric perspectives and paradigms of knowledge construction is the only legitimate philosophy.

Adopting an Afrocentric paradigm to ESD would mean that in the curriculum process the African experiences of the learner are placed at the centre, moving away from the margins, to empower the learner by making him or her the subject and not the object of the learning encounter. Afrocentric educationists identify fundamental principles and these resonate very well with ESD principles, as shown in table 3.1.

* Thus, teachers roles as co-creater of knowledge, co-curriculum developer and facilitater of learning

TABLE 3.1 FUNDAMENTAL PRINCIPLES UNDERLYING THE AFROCENTRIC APPROACH AS POINTERS TO ESD PRINCIPLES

Afrocentric principles (in Swahili) and implications	Contribution to ESD Captures learning as both a democratic process and as a connection, in addition to learning as efficiency/mastery
Ukweli (advancing the truth). The teacher is vital in moral-building, supporting and instilling good citizenship in his/her teaching all the time. The teacher has an important duty going beyond imparting subject knowledge in his/her *in loco parentis* status i.e. standing in for the parent in caring for the learner.	Creation of knowledge must be done in the context of school community. Schools become important spaces in which children not only gain subject knowledge but also learn about themselves, their culture, and good personal and social conduct. It also involves learning to explore the dialectic between tradition and innovation e.g. questioning harmful cultural practices.
Utulivu (create harmony for the sake of peace and respect). The teacher plays a pastoral and mediation role to support learners with special needs and create healthy social environments with equality, fairness, honest, respect and many more values, especially in situations historically or currently affected by racism, tribalism or any other form of civil strife.	Teachers modelling good practice. Learning to envision more positive and sustainable futures and learning to think and view things systemically.
Uhaki (fairness and justice). Requires a learning process that is fair to all learners, which is applied with the well-being of all participants in mind, including the community.	Communities should have a stake in the education process of their children, taking into consideration the historical context in the learning process. In this context, teachers are expected to learn to clarify their own values.
Ujamaa (community). Encourages teachers to accommodate learners of diverse learning needs in support of their own sense and beliefs about themselves and not someone else's expectations of them.	Inroads that the community will influence the many existing sustainability issues (e.g. biodiversity, climate change, equity, poverty and so on) that will be part of the curriculum.
Kujitoa (commitment to the values of humanity). This empowers learners to analyse text for example, and to critically uncover hidden assumptions in curriculum resources and processes. Learners and teachers need to be aware that knowledge is not value-free but is interwoven with its social and political contexts.	Learning to be critical, learning to clarify one's own values, learning to envision more positive and sustainable futures, learning to think systemically.

Adapted with permission of the publisher from Okeke, M. Van Wyk and N.Phasha (edit) Schooling, society and Inclusive education an Afrocentric perpsective (p40-43), Oxford University Press South Africa-ISBN 9780199077809

3.4.1.1 Ubuntu as an Afrocentric philosophy

Ubuntu is one of the Afrocentric philosophies found in different forms in many societies of Africa. Ubuntu is key to all African values, involving collective personhood and collective morality. Many African cultures across the continent carry the Ubuntu saying that translates to '*I am because we are*'. Such adages recognize Ubuntu as a philosophy of humanism that links the individual to the collective. Other axioms across several African cultures such as '*it takes a village to raise a child*' emphasize the cultural connectedness of most African societies. Ubuntu manifests in attitudes and practices such as respect, empathy, accountability, responsibility, fairness, justice, compassion, unity, selflessness, compromise, love, caring, tolerance, forgiveness and many others. Nelson Mandela's humanism is a typical example of the qualities of Ubuntu. His famous saying "Education is the most powerful weapon which you can use to change the world" suggests an education that has connections to sociocultural, social-ecological, contextual and historical dynamics of learners' life-worlds and experiences. Further, communities value beings and doings while also giving attention to 'learning as mastery' (i.e. how to successfully complete educational tasks) and to 'learning as participation' (meaning that learners have a chance to voice their opinions and express their thoughts in an open, supportive learning environment).

SOME LINKS TO UBUNTU PHILOSOPHY

https://www.youtube.com/watch?v=3FbQ3foT9rY

https://www.youtube.com/watch?v=6iL0EcplvL8

https://www.youtube.com/watch?v=JgLVUr2rBk0

Chilisa (2012) extends the Ubuntu philosophy into research, arguing that Ubuntu values balance self-respect and respect for the other as a basis for conducting research. She reasons that postcolonial indigenous research methodologies require researchers to invest time to first develop relationships, followed by a long-term commitment. It follows from this reasoning that research must ultimately be accountable to the community.

It can be deduced from the above discussion that Ubuntu philosophy contributes to the ontology of ESD by broadening the 'what' question. For example what is valued in education in a context of socio-ecological risk? What is the logic to teaching in view of societal challenges and needs? Do we consider social cohesion and value humanity, caring and so on in our curriculum? The elements of Ubuntu are also helpful to ESD to introspect the 'how' question, that is, the epistemology. Simple questions like: Are learning environments inclusive enough? With these lenses (Ubuntu and ESD), inclusivity is broadened to go beyond physical access to school to include epistemological access and cognitive justice as well; "a constitutional right for different systems of knowledge to exist as part of curriculum" (Visvanathan, 2005, p. 8). The discussion on cognitive justice leads us to indigenous knowledge. Indigenous knowledge is everywhere for every indigenous person in a given locality.

WORD OF CAUTION

The following quotation of Van Wyk (2014 p58-59) is priceless if Afrocentric philosophies are to contribute meaningfully to ESD:

The Afrocentric-indigenous pedagogical idea does not mean a complete rejection of all that mainstream Eurocentric education has to offer. On the contrary, it calls for a review of the mainstream ideas, paradigms, viewpoints, and methods, as a basis to critique contemporary society on issues of social justice, racism, environmental degradation, poverty and inclusivity.

The Afrocentric-indigenous thinking is not only for black learners and black teachers or for a certain ethnic group. It simply gives space for African people to interpret their experiences on their own terms rather than through a Eurocentric lens.

3.4.1.2 Afrocentric indigenous knowledge and pedagogy

Indigenous knowledge is conceptualized by Van Wyk (2014) as a way of life for a specific group of people defined by ancestral territories, cultural activities and historical location. He further defines indigenous knowledge as knowledge and skills constructed by indigenous people with the purpose of advancing and sustaining their identity, culture and history for the next generation. The term 'indigenous' denotes that the knowledge is local and specific to a people with common social and cultural connections. The knowledge is passed on from one generation to the next through symbols, rituals, practices, art, oral narratives, proverbs, performances, wise sayings and dances. It is important to point out that indigenous pedagogies are critical in nature, with a commitment that is also ethical and political, as discussed under critical pedagogy.

To help in assessing the educational value of Afrocentric indigenous pedagogy to ESD, let us reflect on case study 3.2.

CASE STUDY 3.2

REFLECT ON THIS

In the current local South African school system, the average black learner performs academically below white learners. Although the South African school system has gone through several changes to address this, seemingly there is still an urgent need for a critical analysis of the institutional school and community power structure within which learning, teaching and administration take place, and how these structures function to marginalize, exclude and alienate black youth.

Adapted with permission of the publisher from Okeke, M. Van Wyk and N.Phasha (edit) Schooling, society and Inclusive education an Afrocentric perpsective (p49), Oxford University Press South Africa-ISBN 9780199077809

In ESD lenses it is clear that the education system in the case study is not inclusive enough. To understand the learning needs of African learners we may have to put on Afrocentric-Indigenous lenses and ask critical questions that cut across the what, how, and the rationale behind curriculum policies, content and practices. Van Wyk (2014) suggests posing questions such as the following:

1. What is it about the education system that creates many disengaged learners who fail to achieve and 'fade out'?
2. Are there perhaps school policies and practices that place some learners at the risk of failing?

In addition to these questions, we can also reflect on the following:

1. How can we use ESD pedagogy in improving learning outcomes in our institution?
2. What possible ESD orientated policies can be appropriate to improve the situation?

The value of an African-centred pedagogy in ESD is that it couples knowledge taught and learned about tradition with responsibility on the part of both the teacher and learner to use that knowledge towards community well-being (Shockley, 2011). Indigenous pedagogy is rooted in experiential learning and it transcends discipline boundaries. For example, acquiring herbal knowledge involves plant biology, ecology, physiology and some familiarity with the historical, economic and social causes of illness, in addition to the appropriate spiritual prayers and the rehearsal of sacred narratives (Dei, 2002). Further to this, indigenous pedagogy consigns a special place to knowledge rooted in oral traditions (storytelling, music, praise poetry, etc.).

3.4.2 ESD, science education and indigenous pedagogy

Economic and social development in any country under modernity relies heavily on a sound scientific and technological base. There is need therefore for the African continent to harness the intellectual and scientific capacity of both men and women for sustainable social, ecological and economic development, and for good governance. Science, mathematics and technology subjects constitute an area of any nation's education system where many of the skills that stimulate development are learned. Unfortunately, it has been seen time and time again that pupils lose their enthusiasm for physics, chemistry and mathematics in their first two years in high school (Chetcuti and Kioko, 2012).

Research shows that the students' low interest in science and their relatively negative attitudes are at least partially attributed to the way sciences are taught at school. The observation is that science curriculum tends to emphasize its academic, strongly intellectual and abstract character, and is presented in a decontextualized way and distanced from everyday life Christidou, 2011; Chetcuti and Kioko, 2012). As a result, there is a considerable mismatch between science-in-society and science-in-school (Rennie, 2011), and thus rendering science as a school subject irrelevant and therefore not useful in everyday life. This perception of school science has detrimental implications for the epistemological access to the discipline and to the quality and relevance of the education system as a whole. This is exacerbated in part by the fact that one-way communication approaches are still widely used in science teaching in Africa (Rennie, 2011). An ESD philosophy can make us rethink the school science curriculum in relation to

how indigenous knowledge pedagogic devices can make sciences more accessible through the use of familiar contexts. Rauha's experiences in case study 3.3 is an example of how indigenous knowledge can complement and reinforce science learning in school.

CASE STUDY 3.3

ETHNOSCIENCE IN NAMIBIA

Rauha is a young physical science teacher in a rural school in the Erongo region of Namibia. Guided by the curriculum that acknowledges the holistic being of the learners by valuing their life experiences as a focal point of teaching, she always tries to use local examples where appropriate to illustrate scientific issues, concepts and processes.

In this example, Rauha was teaching her grade 10 learners on matter and materials. To her bewilderment, the textbooks only identified mud bricks as an example that could be useful in studying ceramics from the local environment. All the other examples were exotic to her context. She was not satisfied that this single example would fulfil the syllabus requirement of using local knowledge in teaching materials. She pondered on how she could make up her lessons around this topic to enable her learners to describe the experiment and to identify the physical properties of materials as stipulated in the syllabus with just this one local, meaningful example available. None of the textbooks at her disposal were helpful besides just listing the physical properties of materials.

It occurred to Rauha that besides mud bricks, clay pots, which are locally made by indigenous people, could also be artefacts that she could use in her teaching of the topic. Over and above that, the curriculum requirement of "valuing indigenous knowledge systems: acknowledging the rich history and heritage of the country" (Namibia Ministry of Education 2010; p. 5) motivated her to go beyond the ordinary lesson. She then planned her lessons for the topic in a way that elicited learners' prior everyday knowledge and experiences of traditional clay artefacts in relation to materials. She organized some field trips for learners to have a real life experience of making clay artefacts. As an educator, Rauha is convinced that the purpose of eliciting prior everyday knowledge is to make the connection between everyday and scientific concepts around the materials. In one class discussion, Rauha is delighted to find out that her learners classified clay artefacts into two groups: clay artefacts that are heated and those that are not. This provided her with an opportunity that she later exploited for a definition of ceramics.

Later, Rauha took her class on several site visits to get first-hand experience of the indigenous practice of making ceramics. Her aim was to make matter and materials meaningful in grade 10. To do this, she identified two indigenous knowledge 'experts'– elderly women who had been making clay artefacts for years. Site visits started with the exploration of the places where the clay soil was collected. Both women explained that most of the soil used to make indigenous ceramics is taken from places that hold water for a long time (i.e. that do not drain easily). The women had the knowledge to identify suitable clay soils, and the art of clay pot making had been passed on from their grandmothers.

After the first visit to the site where the ceramic artefacts were made, Rauha and her class were able to find scientific explanations to match the two women's indigenous knowledge of good soil for ceramics. Among these explanations is that clay soil has small particles, making it difficult for the water to drain easily; clay minerals that are formed by the process of weathering and hydrothermal activities are eroded and transported mostly by water and deposited in places that hold water for a long time. In subsequent visits, both experts demonstrated traditional ways of making ceramics and their demonstrations were very similar. They both use cattle hooves and ribs to process their ceramics artefacts. They produce these artefacts by moulding the clay soil into shapes, allowing it to dry and then firing them at a low temperature.

Out of these visits, Rauha and her learners were able to follow the whole process of making, drying and firing ceramic artefacts. After each visit, the class tried to construct scientific meaning of matter and materials through the process they had observed. Despite the challenges that Rauha encountered, she was pleased that her approach was far more fruitful than the traditional teacher talk she used to practise.

For more information: Lombard *et al.* (2014; pp. 71–72)
E. Lombard *et al.* 2014. Schooling, Society and Inclusive Education. South Africa, Oxford University Press Southern Africa.
[List of authors: E. Lombard; M. Mukwambo; K. M. Ngcoza; C. Chikunda; C. I. O. Okeke; N. A. Boaduo; M. van Wyk; N. P. Sotuku; N. S. Duku; R. Tabane]

3.4.3 Theories relevant for ESD

There are many theories that provide principles that are relevant when implementing ESD. In this guidebook we have opted to discuss only a few, namely, critical theory, system theory, capability theory and constructivist theory. Constructivist theory is explained in more detail in chapter 7.

3.4.3.1 Critical theory

Critical theory is preoccupied with critiquing and changing society as a whole. It arose in divergence to traditional theory preoccupied with only understanding or explaining society. Critical theories aim to get a deep understanding of social life and reveal the assumptions that keep us from a full and true understanding of how the world works. Critical theory tries to explain what is wrong with current social reality, identify the actors to change it, and provide both clear norms for criticism and achievable practical goals for social transformation.

Pedagogic devices are simply plans, strategies or procedures a teacher uses

The point of departure of critical theorists in education is that different forms of pedagogy produce different types of knowledge and identities in learners. Giroux (1992), one of the most influential critical theorists, poses a fundamental question: "How can we make education meaningful by making it critical, and how do we make it critical so as to make it emancipatory" (p.3). Giroux calls for critical reflection on the curriculum to examine its social function. He cautions teachers to view curriculum as a cultural script that introduces students to particular forms of reason that structure specific stories and ways of life. The pedagogical contribution of critical theory to ESD is thus mainly through critical pedagogy.

3.4.3.2 Critical pedagogy

Critical theory opens space for critical pedagogy, which evaluates learning interactions and comprehension, and supports transformations related to empowerment associated with this dynamic process. Critical pedagogy was developed by the Brazilian scholar and philosopher Paulo Freire to combine education and critical theory. In his 1970 book *Pedagogy of the Oppressed* he explains the irrelevance of the banking approach to education in preference to education that – through critical questioning – raises learner's consciousness about their unsustainable status and oppressive factors, which must be tackled to achieve freedom. The intention of critical pedagogy resonates with the fundamental premises of ESD: to transform society and individuals towards sustainability and democracy, and thus contribute to a more just, egalitarian society in which individual and collective freedoms are practised. The following characteristics of critical pedagogy speak explicitly to three intersecting traditions of ESD shown in figure 3.1.

- Critical pedagogy as an ethical project to question social practice that exploits, dehumanizes and denigrates certain groups of people (Scott, 2008). The ethical project has three forms: power, subject positions and social practices.
- Critical pedagogy has a political agenda with implications of celebrating difference in schooling. First it is important to recognize present student identities and subjectivities as the starting point towards creating new, more satisfying and more socially just forms of identity. Second, through critical pedagogy, it is important to allow students to understand these differences and their relevance for celebrating diversity and the pursuit of equality.
- Critical pedagogy and ESD both seek trans-disciplinarity and ways of thinking that are not constrained by the old delineations and boundaries that divided up the corpus of knowledge (Scott, 2008).

3.4.4 Systems thinking and ESD

Systems thinking is important to frame ESD and as a key learning outcome of ESD. Systems theory is based on a holistic worldview that emphasizes interrelationships rather than parts, and patterns over time rather than static components (Meadows, 2011). A system consists of three components: elements or variables; interconnections; and a function or a purpose. (Meadows, 2011; p. 13). The elements of a system include both tangible, visible components and other intangibles. For example in Lucy's water story (case study 3.1), the elements would include infrastructure like hand-dug wells, dam, calabashes and buckets, in addition to intangibles like the expectations of water security, equal access to school and sanitary facilities. These elements can be divided into sub-elements and further into sub-sub depending on the complexity of the system.

The interconnections in a system are the relationships or interactions that hold the elements together and can be both physical flows and information flows. In Lucy's community, physical flows will include the lack of portable water sources, which is interconnected to education, gender and health issues. These types of interconnections are understood as signals that go to decision points or action points within a system. An intervention has to consider all these interconnections in a system.

The function or purpose of a system is determinable by the behaviour of the system over time and not necessarily expressed explicitly. Therefore systems-thinking can be used to bridge social and biophysical sciences to understand, for example, climate, culture, history and the effects of human action on natural resources and how these impact on human well-being.

3.4.5 Capability theory

The capability theory is based on the work of Amartya Sen who developed what is now referred to as the capability approach. By capability he refers to what people are actually free to be and do rather than how much income they have (Sen, 1992). Sen explains that "in the capability-based assessment of justice, individual claims are not to be assessed in terms of resources or primary goods the persons respectively hold, but by the freedoms they actually enjoy to choose the lives that they have reason to value" (Walker, 2006, p.27).

The core concepts in the capability approach are capabilities and functionings. Functionings are various things a person may value doing or being (Sen, 1999). They show the practical realization of one's chosen way of life (Walker, 2006). Examples of functionings include being well fed, having shelter, taking part in community activities, relating to other people, working in the labour market, caring for others, having an education, being healthy and so forth. Capabilities on the other hand correspond to the overall freedom to lead the life a person has reason to value (Sen, 1992; 2009). The difference between a functioning and a capability therefore is similar to the difference between an achievement and the freedom to achieve, or between an outcome and an opportunity. Capabilities will then ask questions such as: What opportunity freedoms do people have to be healthy, to attend school, to take part in political decisions and so forth? It follows that human flourishing, that is, success in pursuit of the totality of goals that one values in life, is linked to the capabilities one has in life.

With this thinking, development for Sen (1992) is about removing the obstacles to what a person can do in life, obstacles such as illiteracy, ill health, lack of access or lack of civil and political freedoms. In other words, development is about broadening people's capabilities that relate to their overall potential freedoms to lead the life they have reason to value.

The capability approach provides us with an evaluative framework for ESD. What can be evaluated can be either realized functionings (what a person is actually able to do or be) or the capability set of alternatives he or she possesses (real opportunities). Using the capability approach framework, the ESD curriculum reorientation will be concerned with, for example, enlarging learners' capabilities, that is, the opportunity freedoms required to flourish in their school work. This in most cases will open up more capabilities later on in life for young people to do and be what they value doing and being.

ACTIVITY 3.3

REFLECT ON THIS

"Development is about removing the obstacles to what a person can do in life".

List any obstacles that you think hinder learners to do and be what they value doing or being.

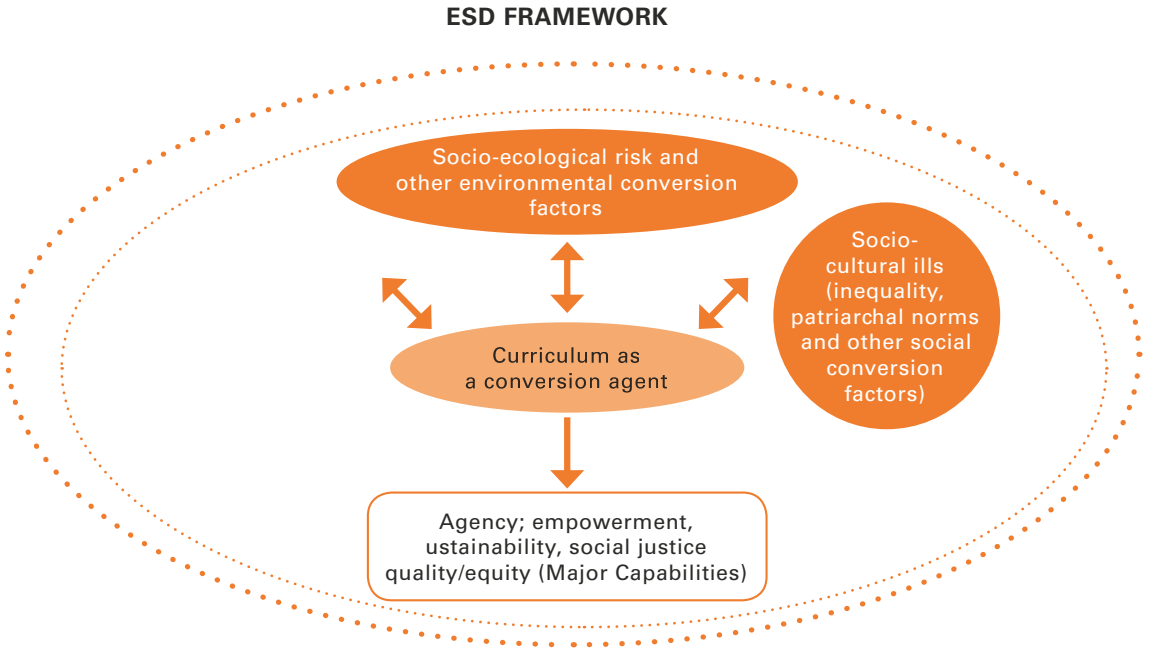
Source of quotation: Sen, A. (1992) Inequality Re-examined. Oxford:Clarendon Press.

This foregoing activity leads us to the discussion of curriculum as a conversion agent.

3.5 Curriculum as a conversion agent

Figure 3.2 illustrates that for a curriculum to be of ESD quality and relevant, it should engage with the three conversion factors (personal, social and environmental). By so doing, the curriculum will have the potential to act as a conversion agent, which is related to the notion of transformational learning referred to in chapter 2.

FIGURE 3.2 ESD CONCEPTUALIZATION OF CURRICULUM AS A CONVERSION AGENT



Sen's concept of conversion factors originates from his view that development, well-being and justice are comprehensive and integrated. There are considerable links between material, mental and social well-being, or to the economic, environmental, social, political and cultural dimensions of life (Robeyns, 2005). The conversion factors are personal, social and environmental:

- Personal conversion factors are internal to the person. For example, personal characteristics such as low interest, lack of confidence, lack of exposure or experience to science-related knowledge are all examples of personal conversion factors that influence how a person can be, or is free to convert resources into functionings.
- Social conversion factors are factors from the society in which one lives such as public policies, social norms, discriminating practices, gender roles, societal hierarchies, power relations related to class, gender, race or caste. For example some of these social norms, traditions, culture and power relationships are used to maintain that women are not good in exact sciences, like mathematics, physics and chemistry, such as found in a study in Lesotho (Prasad, 2004).

- Environmental conversion factors include climate and pollution. For example, climate change induced droughts resulting in reduced agricultural yields impact negatively on livelihoods, but more so on women who predominantly bear the responsibility of agricultural production and feeding families (Shiva, 2012).

Figure 3.2 suggests that an ESD framework has the potential to support the (re)conceptualization of teacher education curriculum practices. This is achieved by developing agency in teacher educators. They must engage critically with social ills and socio-ecological vulnerability in Africa while paying attention to individual learners needs. This will be achieved by paying attention to personal conversion factors, which will enable teachers and teacher educators to analyse curriculum content and understand its uptake by a diversity of learners.

3.6 Understanding adult learning

ESD is far more than simply passing on knowledge and teaching principles related to sustainability. In its broadest sense, ESD is education for social transformation with the goal of creating more sustainable societies. It effectively aims at transforming learning towards lifelong learning whether in formal settings or in informal and non-formal social learning settings. This leads takes us beyond formal schooling to adult learning. The UNESCO (2012) ESD expert review report highlights ESD areas of emphasis pertinent to adult learning;

- Increasing public understanding and awareness of sustainability.
- Providing training to all sectors of the workforce.

Hoffman and Bory-Adams (2005) support the opportunity of adult learning in ESD arguing that ESD must be an education that aims to help people of all ages better understand the world in which they live, and better act on this understanding; it needs to address the complexity and interconnectedness of problems such as poverty, consumption, environmental degradation, climate change, health and population issues including HIV/AIDS, conflict, inequality and violation of human rights.

In this section we look at some learning theories with the potential to contribute towards the ESD agenda in an adult learning context. Most, if not all adult learning theories are grouped under social learning. Before looking at these in detail it is important to highlight some basic principles of adult learning by Malcolm Knowles in the 1970s. He brought the argument that adult learning was special in a number of ways, for example (Knowles, 1978):

- adult learners bring a great deal of experience to the learning environment, and educators can use this as a resource;
- adults expect to have a high degree of influence on what they are educated for, and how they are to be educated;
- the active participation of learners should be encouraged in designing and implementing educational programmes;
- adults need to be able to see applications for new learning;
- adult learners expect to have a high degree of influence on how learning will be evaluated; and
- adults expect their responses to be acted upon when asked for feedback on the progress of the programme.

Two theories have become prominent in adult learning in recent years: the communities of practice and the expansive learning theories.

3.6.1 Communities of practice

A community of practice (CoP) is a group of people who share a concern or passion for something they do, and learn how to do it better as they interact regularly (Wenger, 1998). A CoP can apply to a group of teachers who learn how to cope with a new curriculum or a group of health workers who seek to improve service to citizens. The key elements of a CoP are that:

- Members must commit to a shared domain of interest, e.g. water security in a village.
- Members of the CoP must interact and learn together as they conduct activities in pursuing the shared domain.
- Members of a CoP are practitioners and therefore have a shared practice (Wenger, 1998).

It is necessary for teachers and teacher educators to form CoPs as they implement ESD approaches and principles. More information on the CoP will be found in Chapter 4.

3.6.2 Expansive learning

Expansive learning emerged out of cultural historical activity theory. Activity theory lies in Vygotsky's framework for analysing relationships between human actions and cultural artefacts in order to dispense with the individual/social dualism. Expansive learning entails collaborative learning and seeks to address new and emerging problems in complex systems, creating new knowledge and building institutional work resilience (Engeström, 2001). The process of expansive learning comprises seven cyclic steps .

According to Engestrom (2001), the process of expansive learning comprises seven steps in a cycle as follows:

Step 1	**Need state/ethnography**
Step 2	**Analysing contradictions**
Step 3	**Designing a new model**
Step 4	**Framing the new model**
Step 5	**Implementing the new model**
Step 6	**Reflecting on the process**
Step 7	**Consolidating the new process**

Steps 1 and 2 in the cycle involve ethnographic analysis that entails questioning and analysing current problematic situations, their systemic and historical causes, and any contradictions in the systemic structure that may be the cause of the problems. Steps 3 and 4 entail designing new activities that would address the problems identified in the first two steps. Step 5 entails implementing the new model of activity in order to transform practices. Steps 6 and 7 involve reflecting, consolidating and spreading the new practice and what has been learned.

CASE STUDY 3.4

STOP AND REFLECT

Imagine you are teaching at a school in Lucy's community (case study 3.1). As a teacher you have noticed with concern that only a few girls are enrolling in schools. The few who come to school are often late and look tired.

- Briefly explain how you could establish a community of practice with your fellow teachers around this concern.
- Following the expansive learning (EL) process discuss how you can initiate and support collaborative learning to address the problem.

3.7 Summary

Most teachers in Africa find themselves working in different challenging circumstances that require curriculum innovations in teaching, learning and assessment practice. ESD has the potential to support the required innovation to improve educational quality and relevance in schools in Africa. This chapter highlights some of the theories and approaches that can support ESD curriculum innovations in teacher education, as well as programmes that are oriented towards supporting continuous teacher professional development. The theories and approaches discussed here are by no means exhaustive neither are they without shortcomings. Nonetheless, knowledge of a compendium of theories and philosophical approaches will provide teachers with lenses and pedagogic devices to strengthen the ESD agenda of 'learning as connection', including but not limited to: integration between schools and communities; integration of whole school development actions; integration of different forms of knowledge and so forth. Chapter 4 explains the importance in ESD of understanding the student teacher, the teacher and the teacher educator, and the context in which they operate to which some of the theories explained here will apply.

3.8 Further reading and resources

Scott, D. 2008. *Critical essays on major curriculum theorists*. London, Routledge.

Scott discusses and unpacks the principles underpinning critical pedagogy. Scott focuses on the more tangible aspects of curriculum using critical pedagogy lenses such as knowledge distribution, contextualization and evaluation rules. It contains the principles of critical pedagogy that resonate with ESD learning. For example, educators need to focus on pedagogy as a means of reconstructing schools as democratic public spaces where rights and equality are exercised, and where boundaries among disciplines and curriculum areas are broken.

Van Wyk, M. 2014. Towards an Afrocentric-indigenous Pedagogy. C. Koneke, M. Van Wyk and N. Phasha, *Schooling, society and inclusive education: an Afrocentric perspective*, Cape Town, Oxford University Press, pp. 39–61.

This chapter was written from an African context. It discusses in great detail Afrocentricity as an educational, philosophical and theoretical paradigm in the context of schooling and society. The main emphasis is on inclusive education. Van Wyk discusses the canons and teaching principles underpinning African-centred pedagogy. Although the sources do not specifically use the term ESD, its philosophical stance however is crucial to the ESD thrusts of improving access and retention in quality basic education, reorienting existing educational programmes to address sustainability, and increasing public understanding and awareness of sustainability.

Virkkunen, J. and Newnham, D.S. 2013. *The Change Laboratory. A Tool for Collaborative Development of Work and Education*. Rotterdam, Sense Publishers.

This resource highlights a novel method and a set of instruments to support collaborative learning in, and transformation of, work activities and social practices. Based on cultural historical activity theory, it explains the following aspects in adult learning.

- A systems component – that helps us to construct meanings from situations.
- A learning component – a method of learning from those meanings.
- A developmental component – that allows us to expand those meanings towards action.

It provides a basic description of expansive learning, emphasizing collaborative steps that are pertinent to transform practices and serves well the ESD aim of education for social transformation to create more sustainable societies.

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Chapter 4

UNDERSTANDING THE STUDENT TEACHER, THE TEACHER EDUCATOR, AND THE CONTEXT

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4.1 Introduction

This chapter aims to develop an understanding of the student teacher, the teacher educator and the context in which they work in relation to ESD. It provides a profile for the student teacher and teacher educator, which then leads to a discussion of the competencies – and the pedagogical approaches needed to acquire these competencies – when integrating ESD. The chapter addresses itself to teaching and learning in a multicultural context. It provides a reader with a perspective on professional learning and reflective practice in the context of ESD. It also provides the reader with some insights into how to create ESD friendly environments in their institutions.

4.2 Objectives

By the end of the chapter the reader will be able to:

1. Explain the relevance of profiling the student teacher and teacher educator to appreciate changes to be undertaken when integrating ESD;
2. Appreciate the competencies of the teacher educator for effective teaching and learning using an ESD perspective.
3. Explain and utilize pedagogical approaches that support the development of ESD competencies.
4. Discuss the inclusion of spiritual, cultural and moral values in the ESD framework.
5. Discuss the relevance of teaching and learning in a multicultural context.
6. Engage in professional learning and reflective practice in the context of ESD.
7. Create ESD friendly environments in an institution.

4.3 Profiling the student teacher and the teacher educator

Profiling the student teacher and the teacher educator requires a lot of reflection when done in a local and regional context. This is because of the diverse sociocultural contexts of teacher education institutions. However, the student teacher is often found to be a young person in many countries, around 20 years old or slightly above. For one to enter a teacher training institution in many African countries, he or she must at least be a graduate of secondary education. Those who finish their training and receive a certificate are typically posted to teach in primary schools. Diploma holders are usually posted to teach in secondary schools. University graduates with Bachelor and Master degrees are posted to teach in secondary and teachers' colleges and other tertiary institutions. Trainees in teachers' colleges are henceforth referred to as student teachers. Academic staff who lecture in these training institutions are called teacher educators or tutors in some countries. Student teachers and teacher educators form the main subject of this chapter. We need to learn more when profiling the student teacher or the teacher educator so the following activity may be helpful.

ACTIVITY 4.1

PROFILE THE STUDENT TEACHER AND THE TEACHER EDUCATOR

Teacher educators: identify as many features as possible of your ideal student teacher. You may use such features as age, gender, qualifications, citizen, community, home language, ethnicity, aspirations, consumer and family. You may even list more features. Answer the following questions reflectively:

1. What do the features suggest for reorienting teaching and learning in the institution?
2. What aspects of their professional work must teacher educators aim to enhance?
3. What are the competencies to be developed among student teachers?
4. Write a profile of the ideal teacher educator. You may use the information as above. You may add academic and professional qualifications. What are the implications of profiling for teacher education and its reorienting towards ESD?

For further reflections on the role of higher education refer to the book Tomorrow Today (UNESCO, 2012, p 106) and Learning: The Treasure Within, UNESCO, 1996, p130-134

Through this activity it may be possible to find that the student teacher is a young person about to start a family and has high aspirations to build a successful career and to contribute towards sustainable development. They have many hopes to develop their communities and to become responsible citizens. The communities from which they come will be culturally, socially, ethnically, linguistically, geographically, environmentally, and economically diverse. They will also have diverse sustainable development needs and challenges.

One fundamental implication is that the framework guiding teacher education for sustainability must have a vision to achieve the following:

1. develop competencies to contribute towards achieving sustainable development;
2. help student teachers become competent practitioners and at the same time become responsible citizens;
3. empower student teachers for teaching in the multicultural contexts that define school communities;
4. make student teachers recognize the complexity and at the same time establish the interconnectedness among environmental, social, economic and cultural aspects; and
5. empower student teachers to handle students/pupils of different age groups.

Education for sustainable development provides such a framework. This profiling therefore provides good grounds that aim to reorient teacher education towards mainstreaming ESD. This will help schools become institutions that will develop the capacities of children and adolescents to take part in establishing sustainable development (Corney and Reid, 2007). Studies show that the implementation of ESD is highly demanding for teachers and that it requires specific knowledge, skills and abilities (Summers, Corney and Childs, 2004). Experiences around the world suggest that student teachers and teacher educators will need competencies that enable the realization of ESD learning outcomes.

4.4 ESD competencies for educators and student teachers

It is important to profile the teacher educator and student teacher against the competencies they need to mainstream the ESD perspective in domain-specific subjects or knowledge areas. In chapters 2 and 6 we have indicated the importance of the pillars of quality learning, namely, learning to know, learning to do, learning to be, learning to live together, and learning to transform oneself and one's society as important lifelong learning outcomes in ESD. These are relevant learning outcomes for all people at all ages and in this case are as relevant for student teachers as they are for teacher educators. Learning what (content) and how (methodology) to teach in teacher education institutions requires a careful balance between developing competencies in terms of content knowledge (subject or discipline) and pedagogical knowledge (curriculum related areas). Education systems expect teacher educators to inculcate in student teachers a view of teaching that encourages questioning, interaction, and the consideration of several alternative hypothesis. Pre-service teacher education should equip teachers with professional ethical, intellectual and emotional values and qualities in order that they may effectively develop the same qualities in learners according to society's requirements and aspirations (UNESCO, 1996). The four pillars of learning, which are also curriculum-guiding principles, require that teacher educators have competencies for each learning pillar. These pillars defined by the Delors Commission in the publication entitled "Learning the Treasure Within" (UNESCO, 1996), may be used to design teacher professional standards and assessment rubrics to determine qualification profile.

Table 4.1 below is a summary of the learning pillars.

TABLE 4.1: THE PILLARS OF QUALITY LEARNING

1. Learning to know: that is acquiring the instruments of understanding. This requires that educators and teachers understand society, its challenges, aspirations, questions and concerns.
2. learning to do: as to be able to act creatively on one's environment. The educator and teaches have practical skills, take actions and competently solve situations
3. learning to live together: so as to participate and cooperate with other people in all human activities' The educator/ teacher work with others collaboratively, in cooperation, respectful of others, within the educational institution, with community and society at large
4. learning to be, an essential progression proceeds from the first three (1 to 3) .The educator/teacher is an independent, autonomous person, has integrity, caring and responsible

For full information on the pillars: Education the Treasure Within, UNESCO, 1996 p85-149

The four pillars form a whole, because they are interconnected, equal attention needs to be given to them to make education a total experience that concerns both understanding and application with focus on both the individual and the individual's place in society. ESD calls for a broad encompassing view of learning, one that enables the learner to discover (learning how to learn), unearth and enrich his/her creative potential. An education that reveals the treasure within the learner. This means education should emphasize the development of the complete person. In this regard, within the framework of ESD education systems and society have a lot of expectation from teachers and make a lot of demand on educators, because teachers are:

- Instrumental in development of attitude-negative or positive to learning; can awaken curiosity, stimulate independence, encourage intellectual rigour and create conditions for success in formal and continuing education.
- Agents of change, they promote understanding and tolerance.

Societies expect to through education transform from narrow nationalism to global citizenship, from cultural and ethnic prejudices to tolerance, respect for diversity, understanding and pluralism, from autocratic to participatory ways, to democracy and the rule of law in various manifestations and from technologically divided world to united world (UNESCO, 2010, p85 and p149; UNESCO, 2010, p 106-108). Teacher educators must use the four pillars as teacher education curriculum design principles, to translate them into professional competencies and skills that empower teachers to participate in developing potentials, moulding of the characters and minds of young learners.

There are three essential characteristics of ESD for each of the four quality learning pillars, they are, (1) a holistic approach, which seeks integrative thinking and practice; (2) envisioning change, which explores alternative futures, learns from the past and inspires engagement in the present and (3) achieving transformation, which serves to change the ways people learn and the systems.

Application of the essential characteristics of ESD to the four pillars of quality learning in teacher training through the curriculum of teacher education means using the pillars as basis for designing an assessment rubric for competencies and skills as follows:

1. Learning to know

- **A holistic approach, which seeks integrative thinking and practice:** The educator understands the basics of systems thinking, ways in which natural, social, economic systems function and how they may be interrelated.
- **Envisioning change, which explores alternative futures, learns from the past and inspires engagement in the present**. The educator understands the root causes of unsustainable development, the need to change from unsustainable practices towards advancing quality of life, equity and environment sustainability; and
- **Achieving transformation, which serves to change the ways people learn and the systems**. This requires that the educator understands why there is a need to transform education systems to support learning, approaches to education and learning styles of learners

2. Learning to do

- **A holistic approach, which seeks integrative thinking and practice**. The educator is able to create opportunities for sharing ideas and experiences from different disciplines, places, cultures, generations without prejudices and preconceptions and can connect the learners to their local and global spheres of influence
- **Envisioning change, which explores alternative futures, learns from the past and inspires engagement in the present**. The educator is able to critically assess processes of change in society and envision sustainable futures, and use the natural, social and built environment, including their own institution, as a context and source of learning
- **Achieving transformation, which serves to change the ways people learn and the systems**. The educator is able to facilitate participatory and learner-centred education that develops critical thinking and active citizenship and assess learning outcomes in terms of changes and achievements in relation to sustainable development

3. Learning to live together

- **A holistic approach**, which seeks integrative thinking and practice, the educator is able to actively engage different groups across generations, cultures, places and disciplines.
- **Envisioning change**, which explores alternative futures, learns from the past and inspires engagement in the present: The educator is able to facilitate the emergence of new worldviews that address sustainable development and encourage negotiation of alternative futures.
- **Achieving transformation**, which serves to change the ways people learn and the systems. The educator is able to challenge unsustainable practices across educational systems, including at the institutional level and can help learners clarify their own and others worldviews through dialogue

4. Learning to be

- **A holistic approach, which seeks integrative thinking and practice**: The educator is someone who is inclusive of different disciplines, cultures and perspectives, including indigenous knowledge and worldviews, and assists with the practice of local languages
- **Envisioning change, which explores alternative futures, learns from the past and inspires engagement in the present**. The educator is someone who is motivated to make a positive

contribution to other people and their social and natural environment, locally and globally • is willing to take considered action even in situations of uncertainty

– **Achieving transformation, which serves to change the ways people learn and the systems**. The educator is someone who is willing to challenge assumptions underlying unsustainable practice; a facilitator and participant in the learning process; engages with learners in ways that build positive relationships

The pillars of learning in table 4.1 and related competencies require the teacher educator and student teachers to engage critically through a holistic approach and to envision need for change and development. This must be done with the aim of achieving transformation in the way they do things in certain aspects of our lives. A holistic approach entails integrative thinking, inclusivity and dealing with complexities, and thus integrative thinking is supported by thinking of sustainability in terms of systems. Inclusivity requires educators to incorporate different perspectives and different knowledge systems, e.g. indigenous knowledge, which is critical to negotiating a sustainable future.

In many African contexts, this might mean bringing into the curriculum examples drawn from local environments and cultures including the use of local and national languages that were historically excluded articulating local dimensions in the teacher education and school curricula. Sustainable development issues are interrelated in complex ways and therefore the teacher educator must be able to tackle the cross-cutting issues involved such as poverty, climate change, gender equality and others.

Ferreira and Tilbury (Ferreira and Tilbury, 2006) defined competencies for achieving transformation at three levels :

1. transformation of what it means to be an educator;
2. transformation of pedagogy, i.e., transformative approaches to teaching and learning; and
3. transformation of the education system as a whole (Ferreira, Ryan and Tilbury, 2006).

The above demonstrates that educators and pre-service and in-service teachers need to develop ESD competencies so that their students can acquire sustainable development competences. Sustainable development competences are those reflecting the capacity of an individual to actively and productively contribute towards sustainable living and hence, through ESD, all people must develop these competencies. In essence the vision of ESD is to provide opportunities for everyone to learn the values, behaviour and lifestyles required to build a sustainable future and positive societal transformation (UNESCO, 2005).

ACTIVITY 4.2

REFLECTION ON PRINCIPLES AND APPROACHES TO PEDAGOGY

Ferreira, Ryan, and Tilbury (2006) identified some principles and approaches for pedagogies that can be used transformatively: Enquiry based; Participatory and practiced based; Ideological critiquing; Community based; Collaborative; and Reflective in practice.

1. What do these principles and approaches mean? How are they applied?
2. Have you used these principles in your work with student teachers?
3. What are the opportunities for using these in your teaching?

4.5 ESD and spiritual, cultural and moral values

An important profile characteristic of the educator, teacher and student teacher is their vast range of spiritual and cultural values. In teacher education, student teachers require the support to develop their spirituality; they also require opportunities to reflect on the values they bring from their varied ethnic backgrounds to the profession and for educating for sustainability. They should experience working with learners at the educational level in which they will teach to enhance their spiritual, cultural and moral sensibilities.

Lambert and Balderstone (2000) rightly point out that a spiritual dimension is not confined to religious beliefs. It refers to relationships with other people and with people's search for identity, meaning and purpose in life, as well as with the values by which they live. It helps to foster self-understanding and an understanding of others in their institution and in society. Lambert and Balderstone suggest a model that shows how cultural development is concerned with the development of a sense of identity, a sense of belonging, an understanding of others, and the development of personal enhancement (figure 4.1). They need to develop a sense of identity as well as a sense of belonging.

As part of ESD it is important to provide learners with experiences through which they can identify values and traditions from their own communities that would support ESD learning outcomes. It is important for learners to have experiences of cultural diversity and the different perspectives when it comes to appreciating how sustainable development is perceived and practised in different contexts. Educators must exercise critical thinking with their students to enable opportunities to reflect on why – in sustainable development – institutions and societies (where they are found) must change and transform in order to make them better.

We agree with Lambert and Balderstone who suggest a set of values that educators and their students may find useful to explore together with regard to the aims of ESD. These values relate to the self, relationships, society and the environment. These are paraphrased in box 4.1.

BOX 4.1

A STATEMENT OF VALUES

1. *Values related to the self* – valuing ourselves as unique human beings capable of spiritual, moral, intellectual and physical growth and development.

   Example: Develop self-respect and self-discipline and take responsibility, within our capabilities, for our own lives.

2. *Value for relationships* – for others, for ourselves and themselves because relationships are fundamental to the development and fulfilment of ourselves and others, and to the good of the community. Roles and responsibilities contribute to the well-being of the collective.

   Example: Respect and care for others and for others' privacy and property.

3. *Value for society and the family* – valuing truth, freedom, justice, human rights, the rule of law and collective effort for the common good, and families as the basis of a society in which people care for others.

   Example: Understand and carry out our roles and responsibilities in our families and as citizens.

4. *Value for the environment* – both natural and shaped by humanity, as the basis of life and a source of wonder and inspiration.

   Example: Accept our responsibility to maintain and preserve a sustainable environment for future generations and for other species.

Ask student teachers to examine each of the sets of values in relation to their own values.

a. How are the values above relevant and valuable to them?
b. How are the values relevant to teaching and learning?

For more information: Lambert and Balderstone, 2000
Available at: http://www.amazon.co.uk/Learning-Teach-Geography-Secondary-School/dp/0415156769

4.6 Cultivating values in the Earth Charter

Another important source of values is the Earth Charter. It brings up values relevant not only for environmental sustainability but for other aspects of sustainability as well. The Earth Charter consists of four principles conveying sixteen values.

1. Principle 1 is concerned with 'respect and care for the community of life' and thus emphasizes respect for the Earth and its resources, care for the community of life and building democratic societies.
2. Principle 2 is 'ecological integrity'.
3. Principle 3 is 'social and economic justice' stressing the eradication of poverty, gender equality and equity, and human rights.
4. Principle 4 focuses on 'democracy, non-violence, and peace' emphasizing inclusive participation in decision-making, and the integration into formal education and lifelong learning the knowledge, values and skills needed for a sustainable way of life.

ACTIVITY 4.3

REFLECT

In chapters 2 and 3 we referred to African philosophical frameworks and to indigenous knowledge systems. Download information on an African philosophical framework, for example, *Ubuntu*. It will most likely have values such as respect for nature, creating harmony, community, advancing truth, and honesty. We pointed out that African frameworks and systems of knowledge convey some values that are consistent with values promoted in the Earth Charter and those explained by Lambert and Balderstone (2000). Find and download the Earth Charter: http://www.earthcharter.org

(i) What values conveyed in African culture are comparable to those in the Earth Charter?

(ii) How far do these values reflect outcomes in ESD learning in your institution?

(iii) In light of these values, what statements can you make concerning 'sustainability' and 'sustainable development'?

4.7 Teacher education in and for a multicultural context

The above activity is a good reminder that teaching and learning for sustainable development must be inclusive and take into account experiences and values from the cultures of local communities. In profiling the educator and the student teacher we made reference to the diverse ethnic groups and cultures from which they come. Educators must appreciate that student teachers come from diverse ethnic groups with different languages and traditions, and so will their learners in the education system. ESD is a framework for inclusive education and thus learning that is connected with diverse cultures is quite important. Lupele and Lotz-Sistika (2012) have also pointed out the importance of inclusivity, and one way of observing inclusivity in education is to draw examples from different cultures.

Culture is central to learning because it plays a role in communicating information and in shaping the thinking process of groups and individuals. According to Bennet (2003), multicultural education must be based upon democratic values and beliefs and it must affirm cultural practices. Davidman and Davidman (1997) point out that teachers should help children become aware of diversity and cultural differences and at the same time they should focus on the differences and the beauty of the coexistence of cultures.

One of the responsibilities of the teacher is therefore to learn about their learners' sociocultural and psychological backgrounds and potentials. This is necessary to better understand the student and to properly draw on that cultural capital to help them succeed. Teachers should focus on the synergies that are formed between different curricular materials and environmental elements, as well as the multicultural or diverse classroom environment. In teacher education, this can be made possible if educators are building their teaching on the experiences that student teachers bring forward as members of different cultural groups. For example, identifying and naming local flora and fauna and learning taxonomies in local languages can be a powerful way to support learning of scientific identification and taxonomies in a multicultural learning environment.

An important aspect of multicultural teaching and learning is the recognition and use of a range of teaching and learning approaches to cater for diverse learning needs, learning styles, and learning preferences of learners from diverse ethnic and cultural backgrounds. For example, the indigenous ways of teaching often contrast sharply with approaches to teaching in the formal classroom. In indigenous ways of teaching, group learning methods, oratory and direct observation are common. The inclusion of elders to pass on knowledge provides an authentic experience for students. It is important to be sensitive to the variety of ways information is conveyed, processed and learned. In reorienting teacher education, it is important therefore to incorporate opportunities for teaching and learning methods that include role-play, drama, music, simulation and other participatory methods consistent with social learning in the community.

4.8 Professional learning and reflective practice for ESD learning

Learning for sustainability is a process that must be undertaken through the lifespan of the learner. ESD is a lifelong process and thus for educators and teachers, professional learning must be continuous. This is important as they will encounter a new generation of students with their unique needs, and at the same time challenges in society are continuously emerging requiring adaptation and innovation, and thus innovative pedagogical approaches.

The basis for professional learning should be grounded in reflective practice. It can be said that the most distinguishing features of teacher educators and student teachers are those whose practices are a result of careful reflection. They learn lessons each time they teach, evaluating what they do and using these self-critical evaluations to adjust what they do next time (OFSTED, 2004). A reflective teacher educator should also make use of seemingly challenging experiences as an opportunity for creating best practices; though not all challenges are detrimental.

There are three important forms of reflection, namely: reflection in action, reflection on action and reflection for action.

1. Reflection in action is taking the opportunity to think about the work you are doing, as you do it.
2. Reflection on action is taking the opportunity to think about the work you are doing after you have done it.
3. Reflection for action is taking the opportunity to think ahead of an activity before you try to implement it.

All forms require thinking critically with regard to experiences and actions ahead of their implementation, during their implementation and after their implementation. It is through reflection that we learn from our experiences and construct new experiences. This is because reflection involves interrogating our present experiences and actions as well as the theoretical and value system that guide our professional practices. It is important through reflection to question our present attitudes and values so that we may adopt those values to lead us to positive action in professional practice.

For educators and teachers to reorient teaching and learning towards ESD there is need for reflection. Reflective practice in ESD is necessary in order to appreciate the student teachers and learners, their needs, background, abilities and learning styles. Earlier we presented the case of multicultural teaching and learning requiring reflection. Besides, ESD requires experimentation with different teaching and learning approaches. For example, it will take experimentation and innovation to incorporate poetry into the teaching and learning of mathematics and science subjects in an ESD context. It takes experimenting to build confidence to introduce group project-based learning methods and other out-of-classroom learning experiences for students. It is the reflective teacher educator who will inspire his or her students to be reflective. The following activity might inspire you to experiment with presenting opportunities for your students to independently explore a real-life issue. It is important for students to decide on significant ways of finding information and presenting it to an audience.

ACTIVITY 4.4

REFLECTION ACTIVITY

Allow your students to carry out an independent open investigation on what is considered to be 'the most challenging sustainability issue in their community'. Do not overly guide them. Give them the freedom to investigate from desk study in the library, from surveys in the community, and from newspaper reports. Ask them to present their results to the class who will act as community members. They may use written reports, posters, drama, poetry, and other innovative methods. Reflect on this experience using the following guiding questions.

1. What happened as the students' explored information and presented their results?
2. How did you feel doing this activity, and how did you react to the way students investigated and presented their findings?
3. Was this a useful experience for you and the students, and in what ways?
4. What have you learnt from this experience concerning innovative teaching and learning for ESD? What would you change concerning the assessment of ESD learning among your students?

An educator needs to be a 'reflective practitioner', i.e. someone who does something and is automatically reflective. A reflective practitioner is always concerned about questioning the basis of practice. He or she persistently wants to find answers to the questions 'why?', 'how?', 'where?' and 'what?' with regard to particular practices. Reflective practitioners are continuously learning by evaluating and improving their practices.

4.9 Self and professional appraisal for ESD

ESD provides a framework for changing professional practices. As such, it is important for individual educators teachers to undertake self-appraisals as part of their reflective practice and for the institution to adjust its appraisal approaches to reflect an ESD context. As noted by Ramsden (2003), an appraisal is a reflexive process of reflecting back on professional practices. In the context of ESD the appraisal must provide feedback on the ESD practices and what is being learned from the experiences. Both self and professional appraisals offer periodic assessment of individual performance in the context of the ongoing performance of ESD activities. Educators need to appraise student teachers with respect to ESD competencies

Appraisal may also include a section of 'unexpected' or 'additional' activities or accomplishments. This inherently entails sustaining the principles of reflexivity throughout the implementation process of ESD activities. The format should be intelligible and easy for all appraisal reviewers to understand and to link appraisal comments with the established ESD standards of an institution. In appraisals therefore, being creative and imaginative to design what people will respond to, beyond the usual job skill-set, is expedient (Moon, 2005).

4.10 ESD and communities of practice

While an individual practitioner can learn from their own practice, reflective practice is better when more and more practitioners work together as a community of practice. In chapter 3 we showed that a community of practice (CoP) is a group of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly (Wenger, 1998). A group of educators or student teachers, who learn the use of new teaching and learning methods for ESD in the curriculum can form a CoP. They learn from interacting and sharing; they share experiences, stories, tools, and ways of addressing recurring problems, in short, a shared practice (Wenger, 1998). In the context of an institution, a community of practice can work to create, for example: (i) an ESD friendly environment; and (ii) a reading culture for ESD.

4.11 ESD-friendly institutional environment

Fekadu (2014) explains that the philosophy of possibilism stresses that environment provides options and opportunities; the number of which increases as the knowledge and innovation increases. This poses a challenge for educators to create environments that are friendly for mainstreaming ESD in their institutions. An ESD friendly environment is enabling. It provides a context in which educators and students and other members of the institution can reflect and act in sustainability-friendly ways.

ACTIVITY 4.5

ESD-FRIENDLY INSTITUTIONAL ENVIRONMENT

Download the 'Unit based sustainability assessment tool' (USAT) at http://www.wedocs.unep.org/bitstream/handle/20.500.11822/1183/USAT_tool.pdf

1. Does your institution qualify as 'an ESD-friendly institution'? Please explain why.
2. How can your institution improve its profile as an ESD-friendly institution?

4.12 ESD and promotion of a reading culture

It is important for educators working as a community of practice to model a reading culture for ESD. One important feature of the ESD friendly environment is its reading culture. Igwe (2011) cites Sisulu (2004) who observed that reading is one of the fundamental building blocks of learning. Becoming a skilled and adaptable reader enhances the chances of success at school and beyond. Reading is not just for school, it is for life. Reading in all its variety is vital to being better informed, to having a better understanding of ourselves as well as others. It makes humans thoughtful and constructive contributors to a democratic and cohesive society. It is important for an institution to showcase its commitment to a reading culture. Let us examine various ways in which a teacher education institution can promote a sustainable reading culture for the student teachers with a focus on ESD. Reflective practitioners will be creative in finding other ways of promoting a reading culture.

Create displays and posters that can be mounted in different locations in your institution, for example, in the foyer, on notice boards, and in offices and staff rooms. These may include quotes on reading and may also carry slogans concerning sustainability. Posters for international days and events are also useful to create awareness. By placing students' creative writing on display, including essays and poetry on ESD issues, it can attract interest for reading. The library also needs to have a place for displaying latest resources and books, and provide highlights of those resources dealing with sustainability issues.

This entire guidebook seeks transformation in teaching and learning through ESD. Consequently, the lecture or classroom is a crucial place to model a reading culture. Materials used for reference in lectures and lessons must always have their sources cited. It is important to bring in books, magazines, journals or newspapers from which to read so as to provide case studies of experiences or to show opinions expressed or give evidence. Opportunities can be provided to discuss different books and different authors' stances on different and controversial issues. An important facility for promoting a reading culture is the institution's website, especially if it carries articles contributed by staff and students in the institution. It may be used to share experiences concerning water, energy, waste management, communicable diseases, resource conservation and other examples from eco- and green schools in Africa.

ACTIVITY 4.6

EXPLORE THE RESOURCES

Please explore some of the websites and resources below with your students to get ideas to identify and plan projects in your own setting.

http://www.ecoschools.global – ideas for action-oriented green projects in the context of Africa.

http://www.greenschoolsalliance.org – focus school projects in Africa.

en.unesco.org/esd-repo/562

4.13 The whole-institution approach for ESD

ESD is a holistic process and cannot be achieved by any individual working alone. It requires administrators and all members of staff and students in the institution in working together as a community of practice. Since we are seeking to change society to create sustainable lifestyles and sustainable development, this change must begin at the level of institutions. In this regard, all of the institution's departments and units mainstream ESD and practise ESD principles in their work. Every member of the institution must get involved in actions that contribute towards sustainability. This is the essence of the whole-institution approach to ESD. A whole-institution approach (also known as whole-school approach) aims to address unsustainable practices that are institution-wide, and thus create within the institution momentum for collective behavioural and social change.

Ferreira, Ryan and Tilbury (2006) correctly pointed out what is relevant to our context, that whole-institution approaches involve institutions in "tackling a range of complex and diverse issues such as school governance, pedagogy, resource consumption, community outreach, curriculum development, and landscaping that will assist schools to become more sustainable" (p. 16). As such, whole-institution approaches imply that sustainability concerns in the formal curriculum are, whenever possible, reflected in the day-to-day practice of an institution's hidden or non-formal curriculum. Shallcross and Wals (2007) (citing Sterling, 2001) stress that whole-institution approaches work to make institutions microcosms of the emerging sustainable society and, as such, the sustainability values and attitudes discussed in the formal curriculum will be continually reinforced by the school's institutional practices. Shallcross and Wals stress that "in this way, values and attitudes advocated in the classroom become habituated in the daily actions of teachers, pupils, and support staff. Thus, schools practise what they teach, values are reinforced in actions and consequently caught, rather than taught".

The whole-institution approach is important for institutions to mainstream ESD in all their work. A good example of a framework for the whole-institution approach is one promoted by the Global Higher Education for Sustainability Partnership (GHESP). In this framework, all the following functions of the institution must reflect sustainability principles and practices:

1. Policies of the institution.
2. Planning and administration of the institution.
3. Curriculum and teaching in the institution.
4. Research and scholarship in the institution.
5. Student life in the institution.
6. Physical operations of the institution.
7. Services of the institution to society.

The framework underscores the importance of everyone in the institution working towards challenging and transforming unsustainable practices on campus.

ACTIVITY 4.7

REFLECTION ACTIVITY

Analyse your institutional context in relation to the whole-institution framework with colleagues.

(i) What initiatives must be undertaken in your unit?
(ii) What support within the institution would be needed to make your initiative succeed?
(iii) What initiatives could be undertaken by students?
(iv) Why is it important to model sustainability in a teacher education setting?

4.14 Non-formal educational opportunities for ESD

We have explained the importance of the whole-institution modelling best sustainability practices and ethos. The institution must thus become a microcosm of the sustainable society it aims to contribute towards and to create. Beyond the formal curriculum the teacher education institution will have a non-formal education setting in which learning will continue outside the structured schedules of formal learning. These non-formal settings are often associated with extracurricular activities. Opportunities must be seized to engage educators and student teachers in purposeful learning for ESD in these non-formal spaces.

After-school activities in a teacher training college, which includes clubs and other activities, is qualified as non-formal education as they are less centrally controlled and do not normally count for credit in the formal completion of studies. For example, in a sporting activity of athletics, beginners, intermediate and final year students participate according to their ability and competence regardless of their respective years of study, and this should include ESD activities such as sporting activities, music, tree planting, first aid, different club activities and other sustainability activities. Extracurricula activities offer opportunities for creating a voluntary learning environment (e.g. youth organizations, music and art schools, national parks and sport clubs (Lewalter and Geyer, 2009).

These activities may be extended to the local community where people can learn ESD from activities and projects that extramural activities may offer, which can happen non-formally and informally. What is clear in ESD is that educators and student teachers must model practices and behaviours that reflect sustainability at all times. Members of the community will observe and learn socially from such practices. Further, the community itself is a source of learning in ESD. For example, there are taboos and adages that have positive value for the sustainable development of local communities. For example, many communities in Africa carry adages associated with conservation and preservation. These examples may be brought into the teacher education curriculum for student teachers to interrogate them in relation to their potential to contribute towards sustainable development.

It is important to recognize that these teachings are based on common sense observations; on experiential learning over millennia. These experiences have contributed to the resilience of communities and the sustainability of their environments and livelihoods.

ACTIVITY 4.8

REFLECTION ACTIVITY

The following are examples of things people are taught in some African families and communities. Ask the students to identify and create a complete list of adages and taboos associated with the list below.

(i) Cutting down of trees anyhow is not good.
(ii) Use of certain trees for poles or firewood is prohibited.
(iii) Cutting of trees at a river source is not allowed.
(iv) In the *chitemene* system (slash and burn agriculture) people should only cut branches.
(v) Communal land for grazing should be rotational.
(vi) Cutting trees in the graveyard is taboo.

Ask students to answer the following questions.

1. What is the value of these adages and taboos for sustainable development?
2. Is there scientific merit or evidence for these adages? Explain.
3. Are there examples that reflect beliefs that are not warranted? Explain.

4.15 Summary

This chapter discusses some of the characteristics of the student teacher and the teacher educator and stresses the importance of taking cognizance of these features when mainstreaming ESD into teaching and learning. The ESD competencies that educators and student teachers must acquire were demonstrated on the basis of the pillars of lifelong learning. The chapter shows the importance of profiling learners so that teaching and learning is inclusive and takes place in a multicultural context. The chapter stresses the importance of innovation and reflective practice in mainstreaming ESD, for creating communities of practice, and for working towards whole institutional changes. These changes include the creation of ESD-friendly environments in institutions in which sustainable development is valued and practised. Chapter 5 examines and clarifies reviews and curriculum development in teacher education so as to mainstream ESD.

4.16 Further reading and resources

Coombs, P.H. *et al.* 1973. *New Paths to Learning*. New York, UNICEF.
In this book the authors call attention to the flexibility of non-formal educational programmes in preparing extracurricular learning experiences that are complementary to formal instruction, and in following up formal schooling with directly applicable skills training.

Lambert, D. and Balderstone, D. 2000. *Learning to Teach Geography in the Secondary School: a Companion to School Experience.* London, Routledge Falmer.
This book provides teachers of geography (intending and practising) with the practical skills to design, teach and evaluate varied and exciting lessons. It also helps them to acquire a deeper understanding of geography's role, purpose and potential in secondary education.

Wals, A. 2012. *Shaping the education of tomorrow: 2012 Report on the UN Decade of Education for Sustainable Development*. Paris, UNESCO.
The publication focuses on learning and learning-based change towards sustainability. What kinds of learning processes are emerging in the last stretch of the DESD? What is the role of ESD in supporting them? What changes have occurred since the early years? The report includes input from hundreds of policy-makers, scholars and practitioners engaged in ESD around the world.

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UNESCO, 2010: *Learning the Treasure Within*, pp. 85-149.

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Chapter 5

ESD IN THE TEACHER EDUCATION CURRICULA AND PROGRAMMES

Dorcas Beryl Otieno

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5.1 Introduction

Due to the critical sustainable development challenges facing Africa there is a need to mainstream ESD in teacher training programmes to enable teachers to effectively reorient their teaching programmes so as to incorporate ESD issues, principles and values. Common sustainable development issues affecting the whole of the African continent include poverty, desertification, safe water supply, population explosion, flora and fauna depletion, soil degradation, air pollution and climate change, among others. A policy decision should therefore be made regarding the mainstreaming of ESD themes requiring emphasis within the curriculum, syllabuses, practice and policies to ensure that teacher education programmes fit the environmental, social, and economic conditions and goals of their communities, regions and nations. This chapter focuses on curricula and programmes in teacher education institutions. It provides insights into how teacher education curriculum may be reoriented to mainstream ESD in order to build capacity of teacher educators and teachers to be able to effectively execute ESD objectives.

5.2 Objectives

By the end of the chapter, the reader will be able to:

1. Explain the need to reorient the teacher education curriculum to mainstream ESD.

2. Identify and describe components of an effective curriculum development process and the determinants of ESD programmes in teacher education.

3. Appreciate approaches to reviewing existing teacher education curricula to mainstream ESD.

4. Appreciate and utilize approaches to designing and developing teacher education curricula that integrate ESD for different educational levels from early childhood and care education (ECCE) to higher education and technical and vocational education and training (TVET).

5.3 ESD in teacher education

UNESCO promotes the vision of ESD to recreate a world where everyone has the opportunity to benefit from quality education and learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation. ESD is a process of learning how to make decisions that consider the long-term future of the economy, the environment and the equitable development of all communities. Chapter 2 showed that the pillars of sustainable development, which are economic, environment and social sustainability, are underpinned by culture and good governance. The curriculum for teacher education should therefore reflect objectives in box 5.1. As such, the curriculum that has mainstreamed ESD should be tailored to encourage lifelong learning to achieve these objectives.

BOX 5.1

REFLECTION ACTIVITY

The following are some objectives of ESD. Ask students to critically reflect on the relevance of these objectives.

- To promote and improve basic education, including literacy and lifelong learning for sustainable livelihoods, with emphasis on access, opportunity and quality outcomes for children and youth in and out of school, and adult literacy.
- To reorient existing education programmes at all levels (content and processes) to promote the social, environmental, cultural and economic knowledge, skills, perspectives and values inherent to sustainability.
- To create public awareness and build understanding of the principles of sustainable development with emphasis on the roles of the media and civil society.
- To develop training programmes for imparting skills to promote sustainability practices.
- To develop strategies at every level to enhance capacity for ESD.

ACTIVITY 5.1

ELEMENTS OF ESD IN THE CURRICULUM

1. Respect for self and others, and value and preserve the achievements of the past;
2. Appreciate the wonders and the peoples of the Earth;
3. Live in a world where all people have sufficient food for a healthy and productive life;
4. Assess, care for and restore the state of our planet;
5. Create and enjoy a better, safer and more just world;
6. Be caring citizens who exercise our rights and responsibilities locally, nationally and globally.

Full reference to the objectives can be found in Otieno, B.D.(2006). Training Manual: The Eco-school programme Education for Sustainable Development-Action Learning. Nairobi, Cincom Systems & Romlan Printers.

Chapter 5

Chapter 2 showed that the focal areas of ESD lie in improving the quality of education, reorienting teaching and learning to reflect ESD, enhancing public awareness and sustainability, and capacity-building to enhance competencies of teachers to mainstream ESD in their teaching. How must teacher education prepare teachers for this? The teacher education curriculum should promote the four focus areas of ESD by:

1. ensuring that the curriculum addresses local needs, promotes problem-solving/hands-on skills, and develops relevant teaching and learning resources:
2. reorientation of teaching and learning to make them learner-centred, promote cross-cutting and interdisciplinary approaches, and incorporate cultural values and ethics;
3. engaging with communities to enhance public understanding and awareness as well as sustainability challenges; and
4. integrating ESD in pre-service curriculum and in-service training programmes to ensure teaching and learning of ESD principles and practices in formal and non-formal education.

BOX 5.2

USEFUL APPROACHES FOR MAINSTREAMING ESD IN THE CURRICULUM

There are numerous different approaches available to the teacher and to the teacher educator for mainstreaming ESD in the curriculum. Know these so as to be able to distinguish them in practices in your institution.

- ***Developing an ESD curriculum*** – entails planning an entirely new curriculum that contains ESD principles, topics and themes.
- ***Infusing ESD in the curriculum*** – entails examining existing curriculum or syllabus and finding opportunities within it to include ESD themes and issues without fundamentally changing its scope and structure.
- ***Integrating ESD*** – entails examining the entire range of subjects in the curriculum to make them fully transmit ESD principles and topics.
- ***Reorienting towards ESD*** – entails examining the whole curriculum so that all its components take up and deliver ESD principles and practices.
- ***Reviewing the curriculum*** – entails examining all activities in the curriculum and adjusting it to ensure that ESD principles, themes and practices are made part of the curriculum.
- ***Mainstreaming ESD*** – entails planning and implementing the curriculum such that ESD principles and practices are included in all teaching, learning and assessment. All daily decisions involving activities and operations of the whole institution must reflect ESD principles and practices.

5.4 Effective curriculum development

The development of an effective curriculum is a multi-step, ongoing and cyclical process. The process progresses from evaluating the existing curriculum, to designing an improved curriculum, to implementing a new curriculum, and back to evaluating the revised curriculum. Curriculum designers carry out this process in a planned and systematic manner.[1] Tilbury, 2011 recommends that curriculum that has mainstreamed ESD should respond to the five pillars of learning:

1. learning to know: acquiring instruments of understanding;
2. learning to be: seeing oneself as responsible for one's emotional, spiritual and social development;
3. learning to live together: participate and cooperate with other people in all human activity;
4. learning to do: be able to react creatively and responsibly in all environments; and
5. learning to transform oneself and society: develop respect for the environment, social solidarity and non-discrimination.

CROSS-CUTTING ISSUES
Issues that feature and affect all spheres of sustainable development and that must be addressed through all areas of learning. They can be environmental, e.g. climate change, social e.g. gender equality, cultural, e.g. HIV and AIDS and health, economic, e.g. poverty, or general principles, e.g. governance that underlie sustainable development and quality of life.

In developing a curriculum that incorporates ESD, it is important to follow the steps that is participative and include planning, articulating the content and methods, and implementing while evaluating. The planning stage involves convening a curriculum development committee, including curriculum development centres and policy-makers, identifying key issues and trends in the specific content area, and assessing needs and issues of all sectors to be included in the ESD curriculum.

1 For more on curriculum development processes: http://www.sde.ct.gov/sde/cwp/view.asp?A=2618&Q=321162; and http://www.wikihow.com/Develop-a-Curriculum

ACTIVITY 5.2

REFLECT ON YOUR INSTITUTION

1. How often is your currulum reviewed?
2. How are changes or reviews to the curriculum made in your institution?
3. What ESD issues would be relevant to incorporate in the subject you teach and in the curriculum as a whole?

Planning must be followed by articulating and developing the content and teaching methods that are relevant to realize ESD learning outcomes. This may for example be based on the vision of ESD promoted by UNESCO (2005), which can help to define the philosophical orientation of the whole curriculum or of the individual courses, as well as developing and identifying resource materials. UNESCO (2005) suggests that ESD has the following features.

- Addresses content that takes into account, context, global issues and local priorities.
- Is locally relevant and culturally appropriate.
- Is based on local needs, perceptions and conditions, but acknowledges that fulfilling local needs often has international effects and consequences.
- Accommodates the evolving nature of the concept of sustainability.
- Is interdisciplinary. No one discipline can claim ESD as its own, but all disciplines can contribute to ESD.

These features are shown in case study 5.1 that focuses on the eco-schools programme in Africa in countries such as Kenya and South Africa.

CASE STUDY 5.1

THE ECO-SCHOOLS PROGRAMME

Eco-schools or green schools show exemplary practice in ESD. Find out more from the websites listed here. See also a discussion of eco-schools or green schools in chapters 1 and 4 of the guidebook.

- http://www.fee.global/eco-schools-1/ Shows how eco-schools practice ESD through an integrated approach of classroom study and community action;
- http://www.eco-schools.org Ideas for action-oriented green projects in the context of Africa;
- htpp://www.greenschoolsalliance.org Focus school projects in Africa;
- https://www.greenschoolsalliance.org/home Shows example of green schools in Asia.

In order to ascertain whether the implementation of the curriculum is successfully mainstreaming ESD it must be evaluated. Implementation entails putting the new ESD programme into practice as part of the officially prescribed courses of study, syllabuses and subjects. The process involves helping the learner acquire knowledge or experience of sustainability issues. It is important to note that curriculum implementation cannot take place without the learner. The learner is therefore the central figure in the curriculum implementation process whereby learners acquire knowledge, skills, attitudes and values for civic responsibilities in society and the teacher educator/trainer is the facilitator of the process. This process is influenced by numerous factors and considerations, namely: teachers and learners who must transact the curriculum; the availability of resource materials and facilities; the influence of interest groups and stakeholders who may avail financial and material resources; the nature of the school environment, the schools and the cultural and ideological setting; the quality of instructional supervision; and the influence of assessment processes including public examinations.

The curriculum must be evaluated to ascertain its impacts so that it achieves its aims and can be updated; ESD mainstreamed curricula must be evaluated to determine their success. McNeil (1977) states that "curriculum evaluation is an attempt to throw light on two questions: Do planned learning opportunities, programmes, courses and activities as developed and organised actually produce desired results? How can the curriculum offerings best be improved?" (p.134). This process entails collecting data on the ESD programme to determine its value or worth with the aim of deciding whether to adopt, reject or revise the programme. Programmes are evaluated to answer the questions and concerns of the various parties ie. learner community Government. The public want to know whether the ESD curriculum implemented has achieved its aims and objectives; teachers want to know whether what they are doing in the classroom is effective, and the developer or planner wants to know how to improve the curriculum product.

Evaluation can be differentiated as formative evaluation and summative evaluation; a distinction that will be important to evaluate ESD mainstreamed curricula. As ESD is being mainstreamed into the curriculum it is necessary to conduct formative evaluation. This will help ascertain issues and priority areas that are being mainstreamed as well as the response of learners and stakeholders. Summative evaluation may be conducted after ESD-mainstreamed curricula have been implemented for some time. This is to evaluate their effectiveness and how they impact on the ESD ethos and practices in the institution.

ACTIVITY 5.3

REFLECTION ACTIVITY

1. Why do you need to evaluate the curriculum in relation to ESD?
2. What are the steps in developing an ESD sensitive curricula and the steps for its evaluation?
3. What is the difference between formative and summative evaluation?

5.5 Reviewing existing curriculum to include emerging issues

Curriculum review is a process of assessing implementation of an existing curriculum to confirm its present and future relevance. It involves qualifying the required interventions in the curriculum to meet the present and future citizens, social, economic and environmental needs. This forms the basis for curriculum renewal. Curricula are first reviewed before they can be renewed (NACTE, 2004).

ESD sensitive curriculum expresses and reflects a society's values, attitudes, expectations and feelings about its welfare and development. It is also a complex and evolving mixture of visions and interests of individual and collective aspirations, multiple institutions and stakeholders. ESD curricular construction is specific and unique in each national context, reflecting the diversity of approaches and proposals by multiple stakeholders within the educational system and outside it so as to meet society's expectations and needs. (Leonard *et al*., 1998).

Educational reform in Africa and worldwide is increasingly curriculum centred growing demands for change tend to focus on both the structures and content of school curricula to ensure that it is in line with ESD goals. The curricula must integrate all the ESD pillars (environment, society and economy components) into an educational proposal reflecting the type of society we hope to build and pursue.

CASE STUDY 5.2

NACTE RATIONALE FOR CURRICULUM REVIEW (TANZANIA, UK)

NACTE (2010) gave the following as the reasons for curriculum review.[a]

- A new education content is needed to meet a new need; a ESD programme is needed to meet sustainability issues, e.g. poverty, or climate change in the case of Africa.
- ESD concepts are priorities within the education system.
- The original focus has been lost, there is a need for ESD to bring about change in society, in the environment and the economy.
- The curriculum must meet newly articulated ESD criteria and standards.

1. To what extent are these reasons simular to our institution's or country's?
2. How are they different? Are there other reasons to review the curriculum?

Analyse – together with students – at least one syllabus that you teach to ascertain whether or not it meets ESD criteria.

[a] NACTE. 2010. *Procedures for Curriculum Development and Review, Dar es Salaam*, Tanzania

5.6 Determinants of pre-service teacher education curriculum[2]

Pre-service teacher education is the education and training provided to student teachers before they are appointed and posted to teach[3] in schools. The pre-service education and training (PRESET) of teachers is central to the attainment of sustainability goals. Akyeampong and Lewin (2002) suggest the following as key determinants of a typical pre-service teacher education.

1. Academic qualification. Entry qualifications: college certificate, Diploma B.Ed. or university postgraduate. The certificate of education varies and determines the student's specialization in teaching.
2. Curriculum content. Subjects deemed to be core curriculum such as literacy and numeracy or indigenous perspectives. ESD should be made paramount in the curriculum content with the relevant content promoting sustainability.
3. Teaching and learning methodologies, often termed as pedagogy. Science and the arts that meet the diverse needs of students and help develop cognitive abilities. Methodologies should be able to initiate sustainability concepts in the arts and sciences.
4. Professional studies. Issues that are common to the profession, such as educational, psychological, philosophical theories of teaching, learning and behavioural management, should consider ESD concepts.
5. Elective subjects. Allows students in some programmes to have a specialization degree, such as in environmental education or related subjects, that addresses sustainability.
6. Teaching practice. Regardless of the mode of delivery, all students must also undertake a minimum period of teaching practice in schools on how to deliver ESD concepts.

2 For more on integrating sustainable development in curricula: https://lirias.kuleuven.be/handle/123456789/408628
3 A new phenomenon has emerged, on the job pre-service training in countries where the prectice of contract teachers exist.

5.7 Determinants of ESD in in-service teacher education curriculum[4]

In-service teacher training is a process and part of continuing education and professional development that helps teachers to gain greater insight into teaching ESD concepts. This training takes place once the teacher has joined a school and can be both formal and informal in nature. The goal of in-service teacher development is to improve the knowledge, skills and commitments of teachers to ESD so that they are more effective in planning lessons, teaching, assessing students' learning, and undertaking other responsibilities in the school community. Achieving this goal is critical because the teacher's role is one of the most important factors contributing to high-quality education and effective student learning. The determinants of ESD in-service curriculum and programme include the following.

i) General ESD background

The initial teacher training is an important stage that determines the kind of knowledge and understanding that an educator will possess regarding ESD. As a new phenomenon, many of the educators will not have learnt so much about ESD and therefore there is need for continuous professional development and review of training programmes.

ii) Knowledge and understanding of ESD

Improved teacher knowledge on national ESD policies, subject content, teaching and assessment practices, and how all these related issues are important so as to ensure that the educators/teachers in their teaching appropriately mainstream education and sustainability issues.

iii) ESD practical skills and competencies[5]

ESD in education requires an outcome-based approach to learning, thus the necessary skills that will lead to the shift from promoting rote teaching and learning (based on memorization of facts) to facilitating more-active forms of learning (emphasizing critical, analytical and problem-solving skills) can only be successful if all teachers, regardless of the nature of their initial pre-service preparation, understand and have the knowledge and skills to implement new practices in the classroom (Ginsburg, 2010).

iv) New teaching strategies for ESD

Active learning principles are now part of many countries' policies of teaching and learning and are thus promoted in most in-service teacher training programmes. Because they present a major paradigm shift, active learning pedagogies are often misunderstood, miscomprehended and superficially or poorly implemented.

v) Use of new technologies, Information and Communication Technology (ICT)

The real power of technology will come when teachers have been trained well in the use of ICTs and have captured the potential of technology themselves. With the onset and proliferation of ICTs there is a growing demand to include them in school education. Teacher education should be structured to orient and sensitize the teacher to distinguish between the developmentally appropriate uses of ICTs from their detrimental uses. Teachers should also have the competence to use ICTs for their own professional development.

vi) Professionalism and ethics in ESD

Promoting ESD in education and the anticipated state of sustainability can only be achieved alongside a conscious thrust to promote professional ethics among academics and other stakeholders. In reorienting education in learning institutions for sustainability, professionals will be challenged not only to integrate professional practices into their processes and procedures but also to nurture the values and ethical principles of their professions (professional codes of conduct).

4 For more information on designing education programmes: http://www.equip123.net/docs/E1-FP_In-Svc_TPD_Compendium.pdf
5 Ibid.

vii) Assessment tools

ESD assessment is quite different from the assessment of other disciplines and therefore there is a need to ensure that the educators are oriented toward action- and product-based assessment, using diversified assessment tools.

5.8 Designing a new teacher education curriculum

Due to the complex, controversial, dynamic and varied nature of environmental and sustainable development challenges, curriculum – designed in response to these issues – needs to be innovative. Tilbury (2011) identified the following four key processes underpinning ESD that require innovation when designing a new curriculum for teacher education.

- Processes that stimulate innovation within curricula as well as through teaching and learning experiences.
- Processes of active and participatory learning.
- Processes that engage the 'whole system'.
- Processes of collaboration and dialogue (including multistakeholder and intercultural dialogue) (Tilbury, 2011; p.7).

ACTIVITY 5.4

EXAMINING PROCESSES UNDERPINNING ESD

With colleagues, discuss the following:

1. The processes underpinning ESD.
2. How the information on processes can be made more useful in your institution.
3. What needs to be done and who needs to be involved?
4. What opportunities are there to engage in these processes in your institution?

There are several steps and procedures to be followed when designing a new curriculum[6].

1. Mapping the learner's world: i.e. context and learners' needs. This should include the desired outcomes or expectations of the ESD programme, the role of assessment, the current status of student achievement and actual programme content. The information should also consider the concerns and attitudes of teachers, administrators, parents and students. The data should include samples of assessments, lessons from teachers, assignments, scores on state standardized tests, textbooks currently used, student perception and feedback from parents.
2. Making ethics and values explicit: The ethical framework and set of values that shape the curriculum is made explicit in relation to both content and teaching approaches. The curriculum should be culturally appropriate.
3. Determining sustainability competencies: A set of sustainability competencies relevant to the curriculum is identified. This will provide the relevant methods and techniques of how the curriculum should be delivered.
4. Identifying learning outcomes: The knowledge and skills students need to achieve the learning outcomes are identified, either in advance or by teachers or students together, and assessment procedures are set.
5. Deciding on the best delivery methodology: An appropriate delivery method is selected and tailored to the type and level of course and the style of learner(s), e.g. discovery, participatory/collaborative, problem-based, interdisciplinary, multistakeholder, social, critical thinking-based, and systems thinking-based learning.

6 More information on curriculum design can be found in General Education Modules for Upper Primary and Junior Secondary School Teachers of Science, Technology and Mathematics by Distance in the Southern African Development Community (SADC) developed by the SADC Ministries of Education: http://oasis.col.org/handle/11599/725

6. Promoting the course: Prospective students understand the relevance of and are attracted to a course that provides knowledge, understanding and skills relating to sustainable development.
7. Reviewing and renewing the course: With teachers, students, employers and others, the course is reviewed and renewed regularly to ensure it remains relevant to the world in which its users will live and work.

5.9 Mainstreaming ESD at different educational levels

ESD's mainstreaming goes hand-in hand with a rethinking of the kind of learning necessary to address sustainability issues at different educational levels. It is important to differentiate the needs of teachers teaching at the various levels of education from early childhood, primary and secondary education to higher education including technical vocational education and training.

CASE STUDY 5.3

THE CANADIAN LEARNING OUTCOMES-BASED CURRICULUM

"In 1993, the Canadian Province of Ontario mandated and gave broad guidelines that local school boards create outcomes-based curricula. The first phase was to create a new curriculum for students from Junior Kindergarten (4-year-olds) to Grade 9 (15-year-olds). Each community was to develop a locally relevant curriculum. The mandate was to consult with the community, build a new vision of an appropriate education for the twenty-first century, review the existing programme, and then discard, reorient or build anew. The Board considered the challenges and opportunities of the world in which their children would grow and live: a world with not only great potential for advances in the quality of life, knowledge, mutual respect, and peaceful cooperation, but also a world overwhelmed by technological and social change; beset by conflicts, injustices and inequalities, and faced with dwindling and threatened natural resources." summary citation from Charles Hopkins at the website http://www.esdtoolkit.org

In an ESD reoriented curriculum, what should students know, do and value by the time they graduate from school? Relate this to any level of schooling in your country.

Source: Mackeown, R (2002) Education for sustainable development toolkit: Version 2.
For more information, read this case study at the website: http://www.esdtoolkit.org/about.htm

5.9.1 ESD in early childhood care and education

ESD should begin in early childhood care and education (ECCE). It is in this early childhood period that children develop their basic values, attitudes, skills, behaviours and habits that may be long-lasting. ECCE is about laying sound intellectual, psychological, emotional, social and physical foundations for development and lifelong learning (UNESCO, 2008a). Therefore, it has enormous potential in fostering values, attitudes, skills and behaviours that serve as reference values that support sustainability, the wise use of resources, cultural diversity, gender equity and democracy.

- ECCE ESD programmes should develop a number of basic skills in children related to sustainable development, including: confirming their own identity and self, social skills and communicating using different means and tools, and seeking strategies to discover the components of the surrounding environment and interacting with others.
- The programmes should take into consideration the children's perspectives and meanings, and consider and shape the content and approaches of learning.
- They should include opportunities to introduce children to problem-solving situations and intellectual dialogue with regard to sustainability, and in concrete actions in favour of the environment.
- Should inculcate caring behaviour, incorporate learning to be compassionate and respectful of differences, equality and fairness.
- The learning should encourage scientific and technological literacy components.
- ECCE should help children acquire an identity that is firmly grounded in the culture closest to them, while developing a sense of themselves as global citizens.

UNESCO (2008*a*) proposes that an ESD approach must be based on key common principles and values such as human and children's rights, which should be contextual and related to the socio-cultural-economic context.

BOX 5.3

CRITERIA FOR AN ESD APPROACH IN ECCE

- Learning by doing and by problem-based teaching and learning
- Consider diversity in learning styles
- Active participation
- Alternative ways of knowing and valuing
- Integration of the environment and other global issues
- A case study approach - action - reflection
- The social dimensions of learning
- Learning by action, inaction and for action
- Cultural issues related to ESD
- Role of mother tongue in teaching
- The rights of the child
- The role of the media
- Gender equality issues
- Importance of religious perspectives

Source: UNESCO, 2008.

Here are two case studies that may help you to further your reflections:

1. https://www.youtube.com/watch?v=9GtNj1GZLLI
2. https://www.youtube.com/watch?v=U7YaobYTPgk

These case studies demonstrate active participation in learning, the use of case studies for best practice, the rights of the child, and learning for action, among others. Reflect on them to improve your curriculum and learning outcomes.

5.9.2 ESD in primary and secondary education curricula

Unlike in ECCE, primary and secondary education levels have a history of engaging in topics related to ESD. Often these are labelled environmental education or health education but also more recently global citizenship, disaster preparedness, climate change and consumerism. ESD programmes for primary and secondary schools should therefore be linked to education in basic reading, writing and mathematics skills, along with an introduction to other subjects such as history, geography, natural science, social science, art, music and sometimes religion. These serve to develop learner's ability to obtain and use information from different knowledge areas.

There are two main strategies for achieving this. One is the add-on and integration strategy and the other is the whole system redesign approach. The add-on and integration strategy seeks to widen the space within existing curricula for ESD, while the whole system redesign strategy challenges the entire system by reorienting. The following must be observed to achieve success:

- Educational content structure: explore community problems through interdisciplinary studies.
- Learning processes: student-centred participatory learning that uses analytical thinking and decision-making.
- School organization: participatory decision-making involving school and community.

The learning processes should be collaborative and promote whole-school development processes.

Here are two case studies that may help you to reflect:

1. https://www.youtube.com/watch?v=pozWJZ8QrrA
2. https://www.youtube.com/watch?v=Q7iVCaL0Sk0

These case studies are about best practices of reorienting the curriculum implementation practices such as learning outside the classroom and how to adjust high school curriculum to include ESD.

5.9.3 ESD in higher education curricula

Higher education institutions are challenged to adopt long-term strategies to make sustainability a major mainstream guiding principle.

The curricula of higher education should encompass interdisciplinary learning, project-based learning, gaming, computer simulations, distance learning, back casting, case studies, policy-laboratories, problem-based learning, values education, ecological footprint analysis (examining the effect of human activity on the environment), trans-disciplinary learning, experiential approaches and reflective journal writing, among others. Programmes in higher education should aim at:

- Enhancing participation in research design and in the conduct of research that benefits communities and pays attention to the way that research outcomes are used for the community's benefit.
- Engaging students in service learning and problem-solving projects in 'real-life' contexts.
- Forging stronger partnerships with local communities and development groups to identify priorities for research and development work.

ACTIVITY 5.5

REFLECTION ACTIVITY

Reflect on the above stated three higher education programme aims:

1. What are the implications for reorienting teacher education in your institution to mainstream ESD?
2. Find and watch the video: http://www.youtube.com/watch?v=6OC3YZ0W3OU Reflect on its implications.

For further reflections on the role of higher education refer to the book Tomorrow Today (UNESCO, 2012, p 106) and Learning: The Treasure Within, UNESCO, 1996, p130-134

5.9.4 Technical, vocational education and training

Technical, vocational education and training (TVET), or education for the world of work, provides learning and life skills programmes for young people and adults. TVET is essential for the consolidation and expansion of skills, and the development of competencies necessary in the rapidly changing labour markets.

ESD in TVET curriculum and in-service training programmes should promote technical knowledge and skills, and the capacity for productive teamwork by ensuring that learners have preparation that goes beyond basic literacy and numeracy to include both vocational and social skills, together with values that help build harmonious societies[7]. TVET curriculum approach is a lifelong learning programme that should take place in schools but also in the workplace. The following five areas are integral in TVET and human capital development policies according to the European Training Foundation.

- To promote education geared to developing the values, skills and competencies for sustainable development. This includes the promotion of adequate learning environments, and the teacher education necessary to make people aware of sustainable development and thus develop the required competencies.
- To promote methods for the identification, forecasting and provision of skills to support the greening of products and services, the growth of green sectors and to improve overall competitiveness in a low-carbon future.
- To make TVET schools agents for local sustainable development that empower stakeholders in coping strategies for climate change.
- To integrate sustainable development into entrepreneurial learning and business education.
- To include the dimension of sustainable development in the analysis of partner countries' human resource development policies, with a focus on identifying and applying adequate indicators. (ETF, 2011. p. 17).

You may enrich your experience by looking at the two case studies below on environmental conservation and the importance of ESD for Africa:
https://www.youtube.com/watch?v=VW5qdeNKfs0
https://www.youtube.com/watch?v=MidtMQDwSok

5.10 ESD and non-formal learning

It is important that the curriculum also prepares teachers for non-formal learning situations. Non-formal learning entails all learning initiated by community groups, civil society organizations (CSOs), non-governmental organizations (NGOs) and networks that seek to engage citizens (young and old) in sustainability related issues. According to the Global Monitoring and Evaluation Survey (GMES), some of these activities may also involve schools, colleges and universities, but are not part of their curriculum (UNESCO, 2011).

Non-formal ESD programmes should provide platforms for schools to collaborate with all actors outside the 'core' formal national curriculum in accordance with their 'scholastic autonomy', that is, their opportunity to create self-directed educational paths. ESD in non-formal contexts can also be linked to private sector initiatives and the development of entrepreneurship. Examples here may include learning processes aimed at developing business plans that have sustainability in mind.

7 ESD for learning pillars: learning to know, to do, to be, to live together.

ACTIVITY 5.6

REFLECTION ACTIVITY

Incorporating ESD themes into the existing curriculum at all levels of learning, i.e. from early childhood education through higher levels of education (universities, TVET, colleges) will greatly promote the understanding of sustainability issues and will help all individuals work towards a common goal.

Can you identify any form of ESD in the existing curriculum – in all levels of learning in your country – that will help the mainstreaming process to fully incorporate ESD into the education system?

In order to further appreciate ESD in non-formal education, look for documentaries of Nobel Laureate, the late Wangari Maathai from Kenya.

5.11 Mainstreaming ESD in teacher education curricula

Mainstreaming of ESD in teacher education is the systematic integration of environment and sustainability concerns into a wide range of disciplines, departments, programmes and courses as well as policies, management practices and student activities. This process is value based and involves transformative learning processes/frameworks and new ways of teaching and learning such as instructional materials and in-service teacher training. Effectively incorporating ESD into the curricula may be achieved by observing some general steps and some basic requirements.

In institution-wide approach, the following general steps are essential in deciding on the themes, and to ascertain that all staff understand the rationale behind ESD mainstreaming:

- Decide which themes to emphasize within the curriculum, syllabuses, practices and policies to ensure that teacher education is responsive to the environmental, social and economic conditions and goals of their communities, regions and nations.
- Ensure that educators and administrators understand the concept of sustainability and are familiar with its principles and requirements.
- Distinguish between education about sustainable development (an awareness lesson or theoretical discussion) and education for sustainable development (use of education as a tool to achieve more sustainable futures).
- Promote interdisciplinarity with a view to fostering a holistic approach to ESD.
- Infuse sustainable development values in all aspects of teacher education curriculum.
- Take a leading role in promoting an ethically oriented form of education.
- Encourage staff and student teachers to participate in networking and partnerships across teacher training institutions at the national, regional and international levels.
- Encourage planning and responsible management of the teacher training institutions and environment and promote prudent energy consumption and water usage, sustainable waste management schemes, including recycling, and, in general, lifestyles compatible with sustainable development orientations.
- Develop and consolidate opportunities for interaction with the local community.

The basic requirements for incorporating ESD is built on the rationale that teachers must understand and consider their pivotal role as 'cornerstones' of effective ESD programmes. They must play an active role in bringing ESD issues and perspectives into the school curriculum and syllabuses. It is imperative that they understand the cross-cutting and multidisciplinary nature of ESD (refer to chapter 6 for more guidance on cross-cutting issues). They must be educated to be open to diverse learning strategies to effectively implement ESD principles and content at the school and classroom levels. Quite importantly, teachers must appreciate that working with other teachers and stakeholders is critical to tackling problems as they arise.

In mainstreaming ESD into the curriculum it is important to consider five related aspects that constitute learning outcomes and content of ESD: knowledge, sustainability issues, skills, perspectives, and values.

ESD includes principles, skills, perspectives and values related to sustainability (i.e. in social, economic and environmental realms). Curriculum mapping must ensure alertness to local values, which must then permeate the curriculum. Curriculum mapping entails looking closely at existing curricula syllabuses and activities in order to identify the ESD themes and issues that have already been included. The curriculum needs to promote values and ethics, such as respect and care for the 'community of life', social and economic justice, ecological integrity and democracy, non-violence and peace. Consideration must be made as to how these values and ethics are expressed in the local language and culture. Overall, incorporating ESD in the curriculum can be achieved through the promotion of the following features:

a) Curriculum framework informed by a critical approach/paradigm to curriculum development.

b) Trans-disciplinarity that encourages theme teaching and team teaching. Themes should be derived from the four ESD pillars, and may include: poverty, wasteful consumption, gender inequality, human rights, environmental degradation, conflict, and waste management among others.

c) Skills for decision-making, problem-solving, critical and creative thinking, communication (oral and written), computation skills, and inquiry/research skills.

d) Imparted knowledge drawn from knowledge of society, economy and environment, and informed by national ESD priorities and the major issues of concern for all forms and levels of education.

e) Perspectives that consider history and the future, as well as accommodation of the needs of different stakeholders, while promoting consensus and vision-building.

f) Lifelong learning that results in people becoming empowered to continuously improve their livelihoods and well-being through informed decisions that are culturally appropriate and relevant.

You may find some useful insights reading the following case study: https://www.youtube.com/watch?v=E9agiO89ck4. This case stydy is about Bangladesh and its pursuit of sustainable development. Bangladesh has implemented the 'poverty-environment initiative' to deal with the ravages of hunger, floods and pollution, thus addressing its challenges of sustainable development.

5.12 Methods for enhancing ESD in the curriculum

Due to already crowded curricula, mainstreaming emerging or contemporary issues such as ESD into the central school curricula is recommended (Otieno, 2006). Mainstreaming strategies include: plug-in points for integration and infusion; the text-book driven approach; the pilot-project approach; and the stand-alone subject, i.e. special-event approach. Approaches of enhancing ESD in the curriculum include:

- Infusion. Refers to the incorporation of content and skills into existing curriculum frameworks/subjects without jeopardizing the integrity of the subjects by respecting the integrity of both scope and sequence of the content and skills. It is usually applied to subjects that have no specific ESD content.
- Integration of ESD. Involves cross-curricular strategies, bringing environmental concepts into carrier subjects by way of combining environmental and sustainability concepts with the content of the subjects so that environmental concepts become fully part of the carrier subjects.
- Reorientation of subjects. Entails making emergent ESD issues integral to the curriculum structure and system. The curriculum should include principles, skills, perspectives and values related to sustainability (i.e. in cultural, social, economic and environmental realms).
- Localizing curricula. Entails focusing on the needs of the learners and the community.
- Involve institutional management. Entails involving administrators and management in creating and enabling management and administration mechanisms for ESD mainstreaming, i.e. providing strategy, policy, organizational structures, financing, networking, partnerships and incentives.

To enhance your reflections:

Examine the case studies from the Caribbean (case study 5.4) and Kenya (case study 5.5) for approaches to enhance ESD in the curriculum.

UNESCO-IBE: Module Resource Pack for curriculum design & Development training, UNESCO, 2013.

CASE STUDY 5.4

MODULE RESOURCE PACK FOR CURRICULUM DESIGN AND DEVELOPMENT TRAINING

In the ***Teachers' Guide for Education for Sustainable Development in the Caribbean*** (UNESCO, 2008*b*), Lorna Down explains that "to infuse ESD into the curriculum means to integrate, to weave into the existing curriculum, the knowledge, perspectives, values, skills/actions needed to transform society and to sustain the planet". She further explains that the infusion approach "allows us to address sustainability, not by adding another course, but through the teaching of our subject area. Teachers will find that there are sustainability topics that will complement or extend in meaningful ways what exists in their curriculum". She suggests the following steps.

Step 1: Planning for infusing ESD into a subject area

1.1 See the big picture. Identify objectives for ESD.

1.2 Identify special contributions that literature can make to the curriculum.

1.3 Identify objectives of literature.

1.4 Match literature objectives with ESD objectives.

1.5 Identify the ESD content missing in the literature syllabus.

1.6 Identify general strategies for teaching literature with an ESD focus.

Step 2: Making it Happen

2.1 Explore the term 'sustainable development' with your students.

2.2 Discuss with your students reasons for including an ESD focus in literature.

2.3 Teach with clear ESD focus, working with objectives and outcomes identified in the planning stage. Introductory Activities. Developmental Activities. Concluding/Reflective/Evaluative Activities.

2.4 Provide opportunities for students to learn about and engage in transforming the community within their community. Plan community-action projects related to lessons.

Source: UNESCO,2008*b*.

CASE STUDY 5.5

PROFILE THE STUDENT TEACHER AND THE TEACHER EDUCATOR

The programme is implemented by the Kenya Organization for Environmental Education (KOEE) in collaboration with the Alliance of Religions and Conservation (ARC). The programme integrates religious concerns, ideologies and values, and religious wisdom and practices in educational materials in English, Kiswahili, Arabic and French. This provides children with an opportunity to acquire holistic knowledge, practical experience and a sense of responsibility for their social and physical environment. Faith-based values are made central to all activities in and around the school. Study the faith based ESD toolkit and from it propose a curriculum matrix to show faith-based values. An example of such a matrix is given for water and climate change below:

Themes	Objectives	Co-curricular topics & Languages	Whole-school approach/ Activities	Skills	Faith-based values
Water Sources of Water	Identify the sources of water in their local community Demonstrate how to take care of water sources in their community Appreciate the sources of water in your family Explain how sources of water can be used to generate income	Water sources in the environment The sea	Learners taking care of water sources in school Active participation in World Water Day Establish a water project to generate income and for learning Participate actively in symposiums, clubs and school celebrations Active participation in World Water Day	Empowering young people with skills and values to promote healthy life within their environment Enhancing active learning competencies Capacity-building of individuals	Accountability Responsibility Appreciation Thankfulness Concern Harmony Sharing Respect Love
Climate change	State causes of climate change Explain effects of climate change in human activities Share resources fairly to solve challenges of climate change	Days of the week and weather Environment Everyday activities Climate and disasters Weather and climate	Draw pictures relating to the weather Recite rhymes, poems and sing songs on weather Read stories on the environment and climate change Read texts/ passages based on climate and disasters, and responses to them	As above	Love Fairness Respect Peace Harmony Accountability Responsibility Commitment Stewardship Hard work Cooperation Integrity

Further information on such type of matrix can be found at:
http://www.arcworld.org/downloads/ARC-Faith-based-ESD-toolkit.pdf and Otieno, B.D, 2004.

5.13 Summary

For the effective development of teacher curriculum and programme that is ESD oriented, one needs to adhere to the components of an effective curriculum development process. This should start with planning which covers: convening a Curriculum Development Committee; identifying key issues and trends in the specific ESD content area; and assessing needs and issues in a given locality. The next step is articulating and developing the ESD curriculum which entails: articulating an ESD programme philosophy; defining the ESD programme, and developing and sequencing the level and course objectives; identifying or developing resource materials to facilitate implementation; and developing and/or identifying assessment items and instruments to monitor learner progress. Implementing is the next phase which involves putting the new ESD oriented curriculum or programme into practice. Finally, evaluating the programme makes it possible to update the programme and determine its success. Although cross-cutting issues have been introduced in this chapter, cross-cutting issues are the central concern discussed in chapter 6.

5.14 Further reading and resources

Ginsburg, M. 2010. Improving educational quality through active-learning pedagogies: A comparison of five case studies. *Educational Research,* Vol. 1, No. 3, pp. 62–74

Ginsburg calls for active-learning pedagogies and outlines key philosophical and theoretical foundations of active-learning pedagogies. He introduces the purpose and methods of comparative case studies prior to summarizing the findings from five countries (Cambodia, Egypt, Jordan, Kyrgyzstan and Malawi), which served as cases. The findings focus on the national and related international policy discourses, the professional development and other approaches employed to promote active-learning pedagogies, and the outcomes of such efforts.

UNESCO. 2013. *Guide to Effective Teaching and Learning in Higher Education*. Bamako, UNESCO.
This guide, edited by J. Shabani and P.A. Okebukola, was developed with the support of the West Africa Economic and Monetary Union and UNESCO Bamako Office to improve quality in Africa's educational institutions.
This guide complements the present guide very well and many of its modules can be adapted for teacher education. In particular, the reader is referred to two modules that have implications and insights for reorienting teacher education in your institution to mainstream ESD, i.e. Module 2 'Curriculum development in higher education' and Module 18 'Teaching and learning of ESD in higher education'.

UNESCO. 2005. *Guidelines and Recommendations for Reorienting Teacher Education to Sustainability*. Paris, UNESCO. http://unesdoc.unesco.org/images/0014/001433/143370E.pdf
This resource provides guidelines for the reorientation of teacher training to address sustainability. It carries recommendations on how to reorient curriculum, pedagogy, policy, practice, programmes, rewards, research, information and computer technology, partnerships, networking, communications and so on.

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Chapter 6

CROSS-CUTTING ISSUES IN THE TEACHER EDUCATION CURRICULUM

Mohono-Nyabela Makamohelo

Chapter 6

CROSS-CUTTING ISSUES IN THE TEACHER EDUCATION CURRICULUM

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6.1 Introduction

This chapter presents some cross-cutting issues that need to be understood and tackled in order for people to cope with current life challenges in African societies. Africa is a developing continent where the greater proportion of the population lives in rural areas and survives directly on the natural environment. It is also urbanizing very quickly and many informal settlements are mushrooming. They have challenges of poverty, pollution, energy, scarcity of clean and safe water, and poor sanitation. In Africa, there is a mix of countries, areas and places that are undeveloped, developing and developed and which have to deal with many cross-cutting issues. This chapter examines some of these cross-cutting issues and how they must be addressed in teacher training institutions and schools with the perspective of achieving ESD learning.

6.2 Objectives

After studying this chapter, teacher educators, teachers and student teachers should be able to:

1. Demonstrate understanding of the importance of addressing ESD cross-cutting issues in the curriculum.

2. Identify opportunities in various curriculum areas to include ESD cross-cutting issues, drawing on examples from ecological, socio-political, economic and cultural spheres.

3. Appreciate the essential messages associated with ESD and quality education, and articulate them in teaching and learning.

6.3 Understanding cross-cutting issues

Our understanding of cross-cutting issues is influenced by the perspectives or lenses we use to analyse them and at the same time viewing sustainable development as having many dimensions. Cross-cutting issues are so called because their features reflect environmental, economic, social and cultural dimensions simultaneously. We can illustrate this with reference to environmental degradation as a cross-cutting issue linked to economic and social forces (Ekins, 1992; cited in UNEP 2006). For example, in many parts of Africa poor rural population have to rely on economic activities such as charcoal production, which results in forests being lost. Environmental degradation results from their efforts to eke out a living. The charcoal produced by the rural poor provides the energy needs of the urban dwellers some of whom are in the labouring class who can neither afford electricity nor are connected to the national grid. Tackling environmental degradation in society cannot be successful without at the same time tackling the social, economic and cultural issues that contribute to it. Similarly, economic exploitation of resources must not compromise social and environmental sustainability.

As discussed in chapter 2, sustainable development has four interrelated pillars, namely, economic development, social development, environmental protection, governance and cultural diversity (Koparanova and Warth, 2012). There is thus a need for education to respond to sustainability concerns. In the foreword to Tomorrow Today, Irina Bokova, Director-General of UNESCO, pointed out that it is education that will help us to change the way we think and consume our resources and whether it will be sustainable or not (UNESCO, 2010). A well developed curriculum should lay the foundation through which learners manage to live sustainable livelihoods, enjoy their rights and respect the rights of others, recognize the structures for social justice, and contribute to the economic development within their societies. The teacher education curriculum should help to reinforce the role played by in-service and pre-service education in lifelong learning processes to unfold essential messages in education.

6.4 The curriculum and ESD cross-cutting issues

A quality curriculum is relevant and addresses all the learning needs of the learners and serve as a basis to prepare learners for socio-economic roles in their societies. The challenge is that, although efforts are made by curriculum developers to include emerging or contemporary issues, the same curriculum is often designed in a way that these issues are treated in isolation to the content. Content of different subjects is compartmentalized such that there is no clear emphasis on how environment and development issues are articulated in the content, and how they relate to each other and to real-life situations.

In many southern African countries curricula, content knowledge is the foundation of understanding and thus is considered paramount. Working with environment and development issues tends to be an expansion of content knowledge rather than as an integral part of the content. Ultimately, the issues are treated in a manner that isolates them from the rest of the body of knowledge as well as the practical aspects of dealing with that knowledge; a mix that generally confuses and at times is contradictory to learners. Cambers and Diamond (2011) pointed out that ESD aims to empower and encourage people of all ages to assume responsibility for creating and enjoying a sustainable future. In order to assume responsibility they need to understand cross-cutting issues and be empowered to tackle these issues. For the curriculum, cross-cutting issues require a more integrated approach where collaboration of learners and educators is prioritized (Jobo, 2006). In this case, the curriculum should therefore be designed in such a manner that cross-cutting issues are prioritized and carry essential messages for learners and educators in order to realize a more holistic learning experience while ensuring a sustainable life.

6.5 The essential messages in ESD

As shown in chapter 4, transforming education through ESD perspective should to lead to more opportunities for all people can gain essential knowledge, develop positive attitudes and values, and acquire the skills and competencies to live responsibly and sustainably. Sustainable livelihoods are only possible in societies where human rights and equality are observed, where poverty and other cross-cutting issues are tackled, and where people in all their institutions practise fairness, respectful and caring lifestyles. In this section, the following key ESD messages are addressed.

- Human rights as they relate to social justice and equality.
- Quality of life as depending on sustainable livelihoods.
- Five pillars of learning and quality education.

6.5.1 Human rights and social justice

It is the purpose of education to broaden learners' awareness of their human rights and empower them with skills to enable them to enjoy their rights and equity to live better lives. It is within the school context that learners should learn to undertake certain responsibilities and respect the rights of others for the sake of harmonious interpersonal relations. While human rights pertain to justice for individuals, social justice affects social institutions and the distribution of socially available goods, and the costs of supplying those goods, across members of the society (Meckled-Garcia, 2011). Social justice as "justice as it pertains to social institutions, organizations and structures" (Hatton, 1994). The school provides a context for which a community of students and teachers share and use resources and opportunities within the same environment. This is particularly the reason why principles of social justice should be adhered to in teacher education institutions. Teacher educators should also be mindul as they have a crucial role of ensuring that "they work for public rather than a private interest... the work of teaching is concerned with fair sharing of the benefits of schooling." (Maxwell, 1998). The teacher education & school curriculum should therefore provide a foundation for human rights awareness and protection as well as the principles of social justice within teacher education institutions.

The aim of the curriculum is not only to organize and deliver content, it also concerns the development of attitudes and values in the learners. For example, respect for human rights and equality, the values held by the society, so acquiring such values must be nurtured in the early years of life (ECCE). The knowledge that learners gain from academic content may not necessarily prepare them to become wholesome human being, able to build the kind of society in which people live peacefully together. Values inform the behavior of individuals, because they influence the choices that they make in life. Their willingness to protect or to destroy, to be responsible or to be negligent, to be sympathetic or selfish is driven by the values they developed through socialization and interactions with their environment. It is thus important for educators to be aware of the responsibility entrusted to them by the education system, to shape the reference values and to develop the potentials of learners. To be able to do this effectively, teacher educators and teachers must fully understand the curriculum and how cross-cutting issues are articulated and how to teach them.

ACTIVITY 6.1

REFLECTION ON HUMAN RIGHTS

What are some of the human rights issues in your country? Discuss with colleagues the opportunities to include human rights and social justice issues in the curriculum.

ACTIVITY 6.2

DISCUSSING THE PLACE OF VALUES IN THE CURRICULUM

Values are a defining characteristic of many cultures on the African continent. Some of the values have helped African societies to live harmoniously and sustainably with nature. Discuss the following questions:

1. What practices and values in local communities and in African societies known to you that are relevant for sustainable development and may be promoted through education?
2. What practices and values in local communities and in African societies known to you that do not contribute towards sustainable development and must be challenged through education?
3. How can the curriculum respond to the challenge of developing values and changing behaviour?

6.5.2 Quality of life and sustainable livelihoods

Another integral idea of education is to enhance sustainable livelihoods and to achieve good quality life in society. The curriculum should provide learners with knowledge, skills and attitudes, to prepare them to achieve their basic needs through means that are not harmful to the natural environment and to other members of society. A sustainable livelihood relates to the means, attitude and behaviour of livingas well as capabilities, economic and social resources, and activities that can stand the test of time without undermining the natural resource base (Krantz, 2001). Teachers and educators should therefore be mindful that the inclusion of ESD across the curriculum should inculcate sustainable livelihoods preferences and practices required to achieve quality of life in societies.

ACTIVITY 6.3

REFLECTION ACTIVITY

Forests are sources of livelihoods for many people in Africa.

1. In what ways are forests a source of livelihood? Conduct a case study of how trees are used.
2. What are the economic, social and cultural issues surrounding the use of forest resources?
3. Are forest resources used sustainably such that they will always be available for future generations to use them for their livelihoods?
4. What attitudes and values support or not the use of forests in a sustainable manner?
5. What specific activities can be conducted in your institution to develop knowledge and values for sustainable livelihoods?

6.6 The pillars of learning

Educational quality is reflected in the outcomes dubbed 'pillars of learning':

1. learning to know;
2. learning to do;
3. learning to be;
4. learning to live together; and
5. learning to transform one self and one's society (UNESCO, 1996; UNESCO, 2010; Cambers and Diamond, 2011).

ESD aims to promote these five pillars of learning. What this means is that students need to know more than just the facts about sustainable development issues. They must learn to use their knowledge and ability to do something about the issues and problems of sustainable development in their societies. Their attitudes and behaviours should lead to sustainable lifestyles and livelihoods. They must learn to participate and contribute to activities that help transform society to achieve its sustainable development objectives through problem-solving. With respect to teachers and educators, the UNECE (2011); UNESCO (1996, 2010) suggested that these pillars of learning must translate into their professional competencies, as explained in box 6.1.

BOX 6.1

TRANSLATING THE PILLARS OF EDUCATION INTO COMPETENCIES FOR TEACHERS

The four pillars of learning have direct implications for teacher educators and teachers in terms of professional competencies and skills (UNESCO, 1996). The skills educators and teachers need to develop potentials in individuals to transform self, community and society is the goal of professional development (UNECE, 2011).

Below are the four pillars of education and their implications for teacher education and teaching:

1. Learning to know – teachers must show understanding of local and global challenges of sustainable development, and know their role – together with learners – in tackling sustainable development issues.
2. Learning to do – teachers must demonstrate practical skills and action competencies in relation to education for sustainable development.
3. Learning to live together – the teacher works with others in ways that help develop social skills, associative lifre, partnerships and an appreciation of interdependence, difference, pluralism, mutual understanding and peace.
4. Learning to be – the teacher has the ability to act with greater autonomy discipline, judgement and personal responsibility in relation to others.
5. Learning to transform self and society – the teacher has the ability to take personal and collective responsibility for transforming personal behaviour and lifestyle through developing potentials and skills in learners, as well as contributing towards changing the attitudes, behaviors and lifestyles of others to become more sustainable.

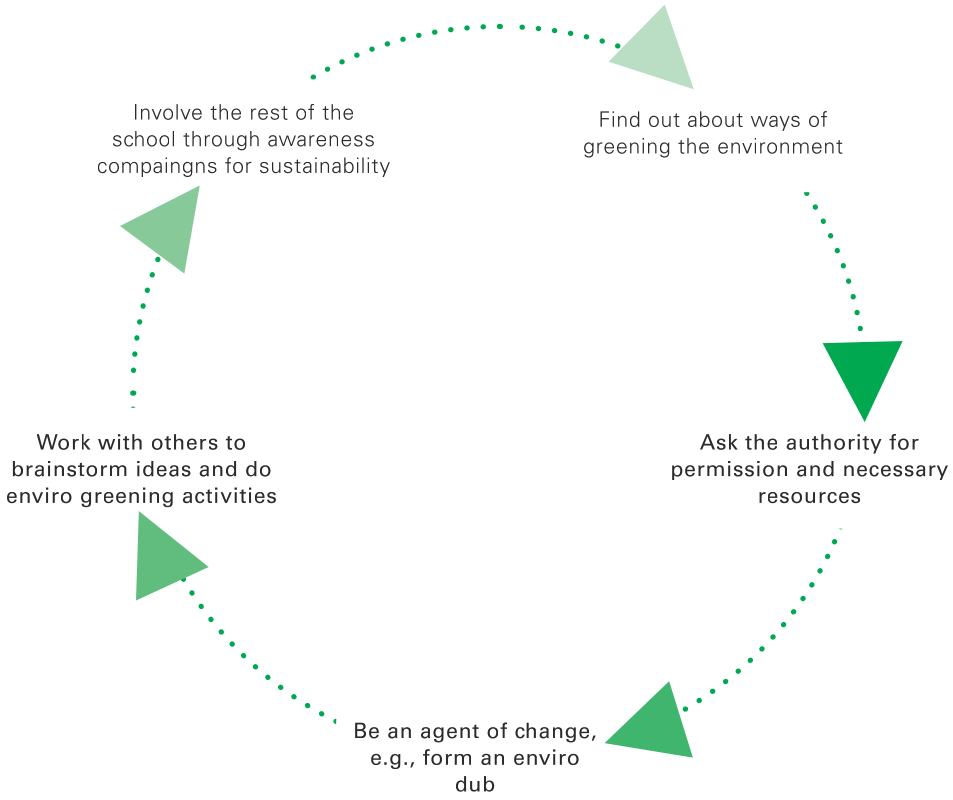
For more information, UNESCO (1996), Learning: The Treasure Within and UNESCO (2010), *Education for Sustainable Development Lens: A Policy and Practice Review Tool*

ESD should thus be integrated into the curriculum to develop in learners the knowledge skills and values systems and to assist them with ways of protecting and developing sources of livelihood so that even future generations can benefit from them. Therefore, the curriculum must be guided by and at the same time seek to achieve the five pillars of education. Across all subjects, the content and activities should be oriented towards the attainment of all five pillars of learning, and ESD should be reflected in what they know, what they do, who they are, and how they interact with others and their environment. (UNESCO, 1996)

ACTIVITY 6.4

REFLECTION ON THE PILLARS OF LEARNING

The figure shows an example where learners undertake a greening project for a school.

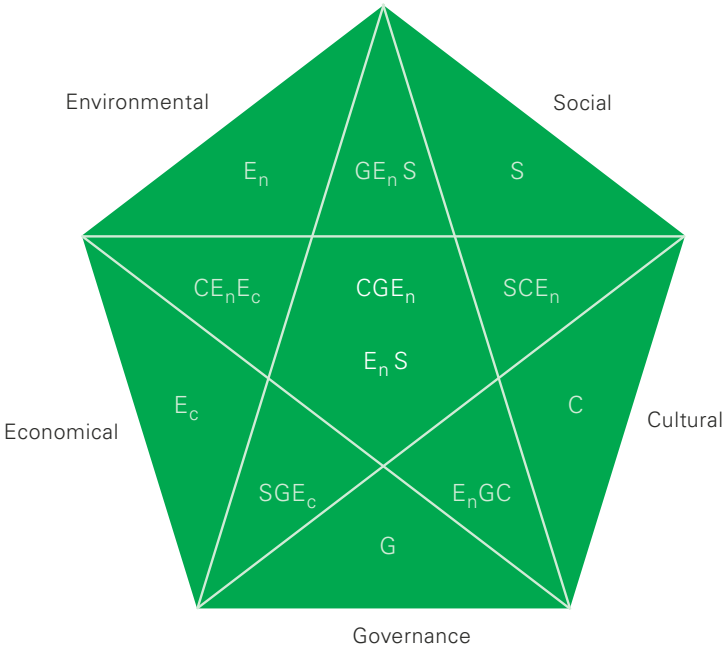


1. How may this activity be related to the taught curriculum?
2. What are the benefits of working together in this activity as teachers and students from various disciplines?
3. In what ways can long-term projects such as this one promote the learning outcomes around the five pillars of learning?

6.7 Addressing cross-cutting issues to convey key ESD messages

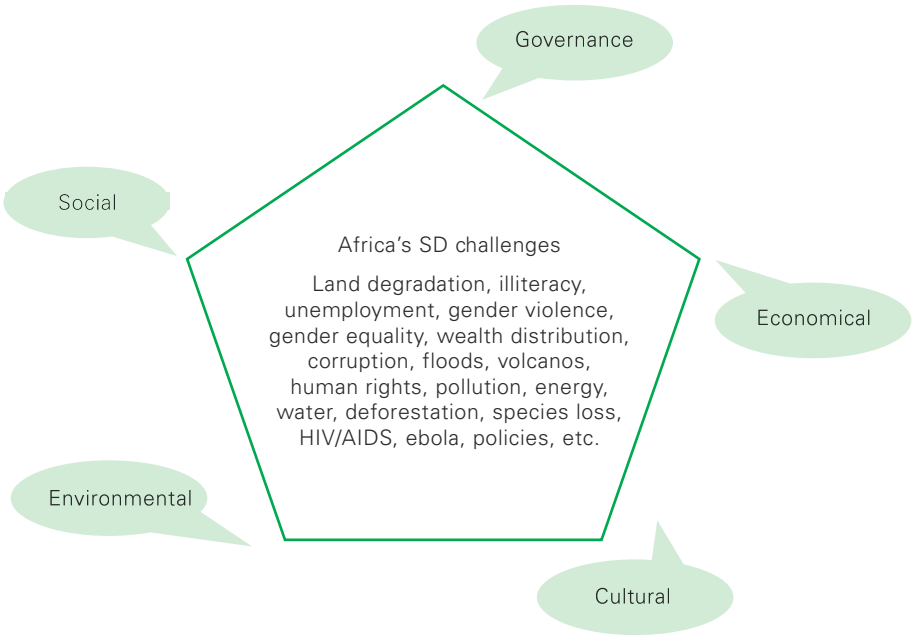
Teacher education institutions play a critical role in preparing teachers to serve as agents in transforming society towards sustainable development. It is important to ensure that they appreciate the complex nature and interconnectedness of the issues involved. Figure 6.1 illustrates the cross-cutting nature of sustainable development issues using the pentagon as the frame of reference. Each side of the pentagon reflects the dimensions of sustainable development: environmental (En); social (S); economical (Ec); cultural (C); and governance (G) dimensions. In this figure, each side of the pentagon forms the base of an isosceles triangle, which intersects with four other similar triangles. The areas of overlap are meant to show the overlapping nature of issues drawing from these five dimensions.

FIGURE 6.1 THE INTERSECTING NATURE OF CROSS-CUTTING ISSUES (AUTHORS)



Some of the challenges facing countries in Africa and how they are connected are illustrated in figure 6.2. The issues are cross-cutting and will affect sustainable development in economic, environmental, cultural and social spheres. In this section examples of cross-cutting issues are given to illustrate how educators may bring up the fundamental messages in ESD. There is need for creativity to develop a wider range of examples beyond those given here. Figure 6.2 illustrates how Africa's sustainable development challenges are cross-cutting and need to be addressed simultaneously by balancing sociocultural, economic, environmental and governance issues. In this figure, the pentagon can be viewed as a basket with cross-cutting issues falling into the one basket and each dimension taking a share of it.

FIGURE 6.2 EXAMPLES OF AFRICA'S CROSS-CUTTING ISSUES (AUTHORS)



6.7.1 Cross-cutting issues from the environmental dimension

In the environmental/ecological dimension we explore climate change, disaster risk reduction and energy. It is now understood that climate change can be attributed largely to the impact of human activities, in particular their unsustainable consumption and production, which contribute to the emission of greenhouse gases (GHGs) that result in global warming (Cambers and Diamond, 2011).

BOX 6.2

WHY RELATE CLIMATE CHANGE TO CONSUMPTION AND PRODUCTION?

The major contributors to global greenhouse gas (GHG) emissions are: "electricity and heat (25%), industry (21%), forestry and land use change (18%), agriculture (15%), transport (13%), buildings (15%), and waste water (4%)" (UNESCO and UNEP, 2011; p. 12). All these sectors use energy from burning coal, oil or gas, producing the GHG carbon dioxide. Agriculture and waste produces the GHGs methane and nitrous oxide.

Climate change is linked to extreme weather and unpredictable seasons. In Lesotho for example, good rains fall in spring and helped to prepare for the growth of field crops such as grains and vegetables. Nowadays, there is prolonged drought followed by stormy rains that limit the planting season. In 2014, the country experienced heavy rainstorms and floods that destroyed people's homes, infrastructure and crops. This has resulted in homelessness, poor agricultural production, a weakened economy and increased dependence on external assistance.

ACTIVITY 6.5

CLIMATE CHANGE AND IMPACTS ON AFRICA

Download and review the IPCC *Climate change 2014 synthesis report: Summary for policymakers.* Available from: https://ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

This should give you good information on what is known and projected about climate change.

1. What relation is there between climate change and people's lifestyles, consumption and production in your community?
2. What is the likely impact of climate change on your community and on your institution?
3. Why is ESD relevant in tackling some of the causes of climate change?
4. What can teachers and teacher educators do to tackle some of the causes of climate change?

This example shows the link between climate change and the occurrence of certain disastrous events. Many disasters that occur in Africa are climate change related, including cyclones and floods that affect mainly the Indian Ocean coastal regions and Island countries such as Mozambique, Madagascar and floods and drought in Western Africa and Sahel regions (World Bank, 2010 and FAO, 2011).These disasters greatly affect development activities and the economies of many countries because they do not have the capacity to cope with the situation. The populations are vulnerable. The situation makes disaster risk reduction an essential part of sustainable development (World Bank, 2010). By integrating these issues and disaster risk management into the curriculum of teacher education and the curricula they teach is decisive in dealing with prevention and the effects of climate change.

In addition to its strong links to some disasters, climate change also impacts on biodiversity. Indeed some human activities that contribute to climate change, e.g. deforestation, land degradation and so on, also cause changes in the biodiversity within ecosystems. Many plant, animal and fish species found in Africa are used as food and thus any loss in biodiversity impacts on food security, nutrition status of communities and poverty. For example, nearly three-quarters of the recorded protein consumption in Africa is derived from plant sources (FAOSTAT 2005 in Scholes, 2006). Plants are also used for timber charcoal, sources of energy and medicine and commercial purposes, particularly as animal products which are exported to other countries outside the continent. We can derive three key messages:

1. Human activities, their consumptive lifestyles and their modes of production contribute significantly to climate change.
2. Climate change leads to extreme weather events that may include flooding and prolonged periods of drought, potentially leading to disasters like famine.
3. Climate change impacts on biodiversity, and losses of biodiversity may worsen poverty and the nutrition status of communities.

These examples illustrate the cross-cutting nature of issues of climate change, disaster risk reduction and biodiversity. It is important to make teachers aware of the linkages, between these issues. ESD principles and messages can be learned by incorporating them into the curriculum.

ACTIVITY 6.6

MAPPING EXERCISE

Let students conduct a tour and create a map of the location of their institution (this could be the campus or beyond to include the immediate environment). Give an option to draw the map to scale (e.g. in maths or geography). They must locate various places, landforms and ecosystems on their map. They may use cameras to take pictures and videos, or GPS instruments. Upon completion of the tour, students are asked to present their results in a variety of ways and answer the following questions.

1. What is happening to the various places, landforms and ecosystems in the event of extreme weather events leading to flooding or to prolonged drought?
2. Identify on the map places or sites that would be considered safe or dangerous, places that are potential environmental hazards, and so on. What can be done about these unsafe places and hazards?
3. What would be the impact of these changes on schooling and education?
4. Is the institution safe and secure to withstand extreme weather events such as flooding, cholera outbreaks and so on?
5. What changes need to be made in the institution to make it secure or safe? How can the environment and ecosystems be protected?
6. Forecast what is likely to happen in the long term to agriculture, disease profiles, e.g., malaria, and to livelihoods in the community?
7. Conduct a survey of the ecosystem and the community. What species of animals and plants are found? Are there any species that used to be there but are no longer present? Is there folklore associated with any of the species?

An activity such as activity 6.6 can lead to acquiring knowledge and values for the protection and management of the environment and its ecosystems. At the same time students learn to value 'place'. Moreover this activity can be used in teaching different subjects, such as geography and mathematics to build mapping skills and drawing to scale. Science can stress biodiversity and interdependence, disaster risk reduction can refer to environmental and school safety, and languages can develop skills of observation and analysis in creative essays, poetry and so on that focuses on local place and environments. Teachers can be creative in designing integrative lessons anchored on sustainability messages, while teaching facts about specific sustainable development topics such as climate change, biodiversity and disaster risk reduction.

CASE STUDY 6.1

PLANNING A CHANGE PROJECT TO MITIGATE GREENHOUSE GASES

Nowadays it is possible to estimate personal and institutional GHG emission levels as carbon dioxide equivalents. For this purpose, a number of carbon emission calculators are available on the internet. Students may be introduced to, for example, the Climate Change Emission Calculator Kit (Climate CHECK) developed for the U.S. Environmental Protection Agency (EPA) Office of Atmospheric Programs. Climate CHECK is an interactive kit designed to: (i) educate high school students about climate change and GHG emissions; (ii) estimate your school's GHG emissions by performing an emission inventory; and (iii) mitigate your school's GHG emissions by developing and implementing an Action Plan.

For more information visit: www.icfi.com/insights/products-and-tools/climate-check

6.7.2 Cross-cutting issues from the economic perspective

Contributions towards global warming and climate change in Africa are associated with poverty and deforestation and the factors that drive it. For instance, deforestation in southern Africa is a serious challenge driven by land clearing for agriculture, forest fires and overexploitation of wood for fuel and timber (FAO, 2000). The section of the *Global Forest Resources Assessment Report* (FAO, 2000) focusing on southern Africa noted that Malawi was losing 71,000 ha of forest per year and Zambia 851,000 ha per year. A major factor in deforestation is the combination of poverty and energy demands. Charcoal produced for use in urban areas led to extensive areas being deforested. In Zambia 43,000 ha of forest were cleared near Lusaka alone for charcoal production in 1990 (Osei-Hwedie, 1996). An Al Jazeera newscast on Somalia and Sudan recently profiled the illegal charcoal industry as a multi-million dollar business that was helping to fund conflicts in these countries and at the same time worsening environmental degradation. Across Africa, use of firewood and charcoal as energy sources for household heating and cooking is widespread-practice among rural and the urban poor, low- and middle-income households. In rural areas, the charcoal industry may be the major if not the only source of employment and income. For law income population charcoal is often the alternative energy source in urban centres and peri-urban settlements that are not connected to the national grid or for whom electricity and/or electrical appliances may not be affordable.

ACTIVITY 6.7

REFLECTION ACTIVITY

Dependence on wood for energy is quite common in Africa. It is important to examine issues that link poverty and energy demands and to examine them with student teachers. Allow students to make a survey and analyse energy use in the institution and in the surrounding community.

1. What are the major sources of energy and the trends in energy use? Analyse these trends by household and by income level.
2. In what ways can the deforestation in the community be reduced?
3. Is there any link between sourcing for energy, firewood and gender? What does it tell about labour and education level of the population.
4. What would be the benefits from setting up a wook plot or a nutrition garden?

6.7.3 Cross-cutting issues from the sociocultural perspective

Culture is an underlying dimension of sustainable development as explained in chapter 2. Culture refers to values and lifestyles that determine whether or not development is sustainable. Through education those aspects of culture that positively support sustainable development must be transmitted while those that do not must be changed. ESD entails learning and creating a new culture in which sustainability is valued and strived for. In Africa, the majority of people in many countries are poor and vulnerable to diseases such as HIV/AIDS, tuberculosis, malaria and Ebola. In certain contexts their vulnerability is worsened by certain tradition and belief systems and practices. The curriculum objectives should lead learners to acquiring knowledge attitudes and skills that sustain-life. Societies in Africa are largely patriarchal, where gender-based hierarchies are observed in almost all aspects of life. For example, girls and women are usually at the bottom of the rung of the gender hierarchy and enjoy fewer privileges, less nutrition and property rights. In these societies girls and women are caregivers in their households and communities, and through this role they are often exposed to contagious diseases such as HIV and AIDS, tuberculosis and Ebola. Hence they are more vulnerable than boys and men (newscast:http//alj.am/1xm5RyM).

CASE STUDY 6.2

HIV/AIDS PREVENTION STRATEGIES IN UGANDA

As a way of preventing and controlling the spread of HIV/AIDS various schools and teacher training colleges have put in place policies and strategies to facilitate information dissemination to parents, teachers, students and teacher educators. The strategy involves displaying information-bearing cards, posters and so on in the campuses of the institutions. These carry messages such as 'Respect oneself', 'Respect HIV/AIDS patients', 'Be assertive', among others. This way, the community is empowered with knowledge, life skills and values that are vital for responsible and positive living. Basic facts and misconceptions about how HIV/AIDS spreads are also displayed.

One way to address this is through mainstreaming ESD in the curriculum of teacher education institutions. ESD teaches us to strive towards achieving respect for human rights and the realization of social justice including through the enhancement of gender equality in learning institutions. Readers will gain more insights into gender mainstreaming in teacher education institutions by consulting *A Guide for Gender Equality in Teacher Education Policy and Practices* (UNESCO, 2014).

ACTIVITY 6.8

REFLECTION ACTIVITY ON TRADITIONS AND BELIEFS

Local harmful traditions and beliefs concerning health and disease and gender roles need to be tackled as part of ESD learning.

- What local beliefs in your society may encourage the transmission of diseases such as HIV/AIDS, tuberculosis, malaria and Ebola?
- Is there validity in the observation that girls and females in the local community could be more vulnerable to HIV/AIDS, tuberculosis, malaria and Ebola because of their gender roles?
- Prepare and implement a lesson or lessons plans in which you elicit some local traditions and beliefs surrounding health and nutrition issues? How must the gender issues be taught in the lesson?

In addition to interrogating harmful traditional practices and beliefs in some communities, it is important to articulate the relevance of traditions and beliefs that are positive and support sustainable development. Nwonwu (2001) describes indigenous knowledge as local knowledge that is unique to a given culture or society, and that serves it well for environmental and social sustainability and for creating a culture of peace. Indigenous knowledge systems in Africa stress the values of solidarity and harmonious coexistence. Transfer of indigenous knowledge in African societies, from one generation to another occurred observing taboos, idioms, poetry, stories, folklore, games and so forth. This knowledge, and the oral traditions by which they were passed, have a place in ESD.

"Indigenous knowledge (IK) remains the cocoon in which the technology and belief systems that supported the livelihood, sociocultural and socio-economic activities of the traditional African societies have been nurtured over the years" (Nwonwu, 2001). Indigenous knowledge is relevant in African societies even today.

ACTIVITY 6.9

REFLECTION ACTIVITY

ESD allows for and respects indigenous knowledge systems and their contribution to sustainable development. Allow students to explore this issue.

- What traditions including idioms, folklore and taboos in their communities express knowledge and values that are useful for sustainable development?
  - What traditional practices are there environmental protection and conservation, promotion of peace and social cohesion, good health and others.
- Plans make lesson in which students are going to be engaged to develop poems, games, songs and essays.
  - What value do these add to the learning process and to the assessment of learning for ESD?

6.8 Summary

This chapter discussed some cross-cutting issues in ESD and how they must be addressed in teacher training institutions and schools with a perspective of achieving ESD learning. It has also stressed the essential messages of ESD learning on human rights, social justice and equality, and to the five pillars of lifelong learning. The chapter explained how that the traditions and indigenous knowledge of local communities are enmeshed in cross-cutting issues and must be addressed in ESD. Positive aspects of tradition and beliefs must be reinforced and those not serving sustainable development objectives must be discarded. This is consistent with the need for people of all ages and society to assess their present values and change any unsustainable behaviour and lifestyles to become more sustainability aware and sustainable. Overall, the chapter stresses that all areas of learning must take responsibility for mainstreaming in teaching cross-cutting issues and that ESD learning must entail critical interrogation of these issues. Chapter 7 provides a rationale and examples of teaching and learning approaches that are relevant for achieving ESD objectives and to tackle cross-cutting issues in the curriculum.

6.9 Further reading and resources

UNESCO. 2014. *A Guide for Gender Equality in Teacher Education Policy and Practices*. Paris, UNESCO. http://unesdoc.unesco.org/images/0023/002316/231646E.pdf
This guide contains ten modules. It explains terms associated with gender as a cross-cutting issue and how gender inequalities manifest themselves in educational institutions. The guide provides step-by-step information and exercises on how gender can be mainstreamed in all areas of teacher education and training. Teacher educators are also reminded about what teachers must know and be able to do in order to promote gender equality through education.

Kethoilwe, M. 2008. *Supporting environmental education and education for sustainable development in higher education institutions in Southern Africa*. Howick, South Africa, SADC REEP.
This book addresses different aspects of environmental education and ESD. The main focus should be directed to chapters 2 to 4 that show approaches that can be used to reorient the curriculum and highlight more open-ended teaching and learning strategies, and methods and activities that can be adapted for ESD integration.

SADC REEP. 2011. *Teacher Education Workbook for Environment and Sustainability Education in Southern Africa*. Howick, South Africa, SADC Regional Environmental Education Programme, Share-Net.
This workbook is meant to improve people's understanding of the natural environment and how they can conserve it for sustainability. In particular, section 2 explains the interactive nature of several aspects of the environment such as ecosystems, biodiversity, water, energy, food, waste and climate change. It provides an understanding of their value, effects and sustainable practices to enhance sustainability. Section 3 demonstrates multiple approaches of infusing and integrating cross-cutting issues of the environment into the different subjects of the curriculum, while section 4 contains methods that can be adapted for ESD in schools and colleges.

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Chapter 7

TEACHING AND LEARNING APPROACHES FOR SUSTAINABLE DEVELOPMENT

Janviere Ndirahisha & Overson Shumba

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7.1 Introduction

Education with an eye to sustainable development is a large and global notion covering interdependent questions of environment, economics, governance and sociocultural issues in society. These issues require that they be examined by all disciplines in the setting of a global approach. This requires adoption or adaptation of teaching and learning approaches to make them learner centred, experience based, and connected to real life problem-solving. Teaching and learning approaches must therefore encompass processes that develop knowledge, skills, values and attitudes that affect the individual's, the school's and the community's ambitions to create a fair and democratic society as well as economic security and ecological sustainability. If students are to be prepared to become responsible citizens it is important that they are actively engaged in learning in ways that model sustainability. In this chapter some active, participatory and student centred teaching and learning approaches for sustainable development are presented.

7.2 Objectives

After reading and completing the activities in this chapter, the teacher and teacher educator will be able to:

1. Explain and apply relevant theories to guide their chosen teaching and learning approaches for ESD.

2. Utilize a range of teaching and learning approaches for ESD with student teachers and learners.

3. Explain and demonstrate the integration of ICTs in teaching and learning that is relevant for ESD.

Teaching and learning encompass processes that promote knowledge and also include skills, values and attitudes that affect the individual's, the school's and the community's ambitions to create a fair society, economic security, ecological sustainability and democracy (Jutvik and Liepina (n.d.) at: www.balticuniv.uu.se/index.php/component/docman/doc_view)

7.3 Teaching and learning methods

This chapter looks into the teaching and learning approaches and methods that teacher educators may utilize to prepare future teachers as they integrate ESD in the teaching subjects. A method is a way of doing something in a regular and systematic way and thus, in this chapter, a teaching method reflects on the role that is played by both teachers and by learners as they work systematically to ensure learning for sustainable development. This learning will reflect the knowledge, attitudes, values and skills for responsible citizenship, and for their roles in changing their communities to become sustainable.

An ESD teaching and learning approach or method reflects the way educators and teachers implement instruction, and at the same time an ESD teaching and learning approach is a way the students act and react as they strive to reach learning objectives.

In this chapter we illustrate the use of some of the teaching and learning approaches and methods that may support learning for sustainable development. We take a leaf from Scoullos and Malotidi (2004) who observed that technically there are no ESD methods, but that through creativity and innovation existing methods can be adapted to support ESD learning. When properly adapted for ESD, these approaches will be unique in a number of ways, namely:

1. they are focused on the development of knowledge and awareness and critical thinking about local and global sustainable development issues;
2. they demonstrate principles that reflect cooperation, democracy and respect for diversity and the rights of others;
3. they allow learners to engage in identifying and resolving real-life problems or identifying and implementing projects; and
4. they allow learners to work and present the results of their work collaboratively, and allowing for multiple perspectives and use of multimedia approaches.

7.4 Constructivist theory and active learning

Teacher educators and teachers are advised to adopt at least one theory of learning to guide them and to inform the teaching and learning approaches they employ. In chapter 3 of this guidebook we discussed critical theory, system theory and capability theory, which provide the principles for ESD. We now turn to constructivist theory or constructivism. This theory assumes that learners actively process information and experiences in their minds to create understanding for themselves as they are supported by their teachers. Constructivism is against a 'banking approach' in education (Madiba et al., 2014) and is relevant for use as a guide to ESD teaching and learning approaches. As we have defined these approaches above, ESD teaching and learning approaches have a focus on: (i) student engagement and participation; (ii) real life problem-solving; (iii) collaboration; and (iv) action-oriented projects. The theory of constructivism would be a good theory to understand. It assumes that learners are actively processing information and experiences in their minds as they work; they are not passive recipients of information. They process information and experiences in their minds and 'construct' new understanding based on this active mental effort. We want to assume that this processing of information and experiences includes recognizing, comparing, analysing, interpreting, questioning, criticizing, valuing and so on, and putting it all together meaningfully in their cognitive structure.

CONSTRUCTIVISM A THEORETICAL FRAMEWORK

It is important to clarify that constructivism is not a teaching methodology but a framework for the interpretation of the learning process. Various learning and teaching methodological approaches have been based on this theoretical framework. (Scoullos and Malotidi, 2004)

ACTIVITY 7.1

REFLECT ON THE QUOTE IN LIGHT OF THE CONSTRUCTIVIST THEORY OF LEARNING

"A common aphorism of the past was that 'the African child is seen and not heard'. In the formal classroom, the African child rarely asked questions, rarely argued with the adult (and all teachers were adults), rarely questioned authority and rarely sought for explanations. … Most African teachers regarded the child as a tabula rasa, a view of the child as a blank slate, ready to be written upon as the teacher wished, or an empty gourd into which water should be poured" (Madiba et al., 2014).

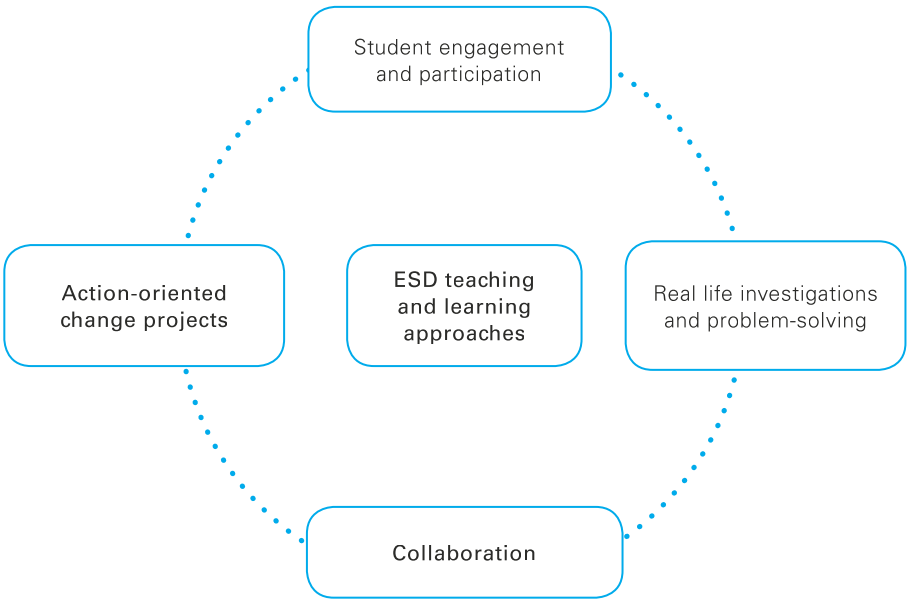
1. Is the blanking approach of learning described above still true for Africa?
2. What changes do educators and teachers need to make for teaching and learning as expected in ESD?

7.5 Examples of teaching and learning approaches

In this section, a number of approaches are discussed that will be relevant for ESD. Study figure 7.1 that summarizes some of the features associated with approaches to promote ESD learning. Reflect on these features as you study examples of some teaching and learning approaches that are presented.

- How are these features reflected in the teaching approach?
- How are these teaching approaches informed by constructivist theory?
- What changes must a teacher make in his/her own practice to effectively utilize these methods?
- How do these methods reflect the African-centred approaches described in chapter 3?

FIGURE 7.1 FEATURES OF ESD TEACHING AND LEARNING APPROACHES



7.5.1 Community-based learning

It is good practice for students to learn in the context of tackling a real issue or problem found or talked about in their local communities. Learning in the context of tackling problems in the community often goes by the names 'community based learning', 'community engaged learning' or simply 'service learning'. It is concerned with learning by doing and thus it is a method that leads to practical experiences for students. Whatever the term used it is important to note that two things must be achieved: (i) students must learn from the experience of doing an activity in the community; and (ii) the 'service' must be a contribution to some good for the community.

A good service learning activity must therefore be planned to achieve learning goals while at the same helping learners contribute something valued in the community. Students ought to be made to reflect on the activity in terms of what they are learning and what they are contributing for the good of the community, i.e. objectives of the community and objectives of learning are achieved. This means that as the students benefit in learning from the community, the community benefits from the activity involving the students.

ACTIVITY 7.2

BENEFITS OF COMMUNITY BASED LEARNING

1. What do you consider to be some benefits of community based learning? (list at least two each for students, the school, and the community).
2. Compare your list to the one provided by the Center for Teaching at Vanderbilt University. Available from: http://cft.vanderbilt.edu/guides-sub-pages/teaching-through-community-engagement/

There are many ways to incorporate community based or service learning in the course of teaching and learning activities. Some of the activities can be short term and others may require a longer duration. Regardless, it is important to realize that the activities must serve a clear purpose. The Ohio Department of Education provides useful examples and guidelines for service learning projects, adapted in case study 7.2. Their website is a useful resource: http://education.ohio.gov/Topics/Quality-School-Choice/Community-Schools/Forms-and-Program-Information-for-Community-School/Community-Service-Learning-Sample-Projects

Community service learning activities must be planned and implemented in phases, and below are some guiding questions for each phase. The incorporation of service learning requires that, first, specific sustainability issues be identified and investigated so that they are understood by learners. If necessary, resource persons from the community must be invited to speak on and explain specific issues involving health, environment, energy, water and so forth. Second, the learners must be engaged to plan, prepare and implement the service learning activities. Third, during the activities or when completed, the learners must be challenged to reflect on what they have learned and what impact the activity is having on the community. They must be prepared to express their learning in a variety of creative ways, i.e. to the community during open days or other celebratory occasions for the community. As with any other learning activity and other teaching methods, it is imperative to evaluate and assess that learning objectives (academic, social, attitudinal) are being achieved.

CASE STUDY 7.1

GUIDELINES FOR SERVICE LEARNING ACTIVITIES/PROJECTS

Project Title:

What are the sustainability issues to be addressed in the local community? Charcoal and sustainability; water, sanitation and sustainability; herbs and sustainability, and so on.

1. Investigation:

   What are the issues to be addressed and why are they selected? What exactly is being investigated?

2. Planning:

   What activities will be done and how will learners be involved? How will members of the community be involved? e.g. guest speakers, community workers and so on. How will the learning relate to the various subjects in the curriculum?

4. Preparation:

   How did you and the students get ready? Who in the school or community do you need to partner?

5. Action:

   What are the service activities students will be involved in? How will their learning be directed?

6. Reflection:

   How do they express what they did whether written, oral, artistic, visual, dramatic and other forms of expression? In what ways did your students reflect and show that learning was a part of experiences?

7. Demonstration/celebration:

   How is the success and impact of the conducted activities celebrated and shared? How will students demonstrate their new learning?

8. Assessment/Evaluation:

   How can you tell that the activities resulted in learning and attitude changes or other impacts? How was the students' progress and the impact of their efforts documented?

More information available at the following website: http//education.ohio.gov

Some good international examples of community-based learning are shown in case study 7.2 and case study 7.3.

CASE STUDY 7.2

SANDWATCH PROGRAMME IN THE CARIBBEAN

Sandwatch is a programme implemented in the Caribbean. Practitioners, community people, youths and children in and out of school come together to learn and work together to care for and to improve their environment. It follows a methodology that entails monitoring, analysing, sharing, and taking action on environmental damage on coastal areas and beaches. Together they contribute ideas for local government policy and action. It is a good example of how communities and schools come together to learn how to tackle real-life issues relating to climate change, environment, sustainable development, cultural diversity, science and more. Programme classroom subjects, such as mathematics and natural science subjects, are linked to social studies and the creative arts. All subjects implement the principles of ESD (UNESCO, 2010; http://www.unesco.org/csi/sandwatch).

CASE STUDY 7.3

KOMINKANS OR COMMUNITY LEARNING CENTRES IN ASIA AND JAPAN

In Japan the *Kominkans*, or community cultural learning centres, were mandated by the Social Education Law in 1949 as places for citizens in cities, towns and villages to learn. They are community-based learning centres promoting learning and participation in local communities, and are operated by the residents in the city, town or village who elect a management council. *Kominkans* have spread throughout Asia as centres for lifelong learning and participatory democracy. It is a place where residents decide on important local development issues and on how they must be addressed. They work together to implement projects that enhance the quality of life in their locality (Okayama ESD Promotion Commission and UNESCO Chair at Okayama University, 2013).

7.5.2 Case study methods

The case study method entails using case studies in teaching and learning, which is quite important to achieve learning for sustainability. The method relies on the fact that special cases, stories, examples, activities or characters can be found that can serve to illustrate concepts and issues in real-life contexts. The important role of the learner is to analyse the cases carefully and to draw learning points or conclusions from them. They must relate those points to a discussion of a familiar situation or context. Let us see three examples of ways of using case studies in teaching and learning. Look out for opportunities to use the cases for individual or group analysis, for information gathering by students, i.e. through literature, newspapers, library, the internet and so on, and for unique ways by which students can present or report the outcomes of their analysis and discussion.

Example 1: Students are given an article on desertification in the Sahel. See example at: http://www.bbc.co.uk/schools/gcsebitesize/geography/water_rivers/drought_rev3.shtml

Pictures are also given for the period before and after desertification.

The learners will be challenged to investigate and find details of desertification. What role did people play that resulted in desertification? What happened to people, vegetation, animals and the land? What are the problems and consequences associated with desertification? Have people fully adapted? What will happen if the same activities are allowed to continue in the local community?

Example 2: Students are told a story of the worst drought in an African country, alternatively, they are asked to find pictures of the 'worst drought in Africa' on the internet, i.e. through the Yahoo search engine.

Students are asked to study the pictures and investigate the causes of drought? Are people's activities contributing factors? What happens to water supplies and to life in the community? Faced with such drought, what can be done in cities and rural villages?

The above examples illustrate a few points concerning the use of case studies in teaching and learning. First, a relevant case must be selected for study to illustrate a concrete problematic situation. Second, the learner is required to make careful observations concerning the case and to find out more information on the case. A learner must research more and in analysing the case ends up drawing certain conclusions. Third, the case study is an opportunity to bring about the confrontation of opinions, thus lending itself to discussion with others and providing an opportunity for group work and analysis of the case. Fourth, the case study calls for careful reflection of the case in the context of the local situation, sometimes confronting the 'What if' type questions.

Example 3: A case study of an unsustainable livelihood that harms the environment and the community.

This example shows a third variation of the potential use of the case study whereby the learners, together with their teacher, plan and investigate a situation to create a case study. Here the learners are confronted with the situation to find an unsustainable livelihood or practice in the local community, e.g. charcoal industry, stream bank cultivation and so on. What are the key issues surrounding the unsustainable livelihood? How extensive is the practice? What is the evidence of unsustainability? What can be done about this practice? In this case, it is possible to create a case study that can serve as a starting point for activities and action projects within the community.

Example 4: Conducting a case study of a region in your country to identify specific sustainability issues such as clean water, clean energy, food security, environmental degradation, and other relevant local issues.

Allow students to make presentations of the outcomes of their case study and answer the following questions: What are the key causes of the problem? Are there any cross-cutting issues? What should be done to address the problem? Conduct a survey of learners and local people.

7.5.3 Values clarification and values analysis methods

The various Chapters have shown that sustainable development and ESD are value-laden concepts. Value-laden concepts are often controversial in the sense that two or more reasonably informed persons, even experts, will disagree on certain aspects of the issues. As such, values are very important to develop as part of learning for sustainability.

> Understanding values (e.g. one's own values, the values of the society one lives in, and the values of others around the world) is an essential part of understanding one's own and other people's viewpoints. (UNESCO, 2012)

Our values determine our most likely behaviours in certain situations where choices ought to be made. In teaching and learning for values clarification, the purpose is to assure that learners develop their own values; a process that is supported by observing and analysing the value of others and those of society, and comparing them to one's own values. In addition, it is important for students to learn how to make choices and to act according to their convictions and the values they hold.

> Values clarification allows learners to exercise their minds and faculties in distinguishing values that may – or values that may not – contribute towards sustainable development. It helps to pose questions to learners:
>
> How did you decide this way?
>
> What alternatives are there?
>
> Why are some alternatives or options not chosen?

Two commonly expressed methods of teaching and learning value-laden issues are 'values clarification' and 'values analysis'. These two methods differ on the locus of attention on values: on the self (values clarification) and on the other (values analysis). Values clarification methods entail learners being challenged and encouraged to clarify their own thoughts, feelings and commitments on certain issues.

This brings out not only their standpoint but also their likely course of action in given situations or when confronted with certain issues. In contrast, values analysis means engaging learners in the analysis of the values that other people hold dear around issues. In ESD, experiences in values clarification and in values analysis are important to understand self and to appreciate and respect others, as well as the manner in which to work together on projects that contribute towards sustainable development and sustainable communities. Try out the following activities 7.3 and 7.4.

ACTIVITY 7.3

REFLECTING ON MOSQUITO NETS

People living in some malaria prone areas are often given mosquitos nets as a way to improve the health standards by preventing mosquito bites. However, in some cases the same people in these communities are found to be using the mosquito nets in the following ways, which is logical for them but have other consequences:

- Used as fishing nets, also to catch small fish.
- Used as greenhouse cover for graving vegetables such as spinach.
- Used as wedding veils for brides.

1. Think of alternative uses to which mosquito nets are put. Explain why these practices are improper and unsustainable.
2. What is your stance with regard to people using resources in alternative ways?
3. What can teachers and teacher educators do to ensure that local people do not misuse resources such as mosquito nets?

ACTIVITY 7.4

EXPLORING SUSTAINABLE DEVELOPMENT ISSUES

With groups of students, explore and research the issue of 'sustainable development' from the following angles, as well as the attitudes and educational values associated with these.

- Human rights and democracy
- Cultural diversity
- Gender equality
- Education for all
- Health for all
- Work for all

The groups of students will present their results in a variety of ways. Ensure that they examine the values that subtend each one of these aspects, e.g. what are some local traditions and beliefs, and attitudes to these issues?

7.5.4 Experimental methods

Experimental methods represent a special case of investigative approaches that are useful for developing a range of scientific practices, life skills and attitudes. Experimental methods are suited to developing the following skills and attitudes associated with scientific methods of work:

1. Thinking skills, such as making hypotheses, designing experiments and drawing conclusions on the basis of evidence.
2. Practical skills, such as making careful and systematic observations, taking accurate measurements, and guaranteeing safety when handling apparatus and specimen.
3. Communication skills, such as verbal and written communication, using appropriate language, reading symbols, data tables, graphs and accurate drawings.
4. Social skills, such as cooperating, working in a group and honesty.4. Attitudes and habits, such as criticalness, respect for evidence, humility, persistence, curiosity, open-mindedness and objectivity (Mutasa and Wills, 1994).

Typically, experimental methods are used when one desires to find answers to questions such as the following:

- What is the impact of…?
- What happens if…?
- What difference does it make…?
- Is this hypothesis or theory true or not?

These questions require that we plan practical activities to collect and analyse information, and use what we find out to answer the questions. It entails looking for evidence in support of our answer or conclusion. The experimental activities can be done in the classroom, laboratory or outdoors taking advantage of the environment. The usual steps of doing experiments are the following:

1. Stating hypothesis (the expected result).
2. Experimenting (doing the practical activity).
3. Observing and recording the results.
4. Analysing and interpreting the observations and the results.
5. Drawing conclusions supported by the results (adapted from Scoullos and Malotidi, 2004).

Experiments can be done to find out answers to the question 'What is the impact or effect of…?' An example is: What is the impact of acids on different materials found in the local environment? This can lead to a discussion of the origins and impact of acid rain for example. Other experiments might require students to explore 'What happens if…?', which requires students to predict or make hypotheses *before* they make observations and collect data to evaluate whether their predictions or hypotheses are true. Some experiments can be done outdoors and over a long term. For example, students can explore the difference that the application of humus, chicken manure and mineral fertilizer can have on the growth of bean seeds. This can lead to a discussion of fertilizers and the pros and cons of different fertilizers. It is important to encourage students to always find out more about the topics on which they experiment by reading from a variety of sources.

In general, experiments require creativity on the part of teachers, teacher educators and students. For example, students can each explore how much water they use when they brush their teeth with a tap water running (Jutvik and Liepina, n.d). They can project how much running water is lost by teeth-brushing both within the family and within the community. What can they do to conserve water based on what they find out?

7.5.5 Simulations and associated methods

In this guidebook, the interrelated chapters stress that values clarification methods comprise all methods used to engage learners actively in exploring their opinions, attitudes and values. There are many methods associated with values clarification. For example, role-plays, drama, games, debates and other forms drawn from the arts provide the means for values clarification when used properly. These methods have three important features. First, these activities involving role-plays, drama, games, debates and so on are entertaining and can motivate learners. Second, these activities serve as a good medium through which to communicate important sustainable development knowledge, messages and values. For this reason, they are sometimes referred as 'edutainment' methods. Third, these methods are examples of simulation activities. Fourth, in certain activities such as role-play, learners take up and act the role of another person with specific functions in real life, and thus they experience being able to express themselves as an other character.

> Games, drama and role-plays allow members of a group to improvise as actors in order to envisage situations drawn from reality and thus elicit attitudes and knowledge they would not have expressed under other circumstances. These methods provide the opportunity for learners to put themselves in the shoes of others. Those who watch the staging develop a critical mind insofar as they must judge the reactions, the attitudes and the arguments put forward by the actors.

In the resources listed below (e.g. UNESCO, 2012; Scoullos and Malotidi, 2004), the following activities are considered simulations in that they present teaching and learning scenarios in which learners must participate and obtain meaning, which can be knowledge gained or values clarified. However, as with simulations, these activities tend to simplify complex real-life situations to the level where they can be understood in the role-play, dramatization or game. Try out the activity 7.5 below.

ACTIVITY 7.5

SIMULATION ACTIVITY 'MUST THE CHARCOAL INDUSTRY BE BANNED OR NOT?'

In many communities in sub-Sahara Africa deforestation is a major challenge and, among other issues, the charcoal industry is to blame. For rural communities the charcoal industry provides an income for youth. In urban areas the charcoal supplements erratic electricity supplies, and for some families it provides a cheaper and preferred energy source. Deforestation is one major contributor to climate change that has already contributed to erratic rain patterns and reduced crop yields in some parts of African countries.

(a) Prepare a series of lessons with the objective that students will appreciate the numerous sustainability issues the community faces and what may be done to tackle them.

(b) In the lessons, assign students to five groups to search for information and data concerning the following: Group 1: The charcoal industry – the economic and employment side; Group 2: The charcoal industry – energy consumption in rural and urban homes; Group 3: The charcoal industry – the environmental degradation side; Group 4: The charcoal industry – climate change; and Group 5: The charcoal industry – local law and policies.

(c) Each group is instructed to prepare the report in the form of a creative simulation activity and present it to the class, e.g. plan a role play, a dramatization or community meeting. Roles may include: charcoal worker, farmer, environmental management officer, household owners, law enforcement officers or disaster management officer.

(d) A member of the group must summarize and interpret the activity and also answer the questions:

Where do you stand on the issue of charcoal burning?

Must the charcoal industry be banned or not?

What workable options are available?

These three interrogations (in activity 7.5) make it necessary for the teacher to clearly articulate the purpose of engaging students in the activity as well as the intended learning outcomes. When using activities, it is important to ensure that the focus does not fixate on the activity itself but rather on the intended learning or value clarification objectives. For example, it is important to ask reflective questions at the end of the activities involving role-plays, games, drama, debates etc. so as to check that the students have learned the intended objectives through the activity.

1. What did you see as the purpose of this activity? Was the purpose achieved?
2. How did it feel to be in the role of this person?
3. Is this activity similar to what you would find in real life? In what ways does the activity differ from real life?
4. What did you learn from this activity? How did you feel in this activity?
5. Is there something you would do as a result of this activity?

7.5.6 Problem-based learning

So far, we have shown teaching and learning approaches in which learners are engaged in learning by doing, by service learning in the community, by simulating real-life activities, and by working cooperatively. It is to be noted that an important teaching and learning approach is that of the problem-based learning method or problem-solving method. In discussing its use, we shall refer the reader back to the simulation activity 7.5 above 'Must the charcoal industry be banned or not?'. As seen in this example, the problem of charcoal burning has been identified and been shown to be linked to many economic, environmental, social and even cultural issues. What solutions or alternatives can be identified to solve this problem? The problem-solving teaching method attempts to accomplish two things; (i) help students learn to identify and recognize a problem; and (ii) help students to explore possible solutions based on analysis of leading evidence. Consequently, the problem-solving method is often said to consist of the following phases: identification of the problem; exploration of information, ideas and data; identification and try out (i.e. implementation) of a solution; and the evaluation and reflection on the results, and conclusion on whether or not the problem is solved.

Problem-solving can be an extension of the charcoal simulation activity in box 7.5. The question 'What are the workable options available?' is a useful starting point to prospect for solutions to the problems associated with the charcoal industry. The ideas that emerge from the students' presentations can be further developed into activities to be tested out and evaluated. In other words, the teaching and learning methods for ESD may be used together. Another example is given in activity 7.6.

ACTIVITY 7.6

REFLECTION ACTIVITY INVOLVING LOCAL ISSUES

Assign groups of students to investigate a local issue of their choice and explore why it is problematic in the community, e.g. the impact of fertilizer and pesticide use, the impact of biofuels, the impact of skin lightening creams on the community and so on.

- Why is it a problematic sustainable development issue? (They must present data that it is problematic and impacts on sustainable development using evidence from newspaper reports, scientific data, perceptions, and so forth.)
- How can these issues be tackled in the community? (Allow students to prepare posters, dramatizations, multimedia presentations and so on for the class, and simulate an 'Open day' with parents.)
- How can this issue be tackled in languages, sciences and other subject areas of the school curriculum?

7.5.7 Investigative methods, excursions and field trips

It will be noticed that the methods so far discussed require that learners be involved in finding out information, collecting data, and evaluating this information and data. The methods have an element of being investigative. Investigative methods involve asking learners individually or in groups to carry out individual researches and then presenting their results to classmates. As seen in the example of simulation and problem-solving, students have to carry out investigations.

In the course of investigations it may be necessary to visit places, sites or institutions of interest. Field trips or excursions offer formal and structured opportunities to visit and learn from the experience of visits. Try out activity 7.7.

ACTIVITY 7.7

PLACE-BASED LEARNING OPPORTUNITIES

1. Assign students to identify issues of importance in the community. Among these, indicate those that have an importance for future generations. They must explain why, and in a few words (a maximum of ten) indicate an action that can be taken in order to safeguard them.
2. Allow student teachers to identify a site for a half-day excursion in the local community, e.g. a cultural centre, a heritage site, a museum, an integrated farm, a factory.

- What must the student teachers prepare their learners for ahead of the excursion?
- What ESD learning outcomes must student teachers plan for their learners?
- How will learners be asked to present the experiences from the excursion? (Ask them to link their experiences to the various subject areas they are learning.)

In the School of Education at the University of Zimbabwe student teachers have explored various topics, for example, as part of their involvement with the Education for Strong Sustainability and Agency (ESSA) project. They work together with pupils, parents in the surrounding area, parent's association committee members and other staff members on projects suited to local areas, such as:

1. Establishment of herbal gardens
2. Establishment of indigenous trees nurseries
3. Waste management
4. Protection of water sources
5. Gulley reclamation
6. Tree planting

On the university campus, students also collect waste metals to create a sculpture park to showcase the big five animals: elephant, cheetah, lion, buffalo and the rhinoceros.

7.6 Choosing the appropriate teaching and learning approach

The choice of teaching and learning approach or combinations of approaches to use is determined by many considerations. It may be determined by the target learning goals and outcomes for example (Scoullos and Malotidi, 2004). In ESD, learning goals relate to awareness and knowledge, attitudes and values, skills and behaviour, and involvement in change projects and activities. Case study approaches may be useful for gaining knowledge and awareness or specific issues. Simulation methods such as role-play and games are better used when attitudes and values are the target learning outcomes. When specific skills and competencies are deemed desirable, projects may be useful. As previously shown, community service learning approaches lead to more integrated learning, i.e. knowledge, skills and values are learned in the context of implementing projects. It must be borne in mind that each method will have its strengths and weaknesses; one has to choose the method for its strengths and relevance in achieving the target learning outcome. As explained, it is imperative to use the methods in complementary ways.

7.7 Use of information and communication technologies

The 21st century is a World of ICTs and their application in educational settings has grown considerably since the last century. They are important in helping learners extend their capacity to perceive, understand and communicate, and as such ICTs are critical tools in ESD (Nyangechi, Eze and Adu, 2013). In light of all the active learning methods promoted in ESD, it is important to think imaginatively and creatively on how it will be possible to integrate the use of ICTs. Try activity 7.8. This calls for teacher educators to re-orient their teaching and learning approaches by integrating the use of ICT as pedagogical, communication, networking and information and knowledge sources.

WHAT IS ICT?

The term 'information and communication technologies' refers to forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. This broad definition of ICT includes such technologies as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, and computer and network hardware and software, as well as the equipment and services associated with these technologies, such as videoconferencing, e-mail and blogs. (UNESCO, 2007)

ACTIVITY 7.8

EXPLORING ICTS FOR ESD

Study the definition of ICTs in the UNESCO ICT Programme in Education. (UNESCO, 2007)

(a) Which ICTs do you have access to personally, and what about your students?

(b) Propose how you might use some of these resources in lessons, including those promoting ESD objectives: consider internet websites (e.g. www.nasa.gov/education/materials), simulation programmes, data and graphics software (e.g. Excel), social media platforms (e.g. Facebook, WhatsApp) and so on.

(c) How have specific ICTs enabled learning of issues in remote places and cultures?

(d) What would you consider to be responsible use of ICTs by students?

7.8 Summary

This chapter presented and discussed examples of teaching and learning approaches and methods that may be used to develop ESD concepts and principles. It seeks to provide guidance for teacher educators on how to support student teachers gain competence and confidence through these methods as part of their training and practice. The activities are applicable for use with younger learners in primary and secondary schools. The chapter encourages teachers, student teachers and teacher educators to experiment together with these teaching and learning methods to make the integration of ESD part of their normal professional routines.

In conclusion of this chapter, the reader is invited to reflect on the question: What do the teaching and learning approaches for sustainable development have in common? All the teaching and learning approaches discussed in this chapter give learners the opportunities to actively acquire knowledge, develop skills, clarify their opinions and develop values. They do so by learning by doing, by service learning in the community, by simulating real-life activities, by working cooperatively, and by problem-solving. Used with careful planning and facilitation, these methods have the potential to develop learners' confidence and their capacity to ask questions and solve problems, and to think critically when confronted with issues. They encourage learners to express and defend their viewpoints on the basis of evidence and data on what they believe and value. All the methods permit the use of ICTs by both teachers and students. Finally, these methods are unique in that learning is extended beyond the confines of the classroom to spaces around and beyond the school. Learning is exercised through the exploration of issues in the local environment and the local community, thus enabling a connection of learning to real-life issues. In a nutshell these methods can be seen overall as pedagogies for responsible citizenship and thus require a reorientation towards an assessment of learning. In the final chapter 8, assessment reoriented towards ESD will be explained.

7.9 Further reading and resources

Jutvik, G. and Liepina, I. (n.d) (eds). *Education for change: A handbook for teaching and learning sustainable development*. EU Comenius 2.1 Programme, Baltic University Programme Uppsala University. http://www.balticuniv.uu.se/index.php/component/docman/cat_view/160-teaching-materials
Provides a good introduction to sustainable development and ESD. It provides the reader with reflection exercises that help to develop deeper understanding, as well as an easy-to-comprehend explanation of constructivist theory and how it serves to transform the role of the teacher or educator. The handbook also provides examples of teaching, learning and assessment methods, and will be a useful complement to the present guidebook.

Scoullos M. and Malotidi V. 2004. *Handbook on Methods used in Environmental Education and Education for Sustainable Development.* Athens, Mediterranean Information Office for Environment, Culture and Sustainable Development. http://www.medies.net/_uploaded_files/publications/HANDBOOK._ENGpdf.pdf
Provides a good background to ESD explaining how it evolved from environmental education. The handbook explains constructivism theory providing a good framework for understanding the learning process and the approaches to effectively support the learning process. It also provides information on Bloom's learning hierarchies. The handbook has many examples of teaching and learning methods, which it illustrates by showing the reader both the advantages and the disadvantages of each method.

UNESCO. 2012. *Education for sustainable development source book*. Paris, UNESCO. http://unesdoc.unesco.org/images/0021/002163/216383e.pdf
An open access source book written for primary and secondary teachers and mid-level decision-makers. It gives some orientation to sustainable development and ESD with some review exercises, and it provides useful information on ESD teaching and learning approaches. The handbook has several examples of teaching and learning methods and gives sample lesson plans on implementing them.

UNESCO. 2010. *Sandwatch: Adapting to climate change and educating for sustainable development*. Paris, UNESCO. http://unesdoc.unesco.org/images/0018/001894/189418e.pdf
A good case study of the Sandwatch programme that implements ESD principles in the Caribbean. Practitioners, people in the community, youth and children in and out of school come together to learn and work together to care for and to improve their environment. It provides guidance and steps on how to start a change project following a methodology that entails monitoring, analysing, sharing, and taking action on environmental damage. It provides examples of how to mainstream ESD principles in school subjects.

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UNESCO. 2010. *Education for Sustainable Development Lens: A Policy and Practice Review Tool*. Paris, UNESCO.

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Chapter 8

ASSESSMENT FOR ESD LEARNING OUTCOMES

Ravhee Bholah

Chapter 8

ASSESSMENT FOR ESD LEARNING OUTCOMES

Ravhee Bholah & Overson Shumba

8.1 Introduction

This chapter discusses assessment in teacher education institutions in the context of ESD. It provides some insights into the assessment of learning activities and how such an assessment can be used to promote sustainable development. A distinction between the different assessment approaches is made and the relationship between good assessment practices and learning for sustainable development is explained. The chapter highlights the importance of good assessment approaches in providing feedback and feed-forward to student teachers and teacher educators. It is important for readers to appreciate the links between different assessment strategies to teaching and learning approaches for ESD, as explained in chapter 7.

8.2 Objectives

After reading the chapter, teacher educators and teachers will be able to:

1. Explain the relationship between good assessment and learning in ESD.

2. Distinguish and be abble to apply different types of assessment approaches for ESD in their own assessment of learning.

3. Relate different assessment practices to teaching and learning approaches for ESD.

4. Provide effective feedback through appropriate assessment approaches.

8.3 Assessment in teacher education

Through ESD, teacher education institutions train staff and student teachers to become responsible citizens so as to meet sustainable development challenges at both local and international levels. In order to achieve this it is imperative to have appropriate assessment systems that affirm the effectiveness of the teaching and learning processes. Wike (1997) considers assessment to be a process that is broader than measurement and testing. It is a purposeful data collection process and often qualitative that includes review of direct performance, practical work and other authentic evidence of performance and accomplishment. Consequently, learners must be exposed to a range of assessment approaches that are fair inclusive, contextualized and valid. Assessments must be valid, meaning that it must measure what the assessor intends to assess.

For example, if a question in the assessment uses abstract language, which is beyond the competency level of the learner, to assess knowledge about a social situation, the assessment may be considered invalid. In this case, the language used in the assessment question would create a barrier; the question might assess the language competency of the student but not necessarily his/her knowledge about the social situation itself.

Assessment of learning in the context of ESD is twofold:

- To inform the teacher educator and the student teacher the strategies to adopt in improving teaching and learning; and
- To inform the teacher educator and student teacher on the progress in relation to their understanding of sustainability issues.

Assessment for ESD can focus on knowledge, skills, attitudes and dispositions, and participation in action and change projects in the institution and in the community. Box 8.1 highlights the important aspects that form the basis of assessment. It emphasizes the importance of motivation towards change of behaviour and participation in projects to change unsustainable ways in communities and institutions.

BOX 8.1

ASSESSMENT FOR ESD

Assessment must demonstrate evidence that learners are acquiring knowledge, developing attitudes and skills, and acquiring values and the motivation needed to change personal behaviours or to participate in projects to change unsustainable ways in the institution and in the community.

Teacher education institutions are required to create environments that are characterized by sustainable practices, that include ESD related activities and projects involving all students. The impact of these activities and projects on students, institutions and stakeholders must be evaluated. Bennet (1984) suggested several changes (1-3) below) to be assessed with respect to environmental sustainability. These are relevant to ESD, conceived more broadly to encompass its other dimensions.

1. Public awareness of – or views on – environmental matters resulting from students' activity;
2. Environmental decisions and/or policies that may have resulted, in whole or in part, from students' activities; and
3. Actual ecological and/or environmental conditions that were positively affected as a result of students' activities.

BOX 8.2

OUTCOMES ASSOCIATED WITH ENVIRONMENTAL LITERACY

- Knowledge of the ecosystem and how it operates e.g. the water cycle.
- Knowledge of environment and of environmental problems and issues.
- Skills associated with the identification, investigation and resolution of problems and issues.
- Environmental dispositions such as sensitivity, values and personal efficacy.
- Participation in service and action projects.

8.4 Methods of assessment

Several methods of assessment can be used to develop a comprehensive understanding of the dimensions of students' ESD learning. The methods can be direct and indirect. These methods and techniques, when appropriately used, evaluate and measure student learning and the attainment of learning outcomes.

8.4.1 Direct assessment methods

Direct assessment methods prompt students to demonstrate their learning in a clear and compelling way and helps produce observable evidence, i.e. they can produce work so that observers can assess how well students' texts or responses match with institutional or programme level expectations. Observers draw inferences based on what students produce, how they perform, or what they select in response to a range of questions or stimuli designed to assess the dimensions of their learning.

EXAMPLES OF DIRECT ASSESSMENT MEASURES

Tests and examinations; projects; performances; oral presentations; research reports; portfolios

8.4.2 Indirect assessment methods

Indirect assessment methods capture student's perceptions and attitudes about their learning as well as the educational environment that supports that learning, such as access to – and the quality of – services, programmes or educational offerings. These can give an indication that students are learning, but do not generally indicate exactly what they are learning or by how much. Some examples include student satisfaction and alumni surveys that document perceptions, reactions or responses. Results of indirect methods may well complement the results of direct methods.

EXAMPLES OF INDIRECT ASSESSMENT MEASURES

Course evaluations; surveys and self-reports; focus groups, interviews; publications (newsletter, journals, books); outreach activities

8.5 Types of assessments

There are many types of assessments and some of these include diagnostic, formative, summative, norm-referenced, criterion-referenced and benchmarked assessments.

8.5.1 Diagnostic assessment

This is usually done at the beginning of a course, lesson or project to assess a student's strengths, weaknesses, level of competency/knowledge/understanding and skills prior to instruction. Initial diagnostic assessment also enables teachers to ascertain what students bring into a course so as to make the teaching and learning responsive to students' needs as well as building upon existing knowledge.

8.5.2 Formative and summative assessment

Assessment can be formative or summative.

The goal of formative assessment is to *monitor student learning* to provide ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning. More specifically, formative assessments.

- help students identify their strengths and weaknesses and target areas that need work
- help faculty recognize where students are struggling and address problems immediately

Formative assessments are generally *low stakes*, which means that they have low or no point value. Examples of formative assessments include asking students to:

- draw a concept map in class to represent their understanding of a topic
- submit one or two sentences identifying the main point of a lecture
- turn in a reasearch proposal for early feedback

Formative assessment is typically carried out throughout the course of a teaching and learning process. Its purpose is to provide feedback and to support further learning. In formative assessment the teacher responds to questions and interacts with students during the learning activities (Black and Williams, 1998). Black and William caution that the questions asked by the teacher must be thoughtful and reflective rather than simple and factual. They urge teachers to use different strategies to ensure student participation, as individuals and in group activities as they learn about and tackle sustainable development issues.

In formative assessment, teacher observation and classroom discussion play vital roles. Tests and homework can also be used by teachers to track learning, inform about the quality of learning, to provide specific focused feedback for enhanced learning. Portfolios or collections of student's work continuously may also be used to monitor the development of skills and knowledge over time. The information gathered can be used by the teacher to guide the teaching-learning process. Formative assessment is most effective when feedback is passed on to students immediately, as delayed feedback can decrease meaningfulness and pupose for the learner. In this guide, emphasis is placed on formative assessment because of its mertis in.

The goal of summative assessment is to *evaluate student learning* at the end of an instructional unit by comparing it against some standard or benchmark.

Summative assessments are often *high stakes*, which means that they have a high point value.

- a midterm exam
- a final project
- a paper
- a senior recital

Information from summative assessments can be used formatively when students or faculty use it to guide their efforts and activities in subsequent courses provinding feedback and supporting learning, and thus enabling acquisition of defined ESD learning outcomes.

8.5.3 Ipsative assessment

Ipsative assessment measures how well a particular task has been performed as indicated by attainment or grade, quality of work or recent improvement. It assesses precisely the present assessment against the prior performance of the individual.

8.6 Assessment for ESD learning

The assessment criteria in ESD should be guided taxonomies of learning. These taxonomies of learning cover cognitive, affective and psychomotor domains of learning. In Table 8.1 we only show Bloom's taxonomy of cognitive learning adapted from Huitt (2011). The taxonomy is arranged into six levels reflecting the different levels of cognitive demands with respect to tasks and questions posed to the learner or responses provided by the learner. Of the six levels on the Bloom taxonomy, level 1 (knowledge) is the lowest and level 6 (evaluation) is the highest. These levels reflect the thinking demands we place on learners when we ask them questions or other tasks and the level of response we expect in their answers.

TABLE 8.1 LEVELS IN BLOOM'S TAXONOMNY OF LEARNING

Level 1 KNOWLEDGE	Learner recalls or recognizes information, ideas, and principles in the approximate form in which they were learned. Learners can write, list, label, name, state, and define
Level 2 COMPREHENSION	Learner translates, comprehends, or interprets informationbased on prior learning. Learners can explain, summarize, paraphrase, describe, and illustrate
Level 3 APPLICATION	Learner selects, transfers, and uses data and principles to complete a problemor task with a minimum of direction. Learners can use, compute, solve, demonstrate, apply, and construct
Level 4 ANALYSIS	Learner distinguishes, classifies, and relates the assumptions, hypotheses, evidence,or structure of a statement or question. Learners can analyze, categorize, compare, contrast, and separate
Level 5 SYNTHESIS	Learner originates, integrates, andcombines ideas into a product, plan or proposal that is new to him or her. Learners can create, design, hypothesize, invent, and develop
Level 6 EVALUATION	Learner appraises, assesses, or critiques on a basis of specific standards and criteria. Learners can judge, recommend, critique, and justify

Adapted from Huitt, W. (2011). Bloom et al.'s taxonomy of the cognitive domain. Educational Psychology Interactive. Valdosta, GA: Valdosta State University.
Retrieved 07 June 2018, from http://www.edpsycinteractive.org/topics/cognition/bloom.html

Within the ESD framework it is important to ensure that learners are given tasks that will enable them to respond at all levels. Further, learning has to be assessed for competencies by relating skills, attitudes and actions. The teacher may use observation or other forms, such as projects, to gain a deeper understanding of students' thinking with regard to environmental and sustainability issues. Debates, presentations and analysis of research findings may demonstrate students' understanding of issues, skills, attitudes, and the appropriate actions they may undertake to effect social change.

ACTIVITY 8.1

1. Find out information on the cognitive, affective and psychomotor domains of learning. What is their relevance for ESD?
2. Design a simple activity or task derived from your locality, which allows you to assess student learning in the cognitive, affective and psychomotor domains of learning.

ESD competencies may also be evaluated through the following:

- projects
- portfolios
- peer assessment
- self-assessment

8.6.1 Projects

A project is usually a creative activity involving a set of specific actions, documents and pre-texts, and an idea to create different kinds of theoretical products or real objects. It is a dynamic approach to teaching in which students explore real world challenges, simultaneously developing cross-curriculum skills while working in collaborative groups. It allows students to integrate knowledge from different areas in order to identify the solution to a problem. This method encourages active cognitive skills and creativity in negotiating multilevel issues to solve problems (UNECE, 2009). Over the years, the steps used in projects have therefore evolved from a set of simple or problem-based inquiry to more complex activities leading to project-based learning approaches.

8.6.2 Portfolios

A portfolio consists of a purposeful collection of student work that exhibits the student's efforts, progress and achievements in one or more areas of the curriculum over time (e.g. individual papers, projects and internship supervisor observations, internship placements or other programme requirements such as comprehensive exams). It usually consists of students' best work, self-selected samples of work experiences related to the outcomes being assessed, and evidence of the student's growth and development towards mastering identified outcomes (Paulson *et al.*, 1991). The collection must include: (i) student participation in selecting content; (ii) criteria for selection; (iii) criteria for judging merits; and (iv) evidence of a student's self-reflection.

Portfolios have been widely adopted for a variety of purposes by educators over the years. There are three main ways to use portfolios, although these are not mutually exclusive, and each has important subcategories; these are for development, assessment and showcasing. In addition, electronic portfolios are widely used in education institutions and may contain photos, graphics, videos, written narratives and hypertext links to organize the material.

8.6.3 Peer assessment

Peer assessment is a process whereby students or their peers grade assignments or tests based on a set of criteria. The practice is employed to empower students, save teachers time, improve students' understanding of course materials and improve their metacognitive skills. Peer assessment is grounded in theories of active learning. It can empower students to take responsibility for, and manage their own learning. It enables students to learn, to assess and to develop lifelong assessment skills, and enhance their learning through reflection, knowledge diffusion and exchange of ideas. It also motivates them to engage with course material more deeply.

For peer assessment to be more beneficial teachers should brief their students about the rationale for carrying out peer review, and explain the expectations and benefits of engaging in a peer review process. They may also consider having students evaluate anonymous assignments for more objective feedback. They must also be prepared to give feedback on students' responses to each other.

8.6.4 Self-assessment

It is the process of looking at oneself in order to assess aspects that are important to one's performance (i.e. abilities). Self-assessment promotes academic integrity through student self-reporting of learning progress; it promotes the skills of reflective practice and self-monitoring. Self-assessment also develops self-directed learning and increases one's motivation. It improves satisfaction from participating in a collaborative learning environment, and it usually helps students develop a range of personal, transferrable skills to meet the expectations of future employers (Sitzman *et al.*, 2010).

ACTIVITY 8.2

SELF-ASSESSMENT ACTIVITY

Conduct a self-assessment on whether or not the teaching methods you employ are aligned or matched with the assessment methods that you use.

8.6.5 Assessment of values, actions and skills

Assessment helps to examine ways in which students apply their learning in environmental and sustainability education to real-life situations. Assessment should be able to measure values such as sensitivity and respect towards others and nature, and awareness on environmental and sustainability issues. Teacher educators and teachers can assess students on their ability to express their own opinions, feelings or critical matters with regard to social, economic and environmental concerns, as well as their willingness to consider changing personal habits and behaviours (Ketlhoilwe, 2008). They can also assess the ability of students at problem-solving, suggesting alternatives, decision-making, appreciating different points of view, and comparing and appreciating the points of view of others (Murdoch, 1993). Engaging students in service work in the community is one context in the assessment of values, skills and competencies. This also provides an opportunity to assess the values, skills and competencies that students are acquiring and exhibiting in a real world context. It is important to map out and plan projects with the community. This will help to take into account the community's seasonal activities.

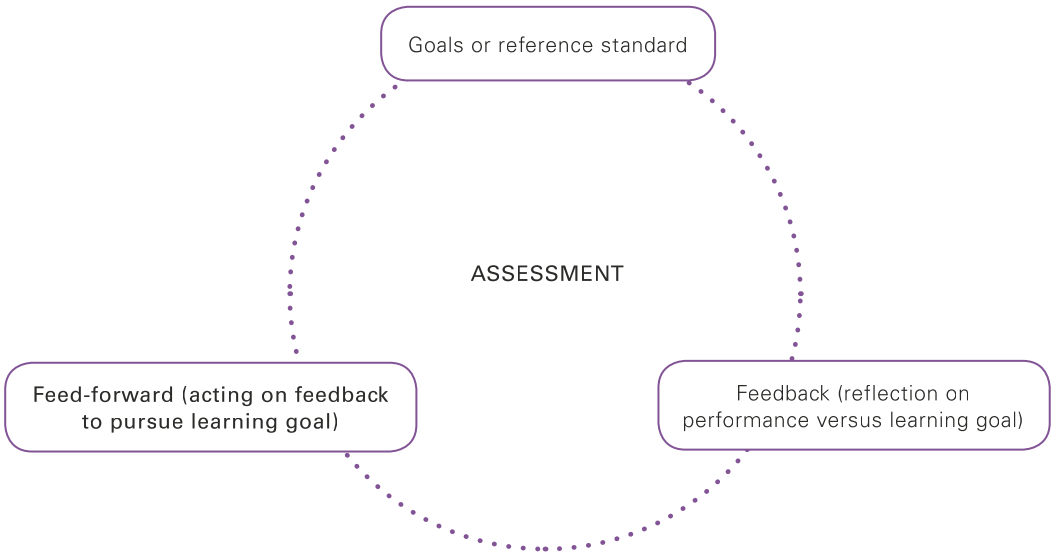
8.7 Assessment, feedback and feed-forward

Research is quite consistent in showing that assessment helps to learn more potently when combined with appropriate feedback, and when there are opportunities to use the feedback to reflect on learning activities (Cretu and Negovan, 2012; Nicol, 2009; Quinton and Smallbone, 2010; White, 2008; Sadler, 1989; Wiggins, 2010). Sadler (1989) suggests that there are three 'indispensable conditions' for effective assessment, namely that:

1. the learner must be aware of the learning goal;
2. the learner must obtain feedback; and
3. the learner must use the feedback to reflect and learn further.

The feedback and feed-forward between educator and student teacher, and between teacher and learners, is therefore critical for learning as it enables learners to learn from the feedback. Figure 8.1 describes the cyclic relationship among assessment goals, feedback and feed-forward.

FIGURE 8.1 RELATIONSHIP AMONG FEED-UP, FEEDBACK AND FEED-FORWARD IN AN ASSESSMENT



Nicol (2009) provides 12 principles of good formative assessment and feedback and the questions teachers might ask about their current assessment practices (box 8.3).

BOX 8.3

PRINCIPLES AND QUESTIONS FOR GOOD FORMATIVE ASSESSMENT AND FEEDBACK

Good assessment and feedback practice should:

1. *Help to clarify what good performance is (goals, criteria, and standards):* To what extent do the students on your course have opportunities to engage actively with goals, criteria and standards before, during and after an assessment task?
2. *Encourage 'time and effort' on challenging learning tasks:* To what extent do your assessment tasks encourage regular study in and out of class, and deep rather than surface learning?
3. *Deliver high-quality feedback information that helps learners to self-correct:* What kind of teacher feedback do you provide, and in what ways does it help students to self-assess and self-correct?
4. *Provide opportunities to act on feedback (to close any gap between current and desired performance):* To what extent is feedback attended to and acted upon by students in your course and, if so, in what ways?
5. *Ensure that summative assessment has a positive impact on learning:* To what extent are your summative and formative assessments aligned and supportive of the development of valued qualities, skills and understanding?
6. *Encourage interaction and dialogue around learning (peer and teacher-student):* What opportunities are there for feedback dialogue (peer and/or tutor-student) around assessment tasks in your course?
7. *Facilitate the development of self-assessment and reflection in learning:* To what extent are there formal opportunities for reflection, self-assessment or peer assessment in your course?
8. *Give choice in the topic, method, criteria, weighting or timing of assessments:* To what extent do students have choices in the topics, methods, criteria, weighting and/or timing of learning and assessment tasks in your course?
9. *Involve students in decision-making about assessment policy and practice:* To what extent are students in your course kept informed or engaged in consultations regarding assessment policy decisions?
10. *Support the development of learning groups and communities:* To what extent do your assessment and feedback processes help to encourage social bonding and the development of learning communities?
11. *Encourage positive motivational beliefs and self-esteem:* To what extent do your assessment and feedback processes enhance your students' motivation to learn and be successful?
12. *Provide information to teachers that can be used to help shape their teaching:* To what extent do your assessment and feedback processes inform and shape your teaching?

Source: Nicole, 2009. Quality Enhancement Themes:The First Year Experience (The Quality Assurance Agency for Higher Education), available at: www.enhancementthemes.ac.uk/pages/docdetail/docs/publications/transformingassessment-and-feedback. Reproduced with permission.

ACTIVITY 8.3

REFLECTING ON ASSESSMENT

1. Reflect on whether your assessment approaches are measuring up to the Nicol (2009) principles? Explain why some of your assessment practices need to change to reflect Nicol principles?
2. Suggest some assessment tasks you would undertake to reflect on Nicol assessment principles.

Source: Nicole, 2009. Quality Enhancement Themes:The First Year Experience (The Quality Assurance Agency for Higher Education), available at: www.enhancementthemes.ac.uk/pages/docdetail/docs/publications/transforming-assessment-and-feedback. Reproduced with permission.

8.8 Summary

Assessment and evaluation are widely used to ensure delivery of quality education including ESD in teacher education institutions. A range of direct and indirect methods of assessment and their various forms should be used and have been explored in this chapter. Teachers and teacher educators need to plan assessments that are appropriate to cover knowledge, attitudes, values and skills so as to decide and behave in ways that promote sustainability. Consequently, this chapter has drawn the attention of educators and teachers to a wide range of assessment approaches, methods and strategies for sustainable development.

8.9 Further reading and resources

Maki, P.L. 2004. *Assessing for Learning. Building a sustainable commitment across the institution.* Sterling, VA, Stylus Publishing.
This book is designed to assist colleges and universities build a sustainable commitment to assessing student learning at both institutional and programme levels. It explains the kinds of learning that students will draw and build upon as they move into the workplace, their local communities and an increasingly global community.

Angelo, T. A., and Cross, K. P. 1993. *Classroom assessment techniques: A handbook for college teachers*, 2nd ed. San Francisco, Jossey-Bass Publishers.
This handbook stresses that classroom assessment encourages teachers to "become more systematic and sensitive observers of learning as it takes place every day in their classrooms." It encourages practitioners to become more reflective. The handbook describes 50 classroom assessment techniques and illustrates nicely their use with brief case studies across different subjects.

UNESCO. 2010. Teaching and Learning for a Sustainable Future. http://www.unesco.org/education/tlsf/
This is multimedia teacher education programme containing 25 modules of professional development for use in pre- and in-service education of teachers, curriculum developers, education policy-makers, and authors of educational materials. Theme 4 carries a section on 'appropriate assessment'. It provides ways of assessing student learning that are appropriate to ESD.

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Index

United Nations
Educational, Scientific and
Cultural Organization

Education
Sector

Guidebook on Education for **Sustainable Development** for educators

Effective teaching and learning in teacher education institutions in Africa

Societies still face huge challenges in transforming into sustainable lifestyles and practices. Education is vital to achieve this transformation. Countries require a new generation of teachers in order to address the complex problems of poverty and development through education and build inclusive and equitable societies. These teachers must be professionals and knowledgeable about a variety of interconnected themes and emerging issues. Teacher educators must be supported in their roles, widening their knowledge and understanding about the complex interactions, among disciplines and systems to implement holistic teacher education curricula.

The themes, case studies, learning activities and references offered in this Guidebook demonstrate how education for sustainable development can effectively shape teacher education curricula and programmes. Sustainability is considered as an integrating context for curriculum and institution-wide practices in teacher education. Themes such as society, environment, economy and culture are treated as interconnected pillars of sustainable development. Articulating education for sustainable development in teacher education and curricula enables educators, teachers and learners to fully develop the knowledge, perspectives, values, attitudes and skills required to participate in decision making processes for improved quality of life locally and globally.

This Guidebook is a continuation of efforts made by UNESCO and its partners during the UN Decade for Sustainable Development (2004-2014) to re-orient education for sustainability. It will support implementation of the Global Action Programme (GAP) on education for sustainable development and SDG4. Teacher educators and teachers are key players in empowering learners as agents of ecological, economic, political, cultural and social transformations.

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4 QUALITY EDUCATION

Sustainable Development Goals