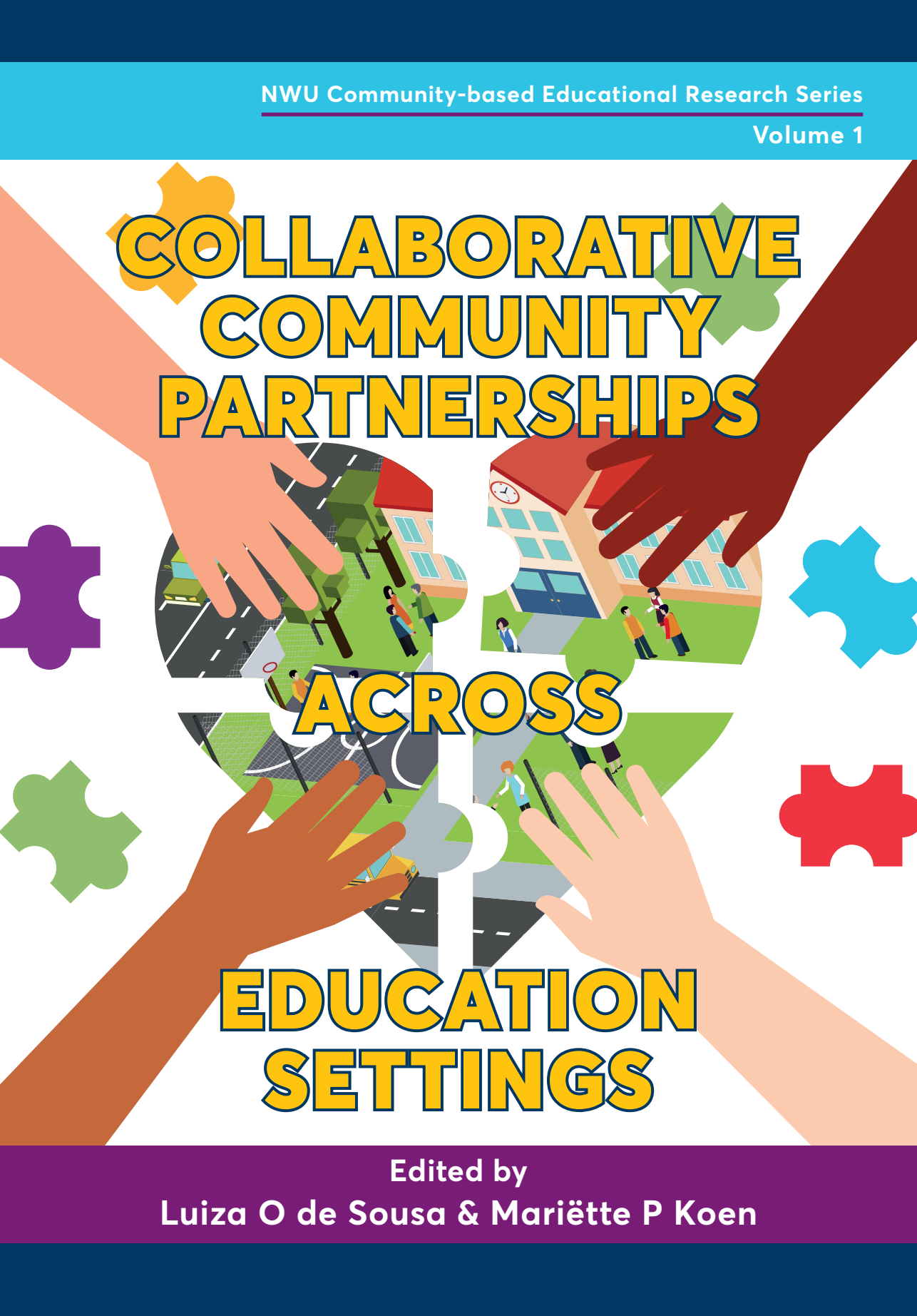




COLLABORATIVE COMMUNITY PARTNERSHIPS

ACROSS

EDUCATION SETTINGS

Edited by
Luiza O de Sousa & Mariëtte P Koen

NWU Community-based Educational Research Series
Volume 1

COLLABORATIVE COMMUNITY PARTNERSHIPS ACROSS EDUCATION SETTINGS



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Volume 1

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EDITED BY
Luiza O de Sousa and Mariëtte P Koen



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Peer-review declaration

The publisher (AOSIS) endorses the South African 'National Scholarly Book Publishers Forum Best Practice for Peer-Review of Scholarly Books'. The book proposal form was evaluated by our Social Sciences, Humanities, Education and Business Management editorial board. The manuscript underwent an evaluation to compare the level of originality with other published works and was subjected to rigorous two-step peer review before publication by three technical expert reviewers who did not include the volume editor and were independent of the volume editors, with the identities of the reviewers not revealed to the volume editors or contributing authors. The reviewers were independent of the publisher, volume editors and contributing authors. The publisher shared feedback on the similarity report and the reviewers' inputs with the manuscript's volume editors to improve the manuscript. Where the reviewers recommended revision and improvements, the volume editors and contributing authors responded adequately to such recommendations. The reviewers commented positively on the scholarly merits of the manuscript and recommended that the book be published.

Research justification

Scholars from various education fields who work in the interdisciplinary field of sustainability authored chapters in this book, *Collaborative community partnerships across education settings*. This book is the first volume in North-West University's Community-based Educational Research Series.

The authors of this book volume explored how quality education can be addressed by focusing on early childhood education, primary and secondary education, and higher education. This book explores how participatory collaborative collaborations between practitioners, parents/guardians and teachers can provide children, adolescents, and pre-service and in-service teachers with opportunities to become active collaborators in making a positive contribution to learning environments and a more sustainable world through participatory approaches. This scholarly book provides researchers and scholars with invaluable empirical evidence of how collaborative initiatives can generate knowledge to promote sustainable development. It will also promote partnerships and collaboration among local community leaders and families, pre-service and in-service teachers, learners, non-governmental, governmental and private sector stakeholders for life-long learning, continuing professional development (CPD) and community-based social learning.

The value of the book also resides in its focus on documenting and promoting southern African experiences on collaboration initiatives in teaching and learning both formally and informally across a wide spectrum of levels of education. The book captures southern Africa's pursuit of achieving the United Nations' (UN) sustainable goal (SG) of quality education and promotes the dissemination of research experiences. Through empirical research and community projects, this book demonstrates how various research designs and data generation techniques can be applied to education in practice at all levels of education, from early childhood to tertiary. Both theory and practice are presented in this book, and the methods employed in the research demonstrate how to carry out participatory research.

The book's intended target audience is scholars (academics and experts) and professionals undertaking research and/or realising projects on early childhood care and education, primary, secondary and higher education, and education for sustainable development (ESD) in Africa.

The ten original chapters in this book will add significantly to the body of knowledge in the field. Individual chapters of this book followed a quality assurance process. They have been subjected to strict blind peer review by at least two external reviewers with good academic standing in their respective fields. The authors had to implement the reviewers' comments and recommendations before the chapters were accepted for publication in this book. References to other authors' works and other sources are duly acknowledged. The following chapters have acknowledgements to either dissertations or the authors' previously published work: 'Incorporating education for sustainable development through community-based education in the Foundation Phase' by Sandra Fourie and Lesley Wood; 'Outdoor play in early childhood education for sustainable development: Parent-practitioner collaboration' by Stef Esterhuizen; 'The use of entomophagy learning resources to foster education for sustainable development' by Mellisa Palmer, Barry Richter, Cathy Dzerefos and Anette Hay; 'Stakeholder involvement in reforming a Namibian Physical Science syllabus through climate change environmental education' by WN Iipinge and LO de Sousa; 'Embodied experiential place-based education: A possible map to expand the prioritisation for an environmentally

literate and sustainable citizenry through life orientation' by Pieter Swarts; 'Project-based teaching, citizen science and education for sustainable development: A partnership for youth-centred teaching and learning' by Irene Muller; 'Challenges experienced in early childhood care and education centres to promote quality education: The view of practitioners as co-researchers for sustainable development' by Benita Taylor; and 'Learner-centredness, partnerships and participatory action learning and research: A triad of transitioning in a special needs education context for sustainable development' by Marietha Malan, Lesley Wood and Mariëtte Koen.

Additionally, care was taken to ensure that no text was plagiarised. This book contains more than 50% original content that has not been published elsewhere, following the requirements of the Department of Higher Education and Training (DHET).

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List of abbreviations and acronyms

ABA	asset-based approach
ACES	Academy of Community-Engaged Scholarship
ADHD	attention deficit hyperactivity disorder
ALG	action learning group
ALS	action learning set
AR	action research
AREA	African Reggio Emilia Approach
BRICS	Brazil, Russia, India, China and South Africa
CAPS	<i>Curriculum and Assessment Policy Statement</i>
CBE	community-based education
COMBER	Community-based Educational Research
CoP	community of practice
COP	Conference of Parties
CPD	continuing professional development
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DOT	Do One Thing
EE	environmental education
ECCE	early childhood care and education
ECD	early childhood development
ECDE	early childhood development and education
ECECfS	early childhood education and care for sustainability
EE	environmental education
ESD	education for sustainable development
ETDP-SETA	Education, Training and Development Practices Sector Education and Training Authority

FAL	(English) First Additional Language
FET	Further Education and Training
HIV	human immunodeficiency virus
HL	(English) Home Language
ITPs	individual transition plans
LO	Life Orientation
MDG	millennium development goal
MDGs	millennium development goals
MES	Mathematics Education and Society
MiPS	motor skills in preschool
NCS	<i>National Curriculum Statement</i>
NELDS	National Early Learning Development Standards
NIECD	<i>National Integrated Early Childhood Development Policy</i>
NIED	National Institute for Educational Development
NPO	non-profit organisation
NQF	National Qualification Framework
NRF	National Research Foundation
NST	Natural Science and Technology
NWU	North-West University
PALAR	participatory action learning and action research
PAR	participatory action research
PBL	project-based learning/play-based learning
PIECCE	Project for Inclusive Early Childhood Care and Education
QOL	quality-of-life theory
SDG	sustainable development goal
SDGs	sustainable development goals
SEAD	social emotional ability development
SEO	Senior Education Officer
SID	severe intellectual disability
SIDs	severe intellectual disabilities
TPACK	technological, pedagogical and content knowledge
TVET	technical and vocational education and training
UFS	University of the Free State
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environmental Programme

UNESCO	United Nations Educational, Scientific and Cultural Organization
WCED	World Commission on Environment and Development
ZPD	zone of proximal development

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Preface

Partnerships educating for sustainable development across collaborative settings

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The aim of this book is to document the functioning of community-based education partnerships across all educational levels and work towards fostering sustainable development. Teachers, as integral members of a community of practice, play a critical role in bringing about transformative efforts required to achieve sustainable developmental goals (SDGs) (UNESCO 2010).

The community-based research reported on in this book used participatory methodologies while advancing education for sustainable

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development (ESD). Participatory action learning and action research (PALAR) is a research approach that involves active participation and collaboration between researchers, stakeholders, practitioners, teachers, parents and community members to identify research questions, collect and analyse data and implement solutions. The aim of PALAR studies is to generate knowledge and promote social change by supporting participants in addressing issues that directly affect their lives (Wood 2020). One way to manage environmental issues is to involve all interested individuals, according to a sustainable development principle that emerges from the desire to preserve the environment (De Sousa 2021). Education for sustainable development has its foundation in environmental education (EE), which initially arose from a deep-seated concern for the natural environment. Education for sustainable development represents a significant reaction to the environmental crisis, encompassing not only environmental concerns but also social, political and economic challenges.

The 1972 Stockholm Convention served as a blueprint for environmental protection (UNESCO 1972). The conference directly resulted in the creation of the UN Environmental Programme (UNEP), whose primary duty was to define the phrase 'environmental education' to provide a conceptual framework for future global development (Irwin & Lotz-Sisitka 2005). The Tbilisi Declaration thereafter (UNESCO-UNEP 1978) shared that EE should be 'integrated into the whole system of formal education at all levels to provide the necessary knowledge, understanding, values and skills'. Environmental education is about understanding the interconnections that exist in and between the biosphere and human societies. Environmental education acknowledges that the biophysical and human-made environment are interdependent and should adopt a holistic and interdisciplinary approach (UNESCO-UNEP 1978). Further to this, the 1987 Brundtland Commission formalised the concept of sustainable development when they were trying to find a link between environmental issues and economic development. The concept, formulated by the World Commission on Environment and Development (WCED) in the document titled *Our Common Future* (Brundtland 1987), refers to the development that permits the current population to fulfil its requirements without impeding the ability of future generations to fulfil their own desires. The document also highlighted the interconnectedness between environmental, social and economic challenges that humanity encounters daily.

In addition to the advances made in the 20th century, the 2009 Bonn Declaration called for a reorientation of teacher education programmes. Education for sustainable development was to be incorporated into education programmes through the development, research and dissemination of good pedagogical practice in teacher education (UNESCO 2009). United Nations Educational, Scientific and Cultural

Organisation's move to ESD, following the World Summit on Sustainable Development (UN 2002), underpinned the vital role of education in nurturing environmental consciousness, ethical awareness, essential skills and behaviours conducive to sustainable development. The approach also facilitates active public engagement in decision-making processes, as outlined by UNDESA in 1992. Embracing such a holistic approach to sustainable development recognises the complexity of the global challenges we confront. This inclusive approach, central to the theme of this book, sheds light on pertinent issues. The ten chapters are dedicated to exploring collaborative methods aimed at fostering an awareness and comprehension of sustainable development issues. The overarching objective is to assist people to understand the causes, consequences and interconnectedness across social, economic and environmental realms. By instilling a sense of immediacy and accountability for collective action, this book aims to cultivate an informed and proactive society, echoing the fundamental imperatives emphasised in the landmark 1987 Brundtland Report.

The term 'education for sustainable development' is complex, and there are many interpretations. For the purpose of this book, it is described as a field focusing on the well-being of individuals through education by promoting future economic, social and environmental aspects (Weldemariam et al. 2013). The chapters argue that ESD is essential for building a more literate, aware and engaged society. The chapters show how collaborative approaches allow teachers and community members to address the complex challenges posed by crises and to work towards a more sustainable and resilient future from early childhood until higher education.

Given the emphasis on interactive, real-world learning (Joseph & Said 2020), the first theme of this book shares how EE and sustainable development are integrated into teaching methods. These discussions illustrate how involving learners in real-world issues empowered them to apply their knowledge to proactively address challenges. Furthermore, the dialogue underscores that EE and sustainable development are not merely concepts to be taught; rather, they are intrinsic elements woven into teaching and learning. The subsequent theme of the book explores how community empowerment through education can foster sustainable development. Specifically, it examines collaborative community-based educational partnerships aimed at sustainable development. Through educational collaborations with local communities, learners actively engage with pertinent issues, collectively striving to achieve SDGs. It emphasised that educational practices aimed to fulfil a broader goal beyond just acquiring knowledge; rather, they aimed to create positive, lasting impacts on society and the environment.

The chapters highlight the potential of PALAR within the context of ESD. Participatory action learning and action research offers a valuable framework for fostering collaborative approaches to ESD across various educational levels and beyond. These collaborative efforts are anchored within the framework of the United Nations' (UN) SDGs, also known as the Global Goals, which were adopted in 2015 as part of the *2030 Agenda for Sustainable Development* (UN 2015). The SDGs, comprising 17 interconnected goals, provide a universal roadmap for addressing global challenges and building upon the principles outlined in the Brundtland Report. Within this framework, the chapters in this book demonstrate how communities of practice, through education, actively contribute to a more just and sustainable future for all. Specifically, this book discusses several SDGs, including Goal 2 (SDG 2): Zero hunger; Goal 3 (SDG 3): Good health and well-being; Goal 4 (SDG 4): Quality education; Goal 10 (SDG 10): Reduced inequalities; Goal 11 (SDG 11): Sustainable cities and communities; Goal 12 (SDG 12): Responsible consumption and production; Goal 13 (SDG 13): Climate action; Goal 16 (SDG 16): Peace, justice and strong institutions; and Goal 17 (SDG 17): Partnerships for the goals (UN 2015).

A critical aspect of achieving sustainable development, as outlined in SDG 4, is ensuring quality education that is inclusive and equitable. Education for sustainable development plays a pivotal role in this endeavour by equipping learners with the knowledge and skills necessary to promote sustainable practices. This book underscores the importance of a participatory approach to ESD, emphasising that meaningful change cannot be imposed from the top down. Instead, it requires active involvement and collaboration among multiple stakeholders, including practitioners, teachers, caregivers and communities. Furthermore, the chapters explore how education can foster critical thinking, cultural change and intercultural tolerance among learners, ultimately cultivating responsible citizens committed to protecting the planet's future. Achieving quality education requires educating children about lifestyle choices, helping them think for themselves and fostering cultural change and intercultural tolerance. The chapters of this book present how stakeholders, practitioners and teachers can promote ESD and work towards ensuring children become responsible adults who will work to protect their own futures (Taylor, Quinn & Eames 2015). Hence, this book addresses EE and sustainable citizenry.

One of this book's key strengths lies in its focus on participatory processes that engage stakeholders at various levels of the education system, including ECE. By empowering teachers and communities to co-design approaches to ESD, this book illustrates the potential for grassroots initiatives to drive meaningful change. Ultimately, ESD is essential for

building capacity and fostering professional development within the education sector, enabling teachers to address socio-ecological challenges and advance sustainability goals effectively.

The ten chapters in this book address pertinent topics and offer evidence-based recommendations for developing the discipline of ESD. A crucial component is the inclusion of different stakeholders from the formal and non-formal education sectors in each research chapter. This facilitates cooperative relationships between educational institutions, communities and other field sectors.

The structure and thematic focus of the chapters are outlined here. The chapters are divided into two distinct themes. Chapters 1–4 vary from fundamental to advanced levels of instruction in EE and sustainable development. Conversely, Chapters 5–10 shift focus to community and individual empowerment through educational initiatives, underlining their pivotal role in advancing sustainable development goals.

Chapter 1, ‘Incorporating education for sustainable development through community-based education in the Foundation Phase’ by Sandra Fourie and Lesley Wood, shows how ESD could be integrated into the Foundation Phase through community-based research. It discusses not only how active engagement among participants could contribute to incorporating knowledge, perspectives and experiences to environmental issues but also how to develop sustainable solutions through promoting a sense of ownership and agency. This approach advances SDG 4 (quality education) by effectively integrating ESD into teacher education and curriculum implementation and contributing to broader sustainable development objectives. The study further not only highlights the neglect of ESD in teacher education programmes in South Africa but also addresses ways to improve teachers’ capacity by integrating ESD content, values and skills into their teaching practices.

Chapter 2 by Stef Esterhuizen focuses on ‘Outdoor play in early childhood education for sustainable development: Parent–practitioner collaboration’. This chapter emphasises the importance of ECD development, parental involvement, quality early learning programmes and play-based learning (PBL) in fostering holistic development and well-being, thereby contributing to the achievement of both ESD objectives and the SDGs. Play-based learning promotes children’s creativity, problem-solving skills and social development, contributing to SDG 4 (quality education) by fostering quality education and promoting lifelong learning opportunities for all children. It further highlights the importance of quality early learning programmes that are developmentally and culturally appropriate.

Chapter 3, 'The use of entomophagy learning resources to foster education for sustainable development' by Melissa Palmer, Barry Richter, Cathy Dzerefos and Anette Hay, illustrates how SDG 2 (zero hunger) and SDG 12 (responsible consumption and production) could be addressed in a collaborative way. If learners are provided with relevant and practical knowledge about sustainable food production methods, it could incorporate inclusive education and promote lifelong learning opportunities for all. This chapter demonstrates a clear connection between ESD and the SDGs by integrating indigenous knowledge and sustainable practices into education in order to contribute to achieving both ESD objectives and the SDGs. In Africa, it is particularly important to explore alternative food sources such as insects. This chapter contributes to discussing efforts to ensure access to safe, nutritious and sufficient food for all, addressing SDG 2 (zero hunger). It also shows how integrating entomophagy learning resources into a curriculum promotes quality education, addressing SDG 4.

Sustainable development goal 4 is addressed in a similar way in Chapter 4. By integrating climate change education into the curriculum, the authors WN lipinge and LO de Sousa show in their chapter titled 'Stakeholder involvement in reforming a Namibian Physical Science syllabus through climate change environmental education' the importance of stakeholder involvement in curriculum development and government policy harmonisation in a syllabus to mitigate the effects of climate change through EE. Sustainable development goal 13 (climate action) is also addressed by demonstrating how incorporating climate change into the Namibian syllabus aligns with ESD principles by fostering stakeholder involvement and promoting EE. Engaging stakeholders ensures that diverse perspectives are considered, leading to more holistic and effective educational initiatives, which is in line with SDG 17 (partnerships for the goals). Guidelines for the Namibian curriculum review are provided, along with recommendations on how to include climate change into the Physical Science curriculum using EE.

In Chapter 5, the author Pieter Swarts aligns with SDG 4 (quality education) in the chapter 'Embodied experiential place-based education: A possible map to expand the prioritisation for an environmentally literate and sustainable citizenry through life orientation'. This chapter contributes to advancing ESD objectives and SDGs by advocating for the integration of EE and sustainable development into curriculum policies, empowering teachers and learners to address sustainability challenges and nurture a sustainable citizenry. The chapter further shows how promoting experiential and place-based learning could provide guidance for curriculum development in line with sustainability principles. By advocating for the inclusion of EE and ESD within education policy statements, the chapter

aligns with the intention to promote quality education (SDG 4), particularly Target 4.7 which emphasises the importance of ESD and global citizenship.

In Chapter 6, 'Project-based teaching, citizen science and education for sustainable development: A partnership for youth-centred teaching and learning' by Irene Muller, the focus is on the growing recognition of project-based learning (PBL) as an effective approach to ESD. She describes how the incorporation of PBL into teaching and learning could provide students with the opportunity to engage with real-world problems related to sustainability, empowering them to make meaningful contributions and decisions. This approach emphasises SDG 4 (quality education) by contributing to inclusive and equitable quality education for all. It also incorporates SDG 11 (sustainable cities and communities) by using project-based learning to foster self-directed learning and collaboration among students, enabling them to appreciate the perspectives of their peers. Adopting project-based learning as a teaching strategy infused with ESD principles could prepare the youth as active citizen scientists capable of addressing 21st-century challenges.

Chapter 7, by Prosper Lunga, focuses on 'Online teaching for enhancing education for sustainable development and the sustainable development goals in the Foundation Phase in South Africa'. The author talks the reader through how technology can help make SDG 4 (quality education) more accessible to more learners as education influences its application. This chapter demonstrates a strong collaboration with ESD and the SDGs by addressing challenges in education, promoting participatory and collaborative approaches to problem-solving and fostering sustainable learning practices that are locally relevant and inclusive. It also fosters community engagement and local relevance, addressing SDG 17 (partnership for the goals) by promoting multi-stakeholder collaboration to achieve sustainable development objectives. In addition, it focuses on SDG 11 (sustainable cities and communities) where it promotes sustainable learning for Foundation Phase learners by leveraging community resources and fostering resilience in the face of challenges.

Chapter 8 effectively integrates the SDGs and ESD by addressing specific targets within SDG 4 within the context of the SDGs that specifically focus on quality education. In the chapter, 'Fostering inclusive early childhood through the pedagogy of play for quality education', Marinda Neethling emphasises the promotion of inclusive education practices, aligning them with sustainable development principles. Inclusive education ensures that all children, regardless of background or ability, have equal access to education, which is fundamental for achieving sustainable development goals, such as reducing inequalities (SDG 10). By leveraging the pedagogy of play and integrating the African Reggio Emilia Approach (AREA), the chapter goes

beyond traditional educational methods. By embracing approaches rooted in African contexts, the chapter promotes cultural inclusivity and respect for diverse perspectives, aligning with SDG 16 (peace, justice and strong institutions) and fostering a culture of tolerance and understanding.

In Chapter 9, Benita Taylor explores challenges encountered with early childhood care and education (ECCE) centres in the chapter titled, 'Challenges experienced in early childhood care and education centres to promote quality education: The view of practitioners as co-researchers for sustainable development. This chapter's focus resonates with the principles of the SDG which emphasises the importance of quality education (SDG 4). Early childhood development forms the foundation for lifelong learning and holistic growth, important elements for sustainable development. This research project adopted a PALAR approach involving practitioners as active participants as co-researchers (SDG 17: Partnership for the goals). By using a PALAR approach, the author shows not only how the project is aligned with SDG 4 but also how a collaborative problem-solving process could address challenges in sustainable development effectively.

Chapter 10, titled 'Learner-centredness, partnerships and participatory action learning and research: A triad of transitioning in a special needs education context for sustainable development', shows how collective action and continuous learning could advance the SDGs. Marietha Malan, Lesley Wood and Mariëtte Koen show the clear intersection between ESD and SDGs in the context of supporting young adolescents with severe intellectual disabilities in transition to employment opportunities. The chapter emphasises improved access to meaningful employment opportunities, contributing to economic growth and reducing inequalities as outlined in SDG 8. It furthermore aligns with SDG 3 (good health and well-being). Also, it emphasises the importance of partnerships between schools, communities and parents, aligning with SDG 17, which focuses on strengthening partnerships for sustainable development (SDG 17: Partnership for the goals). By fostering collaboration between schools, communities and parents, the research aimed to support the needs of adolescents, especially regarding employment opportunities SDG 10 (reduced inequalities). The findings of the study indicated that the transition triad, namely a learner-centred approach, was enacted with school-parent-community partnerships through a process of continual relationship building and collaborative research. This transition triad formed a strong basis for sustainable and effective transition into dignified adult life for young people with severe intellectual disability (SID).

This book presents a holistic approach for integrating ESD into various educational contexts, ranging from early childhood education to higher education, including special needs education. This book's cohesive direction

is emphasised by the insightful discussions in the ten chapters, which consistently highlight the crucial role of collaborative partnerships in facilitating PALAR. By using PALAR as a research design and key sustainable SDGs such as quality education, climate action, zero hunger, reduced inequalities, good health and well-being, and partnerships for goals, this book offers valuable insights and practical strategies for fostering sustainable development through education. This book's presentation of the effectiveness and worth of group research projects in regional settings, as well as the potential contribution of such processes to ESD, is one of its main contributions.

Through diverse approaches, including community-based research, outdoor play, entomophagy learning resources and project-based teaching, this book demonstrates how teachers can effectively integrate ESD principles into their teaching and learning practices. The discussions emphasise the importance of active engagement, inclusivity and collaboration among stakeholders in addressing challenges, employing sustainable practices and promoting lifelong learning opportunities for all learners. Furthermore, this book highlights socio-ecological topics of the day, such as climate change, environmental challenges and ESD in relation to technology in the classroom. By advocating for the integration of ESD into teaching practices and curriculum implementation, this book aims to enable teachers to nurture environmentally literate and knowledgeable citizens capable of addressing 21st-century challenges.

This book is primarily intended for scholars and researchers, while also serving as a comprehensive and unique guide for teachers, policymakers, and stakeholders interested in promoting sustainable development goals through education. It highlights the transformative potential of education in fostering a more equitable, inclusive and sustainable future for all. It may be helpful for readers unfamiliar with the African environment to see potentially familiar topics addressed in rather different contexts. Reading these research chapters strengthens the reader's understanding of our common humanity and how we may all move forward together.

Incorporating education for sustainable development through community-based education in the Foundation Phase¹

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1. This chapter represents a substantial reworking of the Master's (MA) thesis by S Fourie, 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education' in the Research Focus Area Community-Based Educational Research in the Faculty of Education at North-West University, Potchefstroom campus, South Africa, under the supervision of Professor LW Wood, co-supervised by Dr P Swarts and assistant supervisor Dr SP Raath. The thesis can be accessed via <https://repository.nwu.ac.za/bitstream/handle/10394/40068/24095354%20Fourie%20S.pdf?sequence=1&isAllowed=y>.

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■ Abstract

Teacher education programmes in South Africa have, in general, neglected to include education for sustainable development (ESD) as a focus, thereby creating a need to improve South African teachers' capacity to integrate ESD content, values and skills into their teaching. This chapter reports on an enquiry conducted by the first author, a Foundation Phase teacher educator, into how in-service teachers could adapt their teaching to attain this end. As community-based education (CBE) is a learner-centred pedagogy that combines experiential and outdoor learning, we argue that it is an effective way to integrate ESD into the Foundation Phase. In South Africa, the Foundation Phase includes learners in Grades R–3. Learners in this phase are, thus, anywhere between the ages of 5 and 9, depending on their age of entry. Because the aim of the enquiry was sustainable learning, she engaged three Foundation Phase teachers in a participatory action learning and action research project to help them, in Cycle 1, to identify (1) their learning needs with regard to ESD and CBE and (2) local environmental issues. In Cycle 2, the teachers devised action plans to integrate ESD by using CBE, tried them out and evaluated their success. The teachers generated data through participatory methods and analysed them thematically to generate five themes that reflected their learning. The findings indicate that a participatory approach enabled the teachers to increase their knowledge about ESD and their confidence to use CBE to integrate it effectively into the Foundation Phase curriculum. This knowledge contributes to ESD theory and practice by highlighting the value of participatory and community-based pedagogies for integrating ESD into the curriculum.

■ Introduction

The United Nations (UN) has warned that humans have, at best, nine years to prevent devastating global warming, as the risk of droughts, floods, extreme heat and poverty for hundreds of millions of people is significantly worsening (Kaplin 2022). Although government and industry are the main actors in reversing or halting the effects of climate change, individuals also have a role to play through efforts such as recycling, the conservation of resources and caring for the environment. However, this requires people to be educated from a young age on such issues. Education for sustainable development (ESD) needs to start in the Foundation Phase. However, in our experience and according to the literature, few teachers know how to integrate it into the curriculum (Schudel & Lotz-Sisitka 2021), as mandated

by policy (Department of Basic Education [DBE] 2011). In this chapter, we provide evidence that community-based education (CBE) is an effective way of integrating ESD into Foundation Phase teaching across all subjects and suggest guidelines on how teachers can do this. The research question that guided this study was: How can Foundation Phase teachers integrate ESD into the Foundation Phase through CBE? We begin by explaining the concept of ESD as used in this chapter.

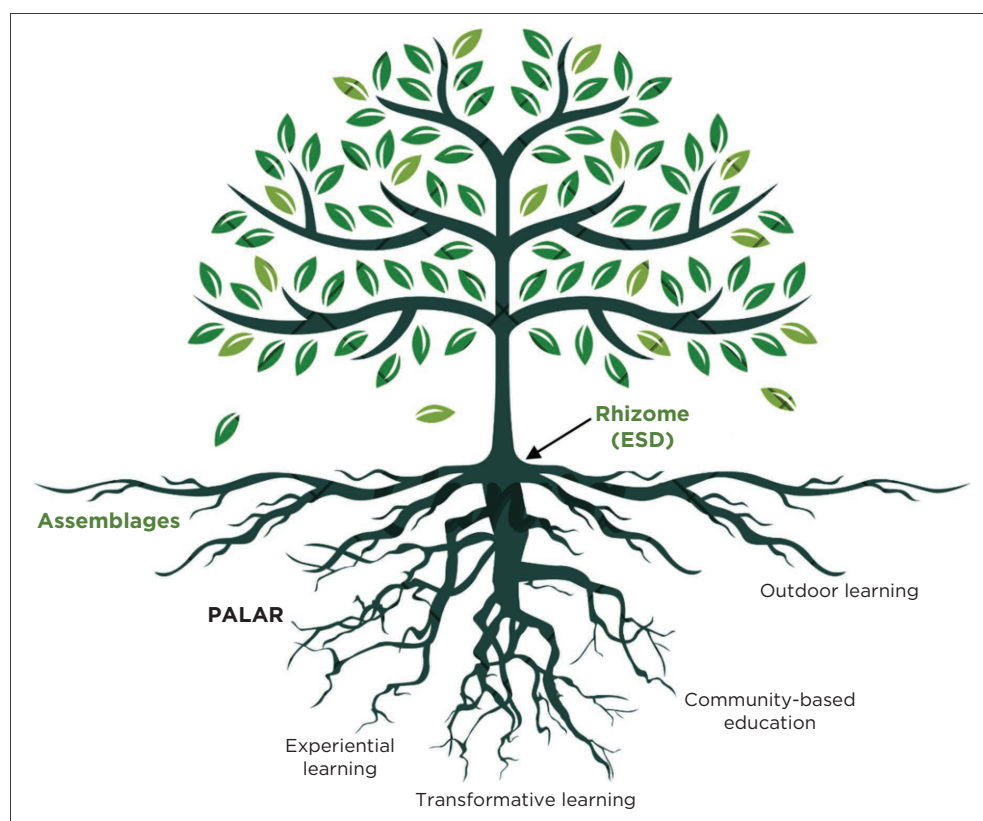
■ Environmental education for sustainable development

Teachers and teacher education play an important role in mitigating the impact of ESD while increasing the capacity of education to address complex socio-environmental challenges (Fischer et al. 2022, pp. 509–524). Environmental education (EE), while related to ESD, primarily focuses on exploring environmental issues, participating in problem-solving and taking action to improve the environment. However, the scope of ESD extends beyond EE to encompass broader socio-economic and environmental dimensions. Education for sustainable development involves developing awareness of and sensitivity towards the environment, as well as fostering knowledge, attitudes and skills to address sustainability challenges in various contexts (Türkoğlu 2019, pp. 1–35). Thus, a participatory action learning and action research (PALAR) approach focused on integrating ESD principles was ideal for this study. Such an approach would enable teachers not only to learn how to integrate ESD into their teaching practices but also to actively engage in the promotion of sustainability within their educational settings.

Education for sustainable development should not be regarded as an add-on to the existing curriculum; sustainability topics should, instead, be integrated throughout (Ramsaroop & Van Rooyen 2013, pp. 595–613; UNESCO 2014). In addition, the *Curriculum and Assessment Policy Statement* (CAPS) (DBE 2011) emphasises that learning is more effective if it takes place in learners' natural environment. However, in the Foundation Phase, only the Life Skills and Mathematics subjects directly address the issue of environmental health and the development of the skills needed to contribute to learners' local community in terms of healthier, safer and more sustainable environments (DBE 2011). The CAPS document emphasises that the world must be understood as a set of *related systems* by recognising that problem-solving contexts do not exist in isolation (DBE 2011). Therefore, ESD should be integrated across all subject areas in the Foundation Phase.

O'Riley (2003) argues that a rhizomatic view of knowledge is dynamic, diverse and unified, as diverse knowledge is connected, distributed

and transferred. Our role as social justice agents requires each of us to act as assemblages within a rhizomatic network, transforming our immediate surroundings as we move through them, improvising as we go and establishing new networks as we do (Sabnis & Proctor 2021, pp. 661-675). A rhizomatic approach to sustainability recognises that there is no central point to sustainability and that, therefore, it is always evolving (Le Grange 2017; Simmonds & Ajani 2022). In this study, we view ESD rhizomatically to produce such a connected and distributed knowledge system, which may open up a dialogue for including local knowledge. According to Le Grange, such a knowledge system will enable ESD to connect, distribute and transfer the knowledge, skills and experiences of teachers, learners and community members in diverse ways to produce new knowledge and mindsets – much like a tree, where the rhizome has the ability to produce a new stem for a new tree to grow from. The assemblage can be viewed as the roots of a tree branching from the rhizome; these roots anchor both the tree and the rhizome, as shown in Figure 1.1. These interconnected



Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University.

FIGURE 1.1: A rhizomatic view of education for sustainable development.

assemblages anchor and stabilise ESD, but can evolve and resprout at any time, creating new assemblages.

A rhizomatic view of ESD (see Figure 1.1) encourages the curriculum to be 'spontaneously shaped, constructed and then reconstructed' (Deleuze & Guattari 1987, p. 21). We argue that the curriculum should likewise be shaped and constructed by teachers' and learners' experiences, to transform learner mindsets and inspire their imagination. Therefore, it is to the benefit of teachers in the Foundation Phase that there is freedom for interpretation and no rigid prescripts in terms of implementing ESD. This freedom would allow teachers to bring the curriculum to life and not rely on it to motivate their teaching.

The South African government supports Agenda 21, adopted at the United Nations Conference on Environment and Development [UNCED], which declares that 'education is critical for sustainable development' (UNCED 1992, p. 2) and for creating environmentally literate and dynamic citizens. So, ESD must be interdisciplinary, integrated and active to ensure that all South Africans practise the sustainable use of resources (Department of Higher Education and Training [DHET] 2015). Also, in the *Minimum Requirements for Teacher Education Qualifications* policy document (DHET 2015), the environment and sustainable development are mentioned as concepts that require greater attention in teachers' professional development in South Africa. Nevertheless, Nakidien, Singh and Sayed (2021, pp. 66–79) indicate that teachers have little capacity for integrating sustainability issues into teaching and learning. There is no proper guidance on how teachers should implement ESD across subjects in the Foundation Phase, so they interpret the policy differently. Furthermore, limited research is aimed at integrating ESD in the Foundation Phase, even though it is crucial for forming attitudes, behaviours and responsibilities during childhood. For these reasons, we thought it useful to work with teachers to help them understand how CBE, as a pedagogical approach, could enable them to integrate EE across all subjects.

■ Community-based education to enhance the integration of education for sustainable development in the Foundation Phase

Learners must learn *in or through* the environment to learn *about* the environment and be able to act *for* the environment (Hedefalk, Almqvist & Östman 2015, pp. 975–990). When learners are restricted to the four walls of the classroom, they become disconnected from nature.

Regarding pedagogy, CBE emphasises learner-centred experiential learning, critical thinking and exploration in the natural environment (Di Biase, Malatesta & Schmidt di Friedberg 2021, pp. 529-544; Motumi 2021). Beckett (2013, pp. 49-62) states that CBE can be achieved through a problem-posing approach where teachers and learners are critical co-investigators of what learners want to explore. Elliott and Davis (2009, pp. 65-77) demonstrate the transformative potential of ESD in the Foundation Phase through experiential learning, discovery learning and outdoor play, and they allow learners' voices to have merit (Bennell 2015, pp. 1-32). Through community-based ESD initiatives, schools can serve as facilitators for social transformation. In the CAPS for Life Skills in the Foundation Phase (DBE 2011), provision is made for outdoor play that offers the opportunity for learners to develop an appreciation of the environment (e.g. gardening and caring for animals) (Dube 2012) to learn to play cooperatively and to make decisions (Bennell 2015, pp. 1-32). Teachers should encourage sustainability and environmental sensitivity in their teaching using outdoor play (Brodanský 2016).

The aim of CBE is to empower individuals and build capacity in the local community by allowing learners to gain real-world skills and knowledge to address issues such as health, the environment, cultural heritage and economic development (Stevenson 2022). Learners who are disconnected from their environment may not be inclined to care for and protect it, but once they establish a sense of place, they will be more motivated to restore and conserve it (Smith & Sobel 2010). A sense of place can be fostered through interdisciplinary, experiential CBE (Roy 2014) and connects place, person and community (Ontong & Le Grange 2014, pp. 27-38). Furthermore, CBE develops sensitivity to local needs, the preservation of indigenous languages and knowledge, increased parental involvement and more meaningful problem-solving in the classroom and environment (Swindell 2022). Swindell further emphasises that CBE can contribute significantly to ensuring that parents and community members are involved in shaping schooling, which can substantially impact a learner's ethnic and cultural identity. Moreover, CBE enlightens teachers about the social and moral dimensions of teaching and their responsibility to address social issues. The change in awareness of their role and responsibilities is critical in helping them change how they view sustainability (Singh-Pillay 2023, p. 2149). When CBE is used to facilitate ESD (Salequzzaman & Gorana 2016), local natural resources (or the scarcity thereof) are emphasised, and learners learn by observing natural changes over time in their community (Fraser, Gupta & Krasny 2015, pp. 777-800).

■ Changing mindsets about education for sustainable development through transformative, experiential learning

Education plays a significant role in the transition to a sustainable future. However, the overall challenge teachers encounter in ESD is empowering learners to reframe their mindsets to become change agents (Harring, Torbjörnsson & Lundholm 2018, p. 124) and considerate citizens (Singh 2011, pp. 113–123). The transformative learning theory entails:

[L]earning that transforms problematic frames of reference – sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) – to make them more inclusive, discriminating, open, reflective, and emotionally able to change. (Mezirow 2003, p. 58)

A study conducted by Khabanyane, Maimane and Ramabenyane (2014, pp. 452–459) discusses four approaches to transformative learning with specific reference to the South African context. Firstly, transformation as conscientisation involves teachers being empowered to reframe their mindsets about ESD in the Foundation Phase and to recognise that they are capable of transforming the mindsets of both learners and society (Freire 1970; Glassman & Erdem 2014, pp. 206–221). Secondly, transformation as critical reflection means that teachers must critically reflect on their current teaching of ESD to determine what needs and shortcomings they experience (Van Woerkom 2010, pp. 339–356). Thirdly, transformation as development entails the development of new experiences and enabling teachers to make new meanings so that they may be more open-minded to incorporating ESD across all subjects through the use of CBE strategies and reframe their understanding of ESD as an adjunct to the curriculum, rather than just an addition (O'Connor & Geiger 2009, pp. 253–269). Lastly, transformation as self-awareness may include the forging of compassionate relationships with others and the environment (Vandeyar & Swart 2016, pp. 141–159), as self-awareness keeps people in tune with their feelings, thoughts and actions. However, Khabanyane et al. concluded that a fifth approach to transformative learning – an experiential approach – is more appropriate for South African classrooms, as it assists teachers and learners to become change agents for social justice (Gross & Rutland 2017, pp. 1–8) and environmental issues.

Tilbury (2011) states that ESD prioritises the changing of mindsets, which is the aim of the transformative learning theory; yet, this learning theory is lacking in many current ESD pedagogies (Balsiger et al. 2017, pp. 357–359; Pretorius, Brand & Brown 2016). In addition, ESD should enable learners to reflect on the causes and effects of their actions in the environment and educate them on the appropriate responses to the consequences of those

actions (Glasser 2019). Experiential learning, the basis of transformative learning, enhances the physical togetherness between people and nature (critical pedagogy of place), which strongly ties with local traditions and authentic learning experiences (Leather 2016, pp. 5-18). Also, experiential learning engages learners in direct experience and reflection to develop their capacity to contribute meaningfully to their communities, as does CBE, which engages learners in community-based activities to address issues in their local community (Labuschagne 2015). Therefore, experiential learning is an important aspect of early childhood learning, as learning and development are significantly improved by direct experiences with nature and natural resources (Anderson et al. 2015; Bender 2017). Moreover, CBE, which combines experiential learning, participatory learning, outdoor learning and collaborative engagement with real-life issues within a community, can create empowered and responsible citizens who can become active change agents. It does so by fostering the required skills to manage sustainability, such as critical and creative thinking, problem-solving skills, collaboration and conscientisation (Cebrián, Grace & Humphris 2014, pp. 122-138).

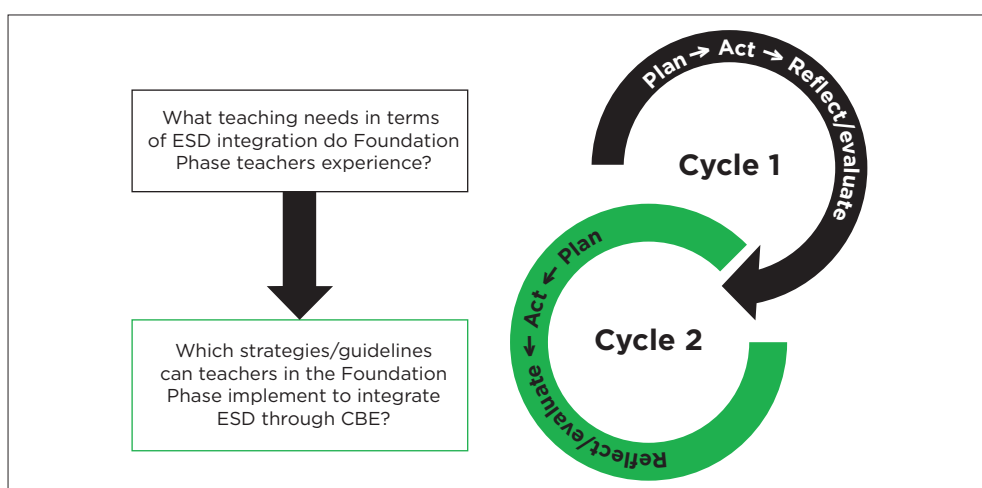
Drawing from the experiential learning model, (1) education *about* the environment is the creation of knowledge based on experiences, (2) education *in* the environment is the critical reflection on these experiences in the local community to form theories and (3) education *for* the environment implies experimentation of theories to enact environmental change in the local community. Experiential learning develops appropriate experiences, attitudes, emotions, skills and knowledge that can contribute to solving local and global sustainability issues (Higgins 2009, pp. 44-60). UNESCO (2020) devised a roadmap that includes five priority action areas of ESD for 2030, namely (1) advancing policy, (2) transforming learning environments, (3) building the capacities of educators, (4) empowering and mobilising the youth and taking action in communities and (5) monitoring their progress that promotes the achievement of the sustainable development goal 4 (quality education). This study embraces all five actions because CBE enables teachers to advance policy (DBE or UNESCO) at a micro level by transforming their own learning environments to make them more participatory, experiential and community based. During the process of building their capacities, teachers reflect on the knowledge and skills they have acquired in a participatory manner and mobilise their learners to take action in their local communities while monitoring the progress of their efforts.

Quality education for sustainability requires that teachers transform content knowledge into experiential learning to ensure that learners are engaged in actions that allow them to act responsibly. Therefore, we aimed

to create opportunities for teachers to implement ESD to evaluate and reflect on their experiences to construct new knowledge and improve their practice. In the 'Methodology' section, we explain the methodology that was used to guide the study.

■ Methodology

Participatory action learning and action research are based on a critical, emancipatory paradigm (Wood 2020) that facilitates transformative learning (Ontong & Le Grange 2014, pp. 27–38). The PALAR design is an effective design to integrate experiential learning to boost empowerment and reframe mindsets for social change in communities (Zuber-Skerritt 2018, pp. 513–532). It provides an opportunity for teachers to work in small groups, called action learning sets (ALSs), to create knowledge based on their experiences, critically reflect on these experiences, form abstract theories and generalisations and test the implications of these newly created theories in new situations (Zuber-Skerritt 2015, pp. 5–25). To bring about change in the thinking and actions of teachers, PALAR incorporates action learning in ALSs. These ALSs focus on building trusting relationships and understanding the teachers' needs regarding capacity development and resources to improve their teaching by contributing valuable knowledge to the project (Wood 2020). This study's research process comprised a cyclical process, as depicted in Figure 1.2.



Source: Fourie, S., 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University.

FIGURE 1.2: Research cycles.

The first author recruited three Foundation Phase teachers from a public primary school where she used to work to form an ALS to explore the two sub-questions in Figure 1.1. The inclusion criteria for sampling were that all the teachers must be able to speak English and teach in the Foundation Phase at the selected school. The convenience sampling method was selected for recruitment because it involves notifying the study participants and allowing them to self-select whether they wish to participate (see Stratton 2021). The teachers had to teach at the same school to make the research site as convenient as possible for all. Three teachers volunteered to be participants – one Grade 2 teacher and two Grade 3 teachers (see biographical data in Table 1.1).

The data generated in Cycle 1 informed action plans for meeting the teachers' learning needs regarding ESD and CBE. The aim for Cycle 2 was to reflect on and determine which strategies to utilise in CBE to facilitate the integration of ESD into the Foundation Phase curriculum. The members of the ALS collaboratively designed the various action plans that the teachers implemented in their classrooms. Thereafter, we reflected on the effectiveness of the changes to determine the usefulness of our action plans in teaching ESD and to address any challenges that had arisen.

We used arts-based methods, such as object medley (eds. Pillay, Pithouse-Morgan & Naicker 2017), symbolic drawings (Theron et al. 2011), photovoice (Stevens 2019) and collages (Masinga et al. 2016, pp. 117-135) to generate data. Reflective journals and transcribed discussions of each ALS meeting also provided rich data. The ALS identified broad themes emerging from their learning, and we then used Clarke and Braun's (2017, pp. 297-298) steps of thematic analysis to generate themes through a theoretical lens. Herr and Anderson's (2015) criteria were used to enhance the validity of the study, namely (1) outcome validity (reaching the identified goals of the study), (2) process validity (adhering to principles of PALAR), (3) democratic validity (considering multiple perspectives and the relevance of data), (4) catalytic validity (teacher transformation and self-awareness) and (5) dialogic validity (peer review). The study was approved by the Research Ethics Committee of the North-West University (NWU-01649-19-A2), attesting that it adhered to the stringent ethical requirements of the Committee. We now discuss the findings.

TABLE 1.1: Biographical data of participants.

Participant	Gender	Race	Languages spoken	Years of teaching experience
01	Female	White	Afrikaans, English	12
02	Female	Indian	English, Memon, Afrikaans	4
03	Female	White	Afrikaans, English	7
04	Female	White	Afrikaans, English	3

Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University.

■ Discussion of findings

Cycle 1 focused on the teachers' initial knowledge, feelings and attitudes towards integrating EE. Because of the restricted word count, the themes are summarised in this section.

■ Teachers' fears contributed to misconceptions about their abilities and awareness regarding teaching education for sustainable development

Knowing how to integrate ESD was the most reiterated need among the teachers, as they felt incompetent and unmotivated to integrate EE. Therefore, it was helpful for them to identify their concerns, as those concerns served as indications of how they needed to improve their teaching. The following was said concerning this:

'I definitely feel nervous because I am unsure how to teach ESD. I am concerned that most of us teachers feel incompetent to teach ESD; it is disheartening and intimidating because we realise that we should know more and do more to implement.' (Participant 02, Female, age unspecified, 2021)

One teacher was not even aware that integration was expected of them, as evidenced by the following remark:

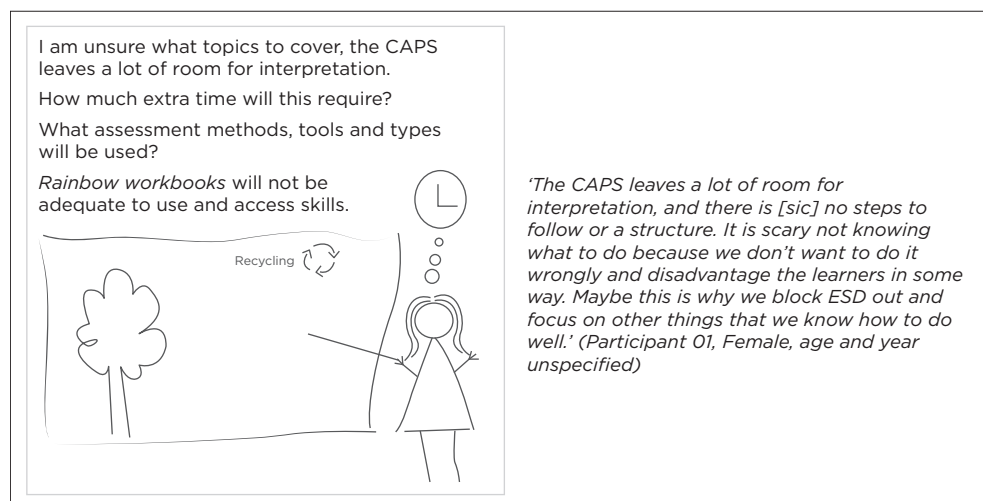
'[...] not expected of us to implement ESD in the Foundation Phase. ESD is not stipulated in the CAPS documents for any of the subject areas. We have not seen how to do this. I have not read about this term before we discussed it in our first meeting.' (Participant 03, Female, age unspecified, 2021)

The teachers also identified the need for guidelines on safely implementing ESD outdoors, as the policy documents are not explicit on this point. These guidelines had to integrate all the subjects because the teachers did not want ESD to be time-consuming, as they already had heavy workloads (see Figure 1.3).

The teachers also mentioned that they needed guidance on assessing ESD when it is integrated across the subjects. After several ALS meetings, the teachers indicated their need for a daily programme to implement ESD through CBE. The assessment of ESD was initially a concern for the teachers, as shown in Figure 1.4.

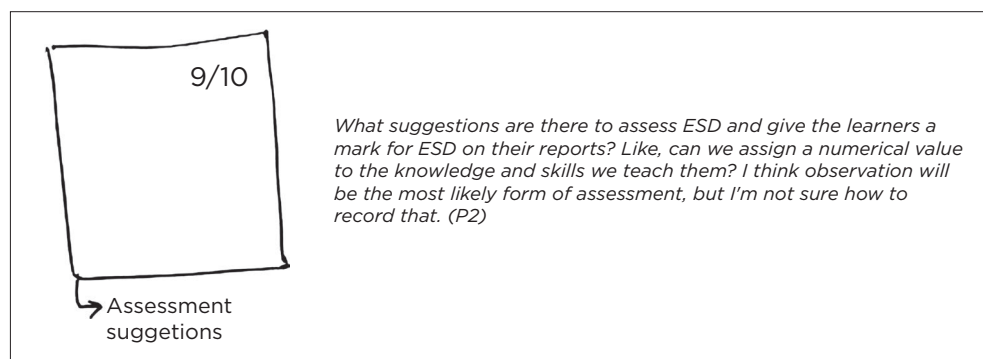
However, the teachers concluded that responsibility, consciousness, care and joy were values and emotions that could not be assessed for recording marks:

'I have realised how it is our responsibility to help nature heal. Going outside and making a difference in the environment gave me and the learners so much joy [...] something that cannot be assessed with percentages and reports.' (Participant 04, Female, age unspecified, 2021)



Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University. Reproduced for publication in this book with the informed consent of the participant.

FIGURE 1.3: Education for sustainable development topics, assessment and time allocation.



Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University. Reproduced for publication in this book with the informed consent of the participant.

FIGURE 1.4: Assessment of education for sustainable development.

Bourn et al. (2016) agree that ESD must focus on learning processes rather than measurable outcomes. The teachers transformed their thinking regarding assessment – from expressing the need to allocate numerical marks for ESD to appreciating that observation and informal assessment are sufficient. They expressed that the process of learning and then acting on that learning indicates that the learners have achieved their goals. One of the participants explained it as follows:

'It isn't necessary to focus so much on assessing ESD if we get to see how the kids help better the environment. They have already achieved something then.'
(Participant 01, Female, age unspecified, 2021)

In this study, CBE enabled learners to act on their learning by identifying environmental issues, discussing possible solutions and experimenting with ideas to take action for the environment. Evidently, the teachers' fear of implementing ESD stemmed from a lack of knowledge and understanding of ESD, as they were unaware that the CAPS allowed them to implement ESD across subjects, which also led to the misconception that ESD is extra and time-consuming. A daily programme was preferred to lesson plans, as the teachers thought that lesson plans restricted ESD to occasional lessons, particular topics (knowledge) and education *about* the environment. With a daily programme, they learnt how ESD could complement and fit into other subjects, and the learners started to establish sustainable daily routines. One participant gave the following explanation:

'It is not an extra subject, so it doesn't take extra time. We could see this clearly, how well ESD fits into the other subjects when we used our daily programme.' (Participant 02, Female, age unspecified, 2021)

In Cycle 2, the teachers discussed CBE as a means to integrate ESD into their teaching. The local environmental issues and their vision for CBE in ESD inspired their action plans. Afterwards, the teachers reflected on their teaching and learning.

■ Teachers' vision for contextualised community-based education in education for sustainable development

All the teachers agreed that the main goal of CBE is to solve local issues collaboratively and give all stakeholders a voice. These stakeholders possess knowledge and skills that have the potential to enrich the learning of the entire community once recognised. Referring to the UNESCO pillar of learning – 'learning to live together' – learning involves appreciating human diversity, interdependence, empathy, respect, conflict resolution through dialogue and working towards solving mutual issues (Delors 2013, pp. 319–330). A rhizomatic view of knowledge is unified as diverse knowledge is connected, distributed and transferred among the teachers, learners and the community to produce new knowledge and mindsets (Le Grange 2016, pp. 5–18), to the benefit of everyone. Figure 1.3 represents their overarching vision of CBE.

The teachers used Figure 1.5 to construct the following vision of CBE to guide their practice:

'CBE enables us to collaboratively solve mutual problems in the local community. We acknowledge that every person has valuable input that transforms and equips the community when teachers utilise the environment.' (Multiple participants [4], Females and Males, ages unspecified, 2021)



Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University, p. 56. Reproduced for publication in this book with the informed consent of the participants.

FIGURE 1.5: Collaborative vision of community-based education.

Loubser (2014) likewise believes the curriculum must be negotiated with role players in the community to serve their needs and goals. The teachers in our study emphasised the need to incorporate nature into teaching ESD. They also highlighted the importance of indigenous inspiration and explained that they must draw knowledge, insights and experience from the local community. When teachers allow the community to inspire their teaching, the community's voice is heard, as also found by Maditsi and Materechera (2021). The CAPS states that when we value indigenous knowledge, we acknowledge the 'rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution' (DBE 2011, p. 5), giving rise to more responsible citizens who will bring out the best in people and the environment.

■ **Identified teaching strategies to enhance education for sustainable development through contextualised community-based education**

The teachers emphasised the need to move out of the classroom and into the community, including the natural environment. CBE is an ideal pedagogy to use for integrating ESD across subjects. The teachers started to take ownership of their teaching and relied less on policy documents for motivation and guidance. They realised that they could inform their teaching of ESD:

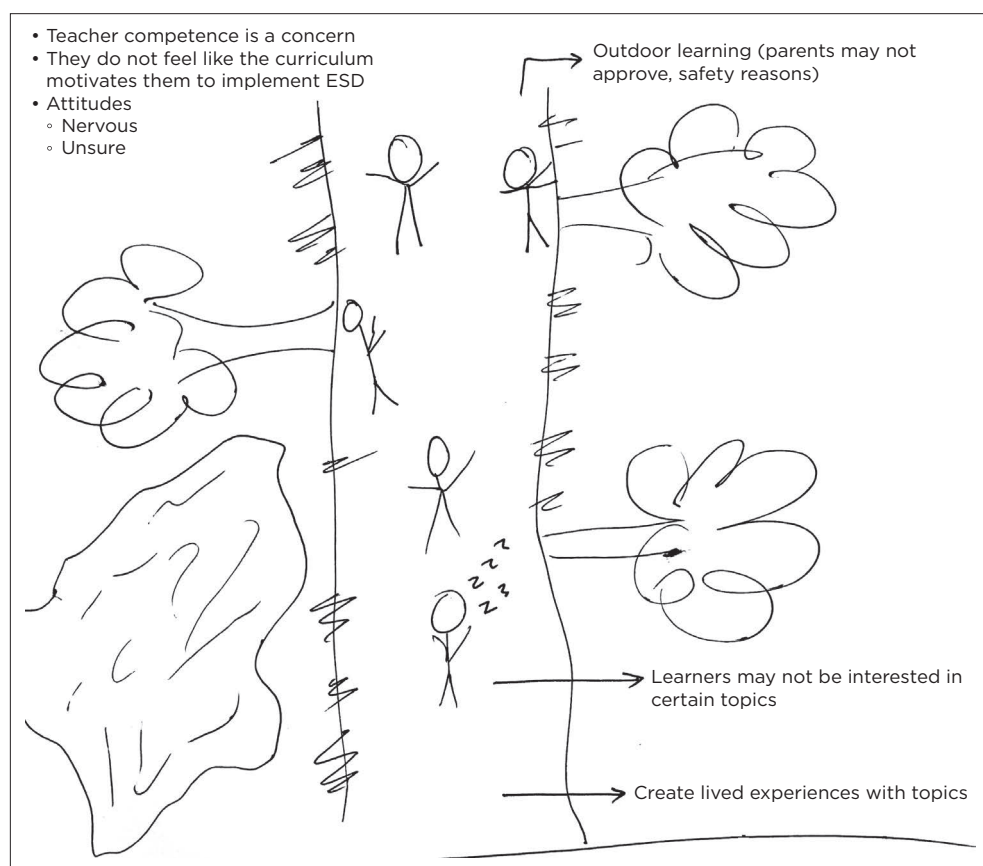
'Our teaching was built on our teaching needs and we could work together to better our teaching. It is relevant and attainable for us because it was created by us.' (Participant 03, Female, age unspecified, 2021)

The teachers agreed that they did not have to adhere to the ESD topics in the CAPS document but that their local environment could inspire their teaching of ESD through CBE. Applying Kolb's (1984) experiential learning theory, education *in* the environment includes critical reflection on experiences in the local community to develop learners' capacity to make a meaningful contribution. Critical reflection is crucial for developing environmental awareness and addressing local sustainability issues (Cebrián 2017, pp. 857-876). It also enables stakeholders to evaluate their action plans and determine whether their mutual goals have been met.

Outdoor learning has been proposed as a strategy to teach ESD through CBE (Bennell 2015, pp. 1-32; Brodanský 2016; Elliott & Davis 2009, pp. 65-77; Hill 2013, pp. 18-32; Lovell, O'Brien & Owen 2010), as outdoor learning benefits learners, the community and the environment. Fraser et al. (2015, pp. 777-800) agree that academics, teachers and communities should collaboratively develop a mutual understanding of implementing ESD. We drew from the local environmental issues that the teachers

identified and their vision for contextualised CBE in ESD to brainstorm and implement teaching strategies. Learners must experience the outdoors to develop a sense of place to foster love and respect for their environment (Card & Burke 2021, pp. 122–138; Ontong & Le Grange 2014, pp. 27–38; Roy 2014) as shown in Figure 1.6.

Utilising the outdoors (see Figure 1.6) as a resource is not suggested solely for ESD topics but for all subjects in the Foundation Phase, where ESD can be incorporated to enhance these subjects. Tinney (2020) agrees that when outdoor activities are planned through a sustainability lens, these activities can be integrated across all subjects because the outdoors can provide a natural setting for teaching science, mathematics, language arts and drama. Outdoor learning can motivate and excite learners to learn because it is a change of pace and scenery and can develop a multitude of



Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University, p. 46. Reproduced for publication in this book with the informed consent of the participant.

FIGURE 1.6: Lived experiences in the outdoors.

skills and values. Learning in nature increases learners' physical activity and concentration and reduces their stress because they do not have to suppress the tendency to move (Wainwright 2021). When learners have the freedom to move in an environment where they usually play, they are more likely to perceive their learning as playing, encouraging participation and intrinsic motivation (Hartmann & Gommer 2021, pp. 319–343). Outdoor learning can assist teachers in bringing the curriculum alive because learners can engage in problem-solving and discovery learning. The participating teachers realised that they implemented ESD occasionally and sometimes unintentionally. The following was said in this regard:

'To me, a big part of understanding ESD is the care and compassion we must have towards the environment and all living things. A vegetable garden and class pet will teach children to take care of something else and responsibility. These things also require a lot of attention and effort every single day. It is hands-on and doesn't require a book and pencil or memorisation of facts. This is boring to children already. The water filtration system should be made with the children and used in the class so that they can see that they also help and make a difference in the class and for their friends and teacher.' (Participant 02, Female, age unspecified, 2021)

They understood that one of their teaching needs was to implement ESD more consistently and expressed this need:

'ESD should be integrated into daily activities and not be isolated instances.' (Participant 03, Female, age unspecified, 2021)

'ESD must be integrated daily and not sporadically, so that habits can form.' (Participant 02, Female, age unspecified, 2021)

The CAPS (DBE 2011) document includes a daily programme exclusively for Grade R. Therefore, we had to adapt it to accommodate all four Foundation Phase grades. We included Language (speaking, writing, reading and listening), Mathematics (numbers and operations, patterns, space and shape, and measurement) and Life Skills (beginning knowledge, creative arts and physical education), which indicates that the skills should be developed in each subject. The teachers agreed that the positions of ESD (*about, in* and *for* the environment) and the ESD dimensions must be added to the programme as a reminder to incorporate them. However, the teachers made it clear that daily ESD implementation does not necessarily mean it has to be integrated into each subject daily. After designing the daily programme, the teachers implemented the lessons and reflected on them in the ALS. They based the lessons on issues that they thought their learners should be more aware of, namely (1) caring for nature (Figure 1.7), (2) water wastage (Figure 1.8) and (3) recycling (Figure 1.9).

This study was conducted in 2021, and according to the CAPS (DBE 2011), the Foundation Phase has four main subjects: Home Language (HL),



There are like very few plants and flowers in the entire school and even in the classrooms. Some of the outdoor plants are fake plastic plants. Most plants are not taken care of and it is the responsibility of the staff, not the learners. They don't have to take responsibility for it and I don't notice that any of the learners acknowledge or admire the plants. (Participant 02, Female, date unspecified)

Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University, p. 54. Reproduced for publication in this book with the informed consent of the participant.

FIGURE 1.7: Neglected plant.



Water is being wasted. (Participant 02, Female, date unspecified)



Learners take water for granted and often leave the taps running. (Participant 04, Female, date unspecified)

Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University, p. 55. Reproduced for publication in this book with the informed consent of the participants.

FIGURE 1.8: Water wastage.



Recycling bins are not properly labelled for the learners. They don't understand the purpose of the bins, it is more like a fun game to them. They were not informed how it may help the environment. Learners were not made aware of the impact their actions and choices will have on the environment. (Participant 03, Female, date unspecified)

Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University, p. 55. Reproduced for publication in this book with the informed consent of the participant.

FIGURE 1.9: Unlabelled recycling bins.

First Additional Language (FAL), Life Skills and Mathematics. The abovementioned environmental issues were integrated across all the Foundation Phase subjects. *Caring for nature* was implemented as a classroom routine, where the learners in the classes were divided into teams that were responsible for watering and pruning the indoor and outdoor plants. The teachers worked out a weekly schedule for each team, and they planned to implement this on a rotational basis throughout the year. Reading informational storybooks made learners aware of the effects of water wastage on the environment. These books encouraged the one class to design posters to make the other learners aware of water wastage. The other class brought ice cream containers from home to place under the taps to catch excess water. A few learners spontaneously used this water to water the plants in their classroom, ensuring the water was not wasted. Once the learners were aware of the effects and benefits of *recycling*, one class decided to label the recycling bins outside to ensure that all the learners knew how to use the bins. Another class started to collect all the waste paper in a bin in the classroom to use during creative art activities. Such innovative ideas can become daily routines that have the potential to be transformed into sustainable habits. Table 1.2 explains the integration of these activities according to the outcomes of each Foundation Phase subject.

The teachers felt that more time would be saved if these activities became daily habits for the learners, as they would not require daily instruction from the teacher. It was found that the teachers saved time when they participated in PALAR because they shared responsibilities and ideas, integrated ESD into all the subjects and did not have to draw up

TABLE 1.2: Integration of education for sustainable development activities across the Foundation Phase subjects.

CAPS Life Skills topics	Language	Mathematics	Life Skills
Caring for nature	Reading informational books	Measuring the growth of the classroom plants	Discussing what products and processes people get from plants
	Asking questions about the care of the plants	Appreciation for the patterns, precision, achievement and beauty in the natural environment	Discovering what plants need to thrive
	Documenting the growth of the plants on a chart	- Measuring how much water each plant needs - Observing the changes in the plants over time	-
Water wastage	Creating posters for water wastage awareness	Measuring if water wastage is increasing or decreasing	Creative arts for designing posters on water wastage
	Listening to stories about the effects of water wastage	Counting how many containers are necessary to collect excess water	Using gross motor skills to collect water outside
	Discussing how to conserve water	Problem-solving – how to stop water wastage	Discussing the effects of water pollution
Recycling	Labelling the recycling bins outside	Sorting and categorising the trash in the schoolyard for recycling	Observing the effects of pollution on the environment
	Discussing where the waste goes	Appreciation for the natural environment	Picking up trash in the schoolyard
	-	Problem-solving – how to reduce waste	Discussing where the waste goes
	-	-	Fostering a sense of responsibility in learners

Source: Fourie, S 2022, 'Enhancing the teaching of education for sustainable development in the Foundation Phase through community-based education', Master's thesis, North-West University. Adapted from the Life Skills Foundation Phase CAPS document.

additional lesson plans or make or purchase resources when they used nature as a resource. The teachers concurred that their teaching strategies would be sustainable because they worked collaboratively:

'When we worked together, we saved time because we could share responsibilities and ideas.' (Participant 04, Female, age unspecified, 2021)

Initially, the teachers were concerned that implementing ESD would be time-consuming and additional to their already heavy workloads. However, after implementing the action plans, they recognised that when ESD is learner-centred, experiential and integrated across subjects, it does not require additional time.

At the outset, the teachers were hesitant to utilise the outdoors, because of safety concerns, but they eventually recognised that learners need these experiences to become more independent and responsible citizens. One participant explained it as follows:

'We really have nature to learn from and learn in. Even though I was scared to use the outdoors in the beginning [...] now I understand that it is useful. I can't keep the kids in a bubble; they have to learn to be independent and responsible. They must realise the consequences of their actions on people and nature.'
(Participant 01, Female, age unspecified, 2021)

Kaldi, Filippatou and Govaris (2011, pp. 35–47) stress the importance of including experiential, discovery and outdoor learning in daily Foundation Phase teaching. Wang, Zhou and Cui (2019, pp. 497–514) agree that ESD content should be integrated into the daily routines of learners for them to foster ESD ideas, skills and values subconsciously. Therefore, a daily programme is more appropriate for ESD in the Foundation Phase, as these learners remain in the same class all year for all subjects. It is easier to establish sustainable daily routines when the environment, the teacher and the responsibilities remain the same. Learners want to see that their contributions are valued and that the focus of learning is not solely on knowledge retention. When ESD is integrated across all the subjects, it can help to make ESD more relevant in learners' everyday engagement with sustainability because they are continuously immersed in ESD knowledge, skills and values (Sund & Gericke 2020, pp. 772–794).

The participating teachers articulated that the process of learning and then acting on that learning indicated that the learners had achieved their goals. The learners' sense of place began to awaken regarding their environment as they became more inclined to care for and protect it (see McCurdy et al. 2010, pp. 102–117). Therefore, integrating ESD through CBE enabled the learners to act on their learning by identifying environmental issues, discussing possible solutions and experimenting with ideas to take action, as suggested by Haith and Whittingham (2012).

■ Conclusion

The participating teachers felt a strong need to integrate and implement ESD, as some felt unmotivated and incompetent. The discussion of the teachers' needs during Cycle 1 resulted in some of the teachers already being innovative and thinking of creative ways to implement ESD. The teachers suggested three ways in which ESD can be implemented daily to form sustainable values, habits and routines (see Table 1.2).

Based on the findings, it was concluded that teachers need to see the policy documents as a guide rather than a step-by-step teaching plan. The rhizomatic approach to ESD, as illustrated in Figure 1.1, emphasises that the curriculum should be spontaneously shaped, constructed and then reconstructed by teachers' and learners' experiences to transform their mindsets and inspire their imagination. The CBE approach and the PALAR methodology enabled the participating teachers to collaborate to create

culturally relevant knowledge to improve their teaching of ESD. They were able to identify relevant connections between the subject content and ESD and then adapted their lesson plans to integrate sustainability issues in a meaningful way successfully. Their collaboration has opened up an ongoing dialogue that will enable them to continue learning how to adapt EE to suit their specific contexts and emerging environmental issues.

The collaboratively designed daily programme can be used for Grades R-3 learners to inspire the integration of ESD across all subjects. The teachers agreed that these teaching strategies would be sustainable because they are time-efficient and because they worked collaboratively and realised that they could inform their teaching of ESD. The daily programme makes it easier for Foundation Phase learners to establish sustainable daily routines that soon become habits. Implementing learner-centred approaches to teaching ESD allowed the learners to experiment with self-directed learning in which the teachers acted as learning facilitators, thereby reducing the need for direct instruction and lesson preparations.

There was a mutual awareness that teachers should not be scared to take learners outdoors for safety reasons but should embrace the potential of the outdoors to teach learners responsibility and life skills. The first author observed how the teachers started to think more learner-centred by focusing on facilitating learning and helping the learners think critically for themselves. Teachers can turn concerns about safety issues related to CBE into an opportunity to teach learners to evaluate possible safety risks and make decisions about how to avoid them. Outdoor learning should always be justified and include continuous risk assessment involving the learners, the principal and the parents in navigating the risks of the outdoors. Teachers can develop guidelines on how to manage learners' safety, as risk assessments will differ depending on the outdoor learning activity and the school's outdoor environment. It may be more realistic for each school to draw up outdoor learning guidelines that are specific and relevant to its context and environment. Informal assessment, such as observation, is the most appropriate form of assessment, as ESD should be assessed under each subject and does not require a numerical value for each achieved outcome.

It can be concluded that the PALAR process empowered teachers to integrate ESD across subjects through the use of CBE. They learnt to implement learner-centred strategies, find alternative ways to incorporate the environment into their teaching and appreciate that informal assessment is sufficient to assess ESD. Participation in the ALS transformed the thinking and actions of the teachers as they started to take ownership of their teaching. The teachers brainstormed, implemented action plans, reflected on these action plans and became more competent in their teaching of

ESD and the research process. Based on the research findings, we conclude with guidelines for integrating ESD into the Foundation Phase curriculum:

- Teachers should form action learning groups for continuing professional development to improve their ability to integrate ESD into their teaching
- Learner-centred experiential learning is best implemented through CBE because it teaches learners *about* the environment, engages learners *in* the environment and takes action *for* the environment
- Informal assessment, such as observation, should be implemented for ESD within each subject and does not require separate numerical assessment
- A daily programme should be utilised to integrate all the dimensions and aspects of ESD that will assist in forming sustainable habits among learners.

This knowledge contributes to ESD theory and practice by highlighting the value of participatory and place-based pedagogies for integrating ESD into the curriculum. As early childhood is a crucial period for people to develop their attitudes, behaviours and sense of responsibility for the world as global citizens, as well as the needs of their community, it is beneficial for ESD to be implemented and integrated from the Foundation Phase. Furthermore, CBE enhances ESD by enabling learners to develop a sense of place and take responsibility for their environment to become sustainable global citizens. The teachers enhanced their capacity to teach ESD through CBE and established relationships that will, hopefully, continue to grow. They were equipped to implement learner-centred experiential learning in the outdoors to teach learners about, in and for the environment. Moreover, they became more adaptable and resourceful in their teaching and were made aware that their teaching could also serve the community. In addition, they gained insight into their teaching and learning methods and learnt about the power of participatory pedagogy to enhance teaching and learning processes. The knowledge generated by the teachers in this study will, hopefully, inspire other Foundation Phase teachers to learn from and adapt this learning to suit their own contexts.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-01649-19-A2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Outdoor play in early childhood education for sustainable development: Parent–practitioner collaboration²

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■ Abstract

This chapter presents findings from an ongoing research project conducted in five early childhood development centres in South Africa, focusing on parent–practitioner collaboration to support education for sustainable development (ESD) during outdoor play. By using a qualitative approach, I employed a participatory action learning and action research (PALAR) design to address the main question: ‘How can parent–practitioner

2. This chapter is based on a more than 50% reworking of the following published work:

Esterhuizen, S, Uys, M & Mohosho, N 2023, ‘Parent–practitioner collaboration to support sustainable development in early years education’, *Educational Research for Social Change*, vol. 12, no. 1, pp. 17–30. <https://doi.org/10.17159/2221-4070/2023/v12i1a2>

How to cite: Esterhuizen, S 2024, ‘Outdoor play in early childhood education for sustainable development: Parent–practitioner collaboration’ in LO de Sousa & MP Koen (eds.), *Collaborative community partnerships across education settings*, in NWU Community-based Educational Research Series, vol. 1, AVARSITY Books, Cape Town, pp. 25–42. <https://doi.org/10.4102/aosis.2024.BK432.02>

collaboration promote outdoor play to educate for sustainable development?'. In the action learning set (ALS), where participants acted as co-researchers, they worked together to create understanding and advocate for social change. Data generation took place during Cycle 2 of the PALAR process, utilising transcribed and recorded ALS discussions and reflection diaries. Thematic analysis was employed to analyse the data collaboratively. The findings reveal that collaboration between parents and practitioners can indeed facilitate ESD in early childhood. This suggests that involving parents as active partners in the educational process can be a valuable strategy for promoting quality education (sustainable development goal 4) goals in the early years of education.

■ Introduction

For the successful development of young children through play, the collaboration between early childhood development (ECD) practitioners³ and parents is imperative (Bartolome 2022). Bartolome (2022) points out that positive working relationships between ECD practitioners and parents can enhance adults' knowledge and understanding of children and children's learning opportunities, which may contribute to children's learning and well-being at home and in the ECD setting. Because ECD is crucial for laying the foundation for a young child's development, quality early learning programmes are fundamental for well-being, lifelong learning and sustainable development (Department of Basic Education [DBE] 2021). Play-based learning (PBL) is generally viewed as a developmental practice and the best approach to achieve multilevel outcomes during the early childhood years (Danniels & Pyle 2018; Excell et al. 2020; Harris, Anderson & Visconti 2022; United Nations International Children's Emergency Fund [UNICEF] 2018).

Outdoor play refers to open outdoor and natural environment spaces and is an essential component of a child's development. It offers numerous benefits for children's overall health, development and well-being. When children engage in outdoor play, they have the opportunity to physically explore and interact with natural elements, such as plants, trees, rocks and soil (Maynard & Waters 2007). This type of play can help children develop their motor skills, perception and sensory processing abilities. In addition, outdoor play provides opportunities for

3. Early childhood development practitioners work with pre-school children in South Africa and hold an NQF Level 4 Certificate in ECD, an NQF Level 5 Diploma in ECD or an NQF Level 6 Advanced Certificate in Education – Foundation Phase and ECD. Teachers or educators obtain at least an NQF Level 7 Bachelor of Education in Early Childhood Care and Education degree (BEEd ECCE) (Department of Higher Education and Training, 2017).

physical exercise and movement, which are crucial for a child's growth and development (Gessiou 2022; Kemple et al. 2016). Outdoor play has been shown to enhance children's attention and self-regulation skills, which are important for their academic success and socio-emotional development (Gessiou 2022; Kemple et al. 2016). By integrating outdoor play into early childhood education, education for sustainability can be promoted, and children can develop a deeper appreciation for the natural world. This, in turn, can lead to more sustainable societies that value and protect the environment (Kornilaki, Skouteris & Morris 2022; United Nations Development Programme 2015) and can even potentially end poverty and inequality by improving the societies in which children grow and thrive (Visser et al. 2021).

According to the UNESCO Global Education Monitoring Report Team (2021), there is a growing recognition that education for sustainable development (ESD) is an essential part of quality education (sustainable development goal [SDG] 4) and a key enabler for sustainable development. Investing in early childhood education is especially important because it strengthens individual, social, economic and environmental quality and fosters a sense of responsibility for the environment from a young age (Ruto-Korir, Jepkemboi & Boit 2020). Young children should act as competent and active participants in their communities (Borg & Pramling Samuelsson 2022). Involving them in activities that promote sustainable development can significantly impact their learning and development (Nthontho 2017). Therefore, it is essential to promote collaboration between parents and practitioners to support outdoor play in ECD, where children can discover, explore and learn. Through parent–practitioner collaboration, a supportive environment can be created that encourages outdoor play, promotes sustainable development and helps children develop important skills and knowledge (Kambouri et al. 2022). By working together, parents and practitioners can identify ways to incorporate outdoor play into children's daily routines and provide opportunities for children to learn about sustainability and environmental stewardship (Ärlemalm-Hagsér & Pramling Samuelsson 2018; Bartolome 2022; Borg & Pramling Samuelsson 2022).

Promoting parent–practitioner collaboration to support outdoor play in early childhood is essential for promoting ESD and creating a better future for all. By working together, we can help children develop important skills and knowledge, foster a sense of responsibility for the environment and promote a more sustainable and equitable society (Bartolome 2022). This chapter focuses on parent–practitioner collaboration to support outdoor play in early childhood for ESD.

■ Background

There is a growing concern worldwide over the decline in outdoor play, specifically in the early years of a child's life (Lee et al. 2021). Several factors contribute to this phenomenon, including urbanisation, electronic media, parents' fear of crime, kidnapping, injury, safety, traffic, pollution, insect-borne diseases, skin cancer from exposure to the sun, insufficient outdoor space and a lack of a sense of community (Christian 2023; Kemple et al. 2016; Lee et al. 2021). Outdoor play is further compounded by the fact that in many families, both parents work, leading to children being confined indoors during after-school care, which further limits their opportunities for outdoor play (Kemple et al. 2016). Although parents recognise the benefits of outdoor play, some are still hesitant to allow their children to engage in unstructured play in outdoor environments. This is because they are unsure whether cognitive outcomes and real learning can occur through unstructured outdoor play (Parsons & Traunter 2020). However, research shows that outdoor play has significant cognitive, socio-emotional and physical benefits for children, and it is essential to encourage children to engage in outdoor play from a young age (Christian 2023; Davis 2015).

A decline in outdoor play leads to inactive lifestyles, which result from decreased physical activity and can lead to childhood obesity (Obee et al. 2021). Research shows that outdoor play can contribute to children's overall physical and mental health, well-being and cognitive development. Parents and practitioners should collaborate to allow children to explore their natural environment and engage with their surroundings.

Outdoor play ranges from active play, which requires physical, verbal or mental engagement, to pleasurable play, which puts the focus on enjoyment (Ali et al. 2018). When children are allowed to play in a way that is meaningful and enjoyable to them, they are more likely to retain the information they have learnt and develop important skills that will benefit them throughout their lives (Ali et al. 2018). Children should have the opportunity to play independently or interact with others, including practitioners, peers and parents. According to Ali et al. (2018), this can help them learn important social skills, build relationships and develop a sense of community. The family, ECD centres and the local community all play a role in supporting outdoor play ESD. Ali et al. (2018) highlight that providing children with safe and stimulating outdoor environments and policies and regulations that encourage outdoor play can help ensure that children can develop important skills through play.

However, there are many barriers and challenges in promoting outdoor play in ECD centres, such as safety concerns, a lack of time, weather constraints, cultural beliefs, practitioner training and parents' and practitioners' knowledge and skills (Cheng et al. 2022; Sandseter et al. 2020).

Cheng et al. (2022) stress the need for professional development regarding the positive effects of outdoor play and training in how practitioners can facilitate outdoor play.

The right to play is of such a critical nature that it is preserved in the United Nations Convention on the Rights of the Child, and outdoor play is emphasised as an essential component of children's development and well-being (Christian 2023). Borg and Pramling Samuelsson (2022) believe that children's agency and participation in their learning are also crucial for promoting ESD. Allowing children to follow their instincts and interests during outdoor play can help them develop a sense of agency, creativity and resilience while also fostering their social-emotional and risk-management skills (Bento & Dias 2017). By promoting outdoor play and children's agency in their learning, parent-practitioner collaboration can help foster their curiosity and love for nature, leading to a greater sense of environmental responsibility (Gessiou 2022). It can also cultivate their overall physical and mental health, well-being, self-regulation skills and cognitive and executive function, which are essential for ESD (Bento & Dias 2017).

According to the Brundtland Report (1987), sustainable development refers to 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development 1987, p. 47). To create a sustainable future, a holistic approach to teaching young children about the economic, environmental, social and political challenges that affect young children all over the world should be adopted (Borg & Pramling Samuelsson 2022). Early childhood education and care for sustainable development (ECECfSD) create opportunities to increase knowledge, skills, values and attitudes by including the holistic and integrated socio-emotional, cognitive, physical and moral aspects of child development to lay the foundation for healthy and sustainable futures (Borg & Pramling Samuelsson 2022; Cheng et al. 2022). Outdoor play in nature facilitates exploration, imagination and interaction with people, plants and animals and helps children to develop environmentally friendly behaviour necessary for ESD. Because of globalisation, ECECfSD should promote children's interest and active participation in society for sustainability by acknowledging their views, voices and interests (Borg & Pramling Samuelsson 2022) to become active agents for change in their communities by preserving the environment and fostering social justice for a more sustainable future (Koen 2021). To become active agents of change, children should participate in everything concerning their lives, have their opinions heard and respected, and be allowed to make choices and decisions concerning their daily actions. In this way, children will be enabled to become competent in making healthy lifestyle choices,

enhancing autonomous thinking and encouraging tolerance towards all people, despite differences in race, culture and socio-economic status (Davis 2015). Thus, they can contribute to a more sustainable society by becoming actively involved.

As proposed by Rogoff (2008), the socio-cultural activity theory emphasises the importance of the relationship between the child and the broader social context. In this regard, promoting outdoor play and physical activity can be seen as a means of fostering children's engagement with their environment and promoting ESD. By providing safe and accessible outdoor spaces, parents and practitioners – together with the community – can create opportunities for children to engage with their surroundings, interact with natural elements and develop their physical and cognitive skills (Gessiou 2022). Furthermore, education and awareness-raising campaigns can help parents, practitioners and caregivers understand the importance of outdoor play and physical involvement in children's learning for their development and well-being. Promoting outdoor play and physical activity for children is an important step towards creating more sustainable and equitable communities, while also promoting children's health and well-being (Borg & Pramling Samuelsson 2022).

Parents and practitioners must work together to promote outdoor play in ECD and overcome the barriers preventing children from engaging in outdoor play. This can involve providing safe and secure outdoor spaces, creating a sense of community, educating parents and practitioners about the benefits of outdoor play and involving them in activities that promote sustainability (Boonk et al. 2018; Durisic & Bunijevac 2017). An integrated approach to ESD can help children develop a holistic understanding of the world and their place in it and promote their engagement in activities that support sustainable development (Ärlemalm-Hagsér & Pramling Samuelsson 2018).

■ Theoretical framework

According to Kivunja (2018), a theoretical framework provides the foundations for and guides a particular study. The socio-cultural activity theory of Barbara Rogoff (1995, 2003, 2008, 2023) – a neo-Vygotskian whose theory focuses on how children cultivate knowledge by interacting with the social environment – underpinned this chapter. The theory indicates that skills derived from engagement in socio-cultural activities can be acquired in specific contexts and learnt through specific cultural activities rather than focusing only on children and their individual processes. Rogoff's work builds upon Vygotsky's socio-cultural theory by emphasising the active participation of children in their development and engagement with the skilled activities of their community.

Where Vygotsky (1978) argues children's involvement in their learning within a language-rich, supportive and collaborative environment (Excell et al. 2020), Rogoff (1995) expands on Vygotsky's theory by emphasising children as active agents in their learning and involvement in their communities. According to Rogoff (2003), children's development is founded on a cultural, social and historical perspective. Rogoff (1995, 2008, 2023) views children's development as deeply rooted in their cultural, social and historical context. She proposes three interrelated planes of socio-cultural activity that provide different levels of focus on this context, namely apprenticeship, guided participation and participatory appropriation.

The *apprenticeship* plane focuses on how children learn by observing and actively participating in skilled activities alongside more experienced members of their community (parents or practitioners). The goal is to expose less experienced participants (children) to mature participation in the activity, which allows them to take on more responsibility and develop their skills gradually. In the context of outdoor play and ESD, children can learn a great deal from their parents and practitioners about the practices within their community, including economic, political, spiritual and material practices (Rogoff 2008). In the context of this study, they may learn about sustainable gardening practices, such as composting and using natural fertilisers, from a parent or practitioner who is skilled in these activities. Through observation and active participation, children can learn not only the skills necessary for sustainable practices but also the values and beliefs underpinning these practices. They may come to understand the importance of reducing waste, conserving resources and protecting the environment (Cheng et al. 2022). By participating in skilled activities alongside more experienced members of their community, children can develop a sense of belonging and connection to their community and become active agents of change for sustainable development. This aligns with the goals of ECECfSD, which seek to empower children to become active and engaged members of their communities who are committed to creating a more sustainable future (Borg & Pramling Samuelsson 2022; Cheng et al. 2022). With regard to outdoor play and ESD, children actively learn from their parents and practitioners about practices within the community.

Guided participation, as described by Rogoff (2023), goes beyond Vygotsky's zone of proximal development (ZPD) and involves more explicit face-to-face instruction and side-by-side guidance through collaborative participation. In guided participation, learning opportunities are structured through choice, observation and listening while participating in the activities and sharing understanding verbally and non-verbally. This means that children use cultural tools with skilled mentors to shape their development. Parent-practitioner collaboration is vital in guided participation (Bayat & Madyibi 2022) because the ZPD is reached when children collaborate with

peers or adults to accomplish their maximum potential. Rogoff points out that guided participation also allows children to choose where, with whom and with what activities they would like to engage in. By actively participating in society and becoming agents of change in their communities, children can apply the knowledge and skills they acquire through guided participation to create a more sustainable future (Borg & Pramling Samuelsson 2022). Overall, guided participation is an important concept in promoting active and engaged learning, as well as sustainable development (Venter 2022; Whitebread, Kuvalja & O'Connor 2015; Wood 2022). By providing children with outdoor opportunities to collaborate with skilled mentors and participate in meaningful activities, we can help them become empowered agents of change in their communities. Considering this study, a parent or teacher can work alongside a child to teach them how to plant and care for a vegetable garden. The adult can explain the importance of gardening and the benefits of growing one's own food.

Furthermore, the adult can guide the child in selecting the right seeds, preparing the soil and planting the seeds in the garden. As the plant grows, the adult can continue to guide the child in watering, fertilising and pruning the plants as needed. Through this process of guided participation, the child learns about the steps involved in gardening while also developing an appreciation for nature and a sense of responsibility for taking care of plants. The adult can also provide opportunities for the child to make decisions and take ownership of the project, such as choosing which vegetables to grow and deciding when to harvest them (Rogoff 2023).

Participatory appropriation is a process by which individuals acquire new knowledge through active participation and observation in a particular activity or context and then apply that knowledge to similar situations in the future (Rogoff 1995, 2003, 2008). Through parent-practitioner collaboration, children actively participate in, for example, the planting process by observing how it is carried out. They acquire new knowledge and skills related to gardening that can be applied to similar situations in the future, such as creating and maintaining a garden at home. This is because participatory appropriation is not just about acquiring knowledge but also about incorporating that knowledge into one's everyday life and using it to make meaningful changes for sustainable development (Rogoff 2003). In the example of planting a vegetable garden, children not only learn about gardening but also learn about the importance of caring for plants and the environment. By participating in the process of planting in a garden, children learn about the different components necessary for plants to grow, such as sunlight, water and soil. They also learn about the importance of composting and reducing waste, which are crucial aspects of sustainable development. Through this experience, children acquire knowledge and skills that can be applied to similar situations in the future.

For example, they can apply their knowledge of composting to their own backyard or community garden, or they may reduce their waste at home by practising more sustainable habits. Participatory appropriation is a process of ‘becoming’, rather than attainment (Rogoff 2008).

Rogoff’s theory (2008) is appropriate for this chapter because I wanted to understand better how parent–practitioner collaboration can promote outdoor play to educate for sustainable development.

■ Research methodology

In this qualitative study, we strove to understand and make sense of the phenomena the participants experienced. Therefore, we explained in the action learning set (ALS) how we felt and what we experienced and thought about parent–practitioner collaboration to support outdoor play for ESD, as suggested by Tenny, Brannan and Brannan (2022).

■ Context of the study

The eight participants consisted of practitioners from five ECD centres in the Sedibeng East district in Gauteng and researchers from the North-West University who formed an ALS. The participants acted as co-researchers to promote equal participation and eliminate power relationships, as proposed by Wood (2020). The practitioners were purposively selected by the Grade R facilitator from the National DBE in the Sedibeng East district, Vereeniging, Gauteng. She acted as an objective mediator to enhance trust among the members of the ALS and ensure objectivity, as suggested by Wood. The ALS members were aged between 35 and 45+. The eight participants who formed the ALS were numbered from one to eight. Pseudonyms indicating their number and gender (‘F’ for Female and ‘M’ for Male) were used to refer to them, as indicated in Table 2.1.

Even though the study comprised three iterative cycles of action and reflection during which we addressed the research questions, as discussed in Lunga et al. (2022), this chapter reports only on Cycle 2. The study started in 2022.⁴

4. In this chapter, I reported on research performed during Cycle 1 by Lunga et al. (2022), ‘Play-based pedagogy: An approach to advance young children’s holistic development’ and Esterhuizen, Uys and Mohosho (2023), ‘Parent-practitioner collaboration to support sustainable development in early years education’. This chapter focuses on Cycle 2. During Cycle 2, we explored how the capacity for PBL in ECD could be strengthened through a collaborative approach among stakeholders. In our discussions, the need for knowledge and skills in outdoor play for ESD emerged. We conducted four sessions, each lasting between 45 and 60 minutes, to assist the ALS to think of ways to promote parent–practitioner collaboration to support outdoor play to educate for sustainable development. During Session 1 and 2, we generated the data reported in this chapter for Cycle 2 through recorded and transcribed ALS discussions and reflective diaries.

TABLE 2.1: Biographical details of the members of the action learning set.

Pseudonym	Gender	Age group	Language group
F1	Female	45+	isiZulu
F2	Female	35+	English
F3	Female	35+	Sotho
F4	Female	45+	Sotho
M5	Male	35+	Shona
F6	Female	45+	Afrikaans
F7	Female	45+	Afrikaans
F8	Female	45+	Afrikaans

Source: Lunga, Esterhuizen and Koen (2022).

During Cycle 2, we explored how a collaborative approach among stakeholders could strengthen the capacity for PBL in ECD. In our discussions, the need for knowledge and skills in outdoor play for ESD emerged. We conducted four sessions, each lasting between 45 and 60 min, to assist the ALS in thinking of ways to promote parent–practitioner collaboration to support outdoor play to educate for sustainable development. During Sessions 1 and 2, we generated the data reported in this chapter for Cycle 2 through recorded and transcribed ALS discussions and reflective diaries.

■ Research design

This qualitative study followed a participatory action learning and action research (PALAR) design, where participants collaborated as equal partners or co-researchers. During PALAR, cycles of action and reflection took place, during which collaborative learning, inclusion and care were eminent. The ALS acted as co-researchers by acting not only as receivers of knowledge but also as producers of knowledge (see Wood & Zuber-Skerrit 2022) and explored how collaboration between parents and practitioners could support outdoor PBL for ESD (see Wood 2020; Zuber-Skerritt 2019). We strove to develop democratic, authentic, trusting and supportive relationships and acknowledged and respected each member of the ALS (see Kearney, Wood & Zuber-Skerritt 2013). The parents’ and practitioners’ practical experiences and real-world knowledge, combined with the researchers’ theoretical and methodological expertise, enhanced the quality of the research to bring about change in our communities for social justice that may contribute to sustainable development, as expressed by Zuber-Skerrit (2019). The data were generated by reflective diaries and recorded and transcribed ALS discussions. Collaboratively, we thematically analysed the data according to Braun and Clarke’s (2013) six steps – becoming familiar with the collected data, using coding to indicate the various sections, generating themes by identifying patterns, reviewing the themes, defining and naming the themes and, lastly, displaying the themes.

■ Data analysis and ethics

To ensure integrity throughout the research, we followed Herr and Anderson's (2005) five quality indicators, namely outcome validity, process validity, democratic validity, catalytic validity and dialogue validity. For this low-risk-level research project, we received permission from the Gauteng Department of Education, Sedibeng East district and the Ethics Committee, Edu-Rec, of the North-West University.

■ Presentation of findings and discussion

Verbatim statements of the ALS (see Table 2.1) reveal the originality of our collected data. Three themes transpired from the data, namely 'parent-practitioner perception of outdoor play', 'teaching and learning' and 'challenges for implementing outdoor play'.

■ Theme 1: Parent-practitioner perception of outdoor play

The ALS acknowledged the importance of outdoor play (Cheng et al. 2022), but it was concerning that some of the practitioners and parents in the ALS seemed to equate outdoor play solely with the use of playground equipment, for example, running around outside, playing with one another, swinging, sliding from a slide or climbing on a jungle gym. This narrow view of outdoor play may limit the types of experiences that children are exposed to and prohibit role players from fully taking advantage of the benefits of outdoor play (Cheng et al. 2022; Visser et al. 2021). The lack of outdoor equipment or natural elements in some of the outdoor areas was concerning. The outdoor area at F3's ECD centre was not equipped at all: there were no trees, plants or grass. She said:

'We do not have any toys the children can play with. They play touchers or run around chasing each other. Some children sit and look at how the others play.' (Participant 03, Female, age unspecified, 19 July 2023)

F2 explained her situation as follows:

'Some people brought us outdoor play equipment, but we do not have enough space for it. We also need to fix and paint it. We cannot use it, because we do not have the tools. The children fight. So, it is of no use to us.' (Participant 02, Female, age unspecified, 26 July 2023)

The participants' traditional view of outdoor play as a place of limitation, where only physically active movements occur, is expected (Jeon & Jun 2021), especially in rural areas. Although the primary function of outdoor play is to promote play, it also functions to promote the learning and development of children holistically. Jeon and Jun (2021) assert that it

is essential that parents and practitioners recognise outdoor play as a place for learning and development. Therefore, ECD centres and other organisations that provide opportunities for outdoor play should strive to create safe and stimulating outdoor environments that include a variety of elements, such as plants, trees, grass and natural materials, as well as opportunities for physical activity and imaginative play (Jeon & Jun 2021).

When asked which developmental areas should be addressed in ECD, the ALS mentioned that it included children's physical, cognitive, socio-emotional, language and moral development (see also DBE 2021; Excell et al. 2020; Harris et al. 2022). Research affirms that outdoor play provides children with opportunities for exploration, discovery and problem-solving (Parsons & Traunter 2020). Children can develop their creativity, imagination and spatial awareness through activities such as building forts, exploring nature and playing with water and sand (Kamal & Gabr 2023). Outdoor play also positively impacts socio-emotional development, as it allows children to interact with others, develop social skills and learn about relationships and empathy. Playing together in natural environments can foster a sense of community and cooperation and provide opportunities for children to learn about sustainability and diversity (Pramling Samuelsson & Kaga 2008). Furthermore, outdoor play can support language development, as children can engage in conversations and storytelling while exploring their surroundings. Exposure to nature can also enhance children's vocabulary and language comprehension while engaging in outdoor activities to promote their moral development. Moreover, by engaging in activities such as gardening or recycling, children develop an understanding of sustainability and their role in protecting the planet (MacDonald 2015).

M5 pointed out that the perception of outdoor play only addressing a child's physical development was incorrect: with outdoor play, a number of skills can be developed, and the development of sustainability can be added to this list. M5 explained it as follows:

'Outdoor play is not only about running around. We must think of ways how to stimulate other developmental areas so that we can create a prosperous future for our children. We have to teach our children to sustain our environment for future use and that can be done through outdoor play.' (Participant 05, male, age unspecified, 26 July 2023)

The literature is clear on the benefits of parent-practitioner collaboration to promote ESD beyond the immediate context of outdoor play (Danniels & Pyle 2018; Harris et al. 2022; UNICEF 2018). When parents and practitioners model sustainable behaviours and practices (Kornilaki et al. 2022; United Nations Development Programme 2015) and involve children in these activities, as suggested by Rogoff (2008), it helps to instil a sense of environmental responsibility in children from an early age.

After discussing the plethora of active learning opportunities for children during outdoor play (see Borg & Pramling Samuelsson 2022), F3 stated:

‘That is such an eye-opener! I never thought of that. I would like to do that in my centre.’ (Participant 03, Female, age unspecified, 19 July 2023)

F1, F2 and F4 agreed wholeheartedly with F3, but F1 immediately voiced her concerns as follows:

‘In our area, we cannot take the children out to a park. It is just not safe. We do not have transport, and there are too many children to look after. And in any way, there is no park in our area.’ (Participant 01, Female, 19 July 2023)

F7 reassured the ALS that it was not necessary to take children to a park and said that we, as an ALS, should plan how we could create a corner in the centre’s yard where we could expose the children to outdoor play for ESD. F4 reacted to this statement as follows:

‘We as parents can come and help. Maybe on a Saturday we can come together and prepare a piece of ground.’ (Participant 04, Female, age unspecified, 26 July 2023)

The statement made by F4 correlates with Rogoff’s (2008) *apprenticeship plane*, which affirms that children learn through observation and active participation alongside more experienced community members. Ntekane (2018) confirms this statement that parental involvement in the education of children holds many benefits. Bartolome (2022) believes that positive working relationships between parents and practitioners promote adults’ knowledge of child development and learning, which, in turn, contributes to children’s learning and well-being at home. F6 remarked that we should include the community and other stakeholders to identify a safe space close to the ECD centre that could be transformed into a park:

‘We must investigate how we can create a safe park within walking distance from a few ECD centres where practitioners can take their children from time to time for outdoor play. We can ask parents to accompany the group to ensure the safety of our children.’ (Participant 06, Female, age unspecified, 26 July 2023)

This remark relates to the literature that states that by working together, parents, practitioners and the community can create safe and accessible outdoor play spaces where children can freely explore and engage with their natural environment (Borg & Pramling Samuelsson 2022). Outdoor play that educates on sustainable development through parent–practitioner collaboration can be a powerful tool when working together. We can create a more sustainable and equitable world for future generations (Ärlemalm-Hagsér & Pramling Samuelsson 2018). This aligns with Rogoff’s (2023) *guided participation plane*, which highlights explicit face-to-face instruction and side-by-side guidance through collaborative participation.

■ Theme 2: Teaching and learning

The participating practitioners admitted that they had no knowledge of teaching and learning during outdoor play. All the practitioners voiced their need for further training to obtain higher qualification levels. F3 made the following remark:

'I need training in the ECD programme. We received toys with which the children can play inside, but I don't use them, because I don't know how. I have to know what to do with the children and when should I do it.' (Participant 03, Female, age unspecified, 19 July 2023)

F2 agreed and said:

'If we can just have a workshop where you can show us how to do the outdoor play, we will be happy to do it.' (Participant 02, Female, age unspecified, 19 July 2023)

F1, who was furthering her studies through an online institution, complained:

'I received my study material late. Everything is online. If I don't understand something, I have no one to ask for assistance. They don't reply to e-mails and don't answer their phones. Nothing is explained practically. I have to read through the study material, and most of the time don't even understand what I have read. We need practical, face-to-face workshops where you show us what to do. Shoh ... and the load shedding is terrible when you study online.' (Participant 01, Female, age unspecified, 19 July 2023)

These statements corroborate research that states that 78% of ECD practitioners do not have a diploma to teach at the pre-school level, while 23% of ECD practitioners have no training at all (Visser et al. 2021). Although ECD training courses are presented, some of these are not aligned with the National Curriculum Framework, and some workshops are not for free. According to Visser et al. (2021), most practitioners also lack funding.

■ Theme 3: Challenges for implementing outdoor play

According to Cheng et al. (2022), ECD centres can play an important role in outdoor play, and practitioners are important role-players in supporting children's outdoor play opportunities. Although outdoor play is recognised as beneficial to children's healthy holistic development and well-being (Bento & Dias 2017), practitioners face numerous challenges with implementing outdoor play at their centres (Cheng et al. 2022; Sandseter et al. 2020; Visser et al. 2021). Challenges concerning safety, space and a lack of knowledge were experienced at the ECD centres that took part in this project.

When the ALS discussed various activities that could be implemented outdoors and the benefits these held for child development, parent-practitioner

collaboration and sustainability, numerous challenges specific to their context were mentioned. F1 raised her concern about the environment in which the ECD centres are located. She said:

‘You see what our environment looks like. Firstly, we do not have natural parks close by to take our children to. Secondly, we can take them to Heidelberg or Johannesburg, but then we have to ask permission from the Department of Education three months in advance. Thirdly, we do not have funds to travel so far, and usually, you have to pay an entrance fee. Fourthly, we have too many children. We will not be able to keep them all safe. And fifthly, we do not know what to teach the children; what should we look out for? How do we do it? For us, it would not be possible.’ (Participant 01, Female, age unspecified, 26 July 2023)

All the participants agreed, and F4 also raised her concern about the safety of the children:

‘We send our children to the centres, and we trust they will be safe. If they play outdoors, they can be kidnapped or get hurt.’ (Participant 04, Female, age unspecified, 26 July 2023)

F2 and F3 simultaneously reacted as follows:

‘I agree. I am responsible for the children in my class. If something bad happens to any one of them, I will lose my work.’ (Participant 02, Female, age unspecified, 26 July 2023)

‘I am concerned about our children’s safety. We cannot leave them on their own to play outside.’ (Participant 03, Female, age unspecified, 26 July 2023)

It is common for adults to feel a sense of fear or concern when children engage in outdoor play; however, research suggests that outdoor play is beneficial for the holistic development of children (Sandseter et al. 2020). Despite the challenges mentioned here, the ALS agreed on the multitude of benefits when children spend time outdoors and that children spending most of their time indoors can influence their socio-emotional, cognitive and physical development (see Bento & Dias 2017). Insufficient space was mentioned as another challenge, as summarised by Participant 02:

‘You can see for yourself. My centre does not have space, even not [*sic*] for the [*sic*] swings. Where can I plant a vegetable garden?’ (Participant 02, Female, age unspecified, 19 July 2023)

Furthermore, F4 pointed out their area’s lack of space and natural parks. For safety reasons, children are kept inside their houses after school and over weekends and holidays because of the high crime rate in the area. She said:

‘We don’t have natural parks here. The open spaces are used as dumping grounds, and it is not safe to let your children go to the dumping grounds because of the crime. Daily we hear about young children being killed or abducted in our area.’ (Participant 04, Female, age unspecified, 19 July 2023)

The responses provided here emphasise the lack of outdoor play in ECD centres because of various reasons, such as parents' and practitioners' perception of outdoor play, teaching and learning opportunities and challenges about implementing outdoor play at ECD centres.

■ Discussion of the findings

The benefits of outdoor play for young children are well documented, including promoting physical, cognitive, socio-emotional and moral development and self-regulation skills, as well as connecting with nature, to mention only a few (Bento & Dias 2017; Gessiou 2022; Kemple et al. 2016). Incorporating ESD into outdoor play can help children develop an appreciation for the environment and an understanding of how to live sustainably (Borg & Pramling Samuelsson 2022).

However, many factors contribute to the decline in outdoor play, including urbanisation, electronic media and safety concerns (Christian 2023; Kemple et al. 2016; Lee et al. 2021). Parent–practitioner collaboration can play a vital role in promoting outdoor play for sustainable development in the ECD sector in South Africa and beyond. By working together, parents and practitioners can create safe and engaging outdoor play environments that support children's development and help them develop an appreciation for sustainable living (Bartolome 2022).

Outdoor play is primarily seen as a way to promote physical activity and gross motor development and not as an opportunity to engage with and learn from the natural world from an early age (Jeon 2021). Practical training sessions or workshops can be an effective way to increase parents' and practitioners' knowledge and understanding of the benefits of outdoor play and how to support it effectively. These sessions can provide information on the many opportunities for learning and development that outdoor play provides, as well as practical strategies for creating safe and engaging outdoor play environments. Increased knowledge and understanding of the benefits of outdoor play can assist with parent–practitioner collaboration to support outdoor play for sustainable development and knowledge of how to overcome the challenges they experience.

The socio-cultural activity theory of Rogoff (1995, 2003, 2008, 2023) was a useful framework for the study. The *apprenticeship plane* refers to children learning through observation and active participation. This study relates specifically to learning about sustainable gardening practices and conservation. The *guided participation plane* highlights the importance of children having a say in their learning and participating in activities that interest them. In the context of this study, the guided participation plane

involves giving children the choice of where, with whom and in what activities they want to be involved, which can help promote a sense of ownership and engagement in the gardening process. The *participatory appropriation plane* is about acquiring new knowledge from more skilled peers or adults through active participation. In this study, this plane relates specifically to children acquiring new knowledge about sustainable gardening practices and techniques from skilled practitioners and parents through outdoor play.

This is an ongoing study. In Cycle 3, the ALS will collaboratively compile guidelines on how outdoor play to educate for sustainable development through parent–practitioner collaboration can be supported. This is relevant to Rogoff’s (2008) *participatory appropriation plane* because the participating parents and practitioners will obtain knowledge about outdoor play to educate for sustainable development, and they will be able to apply this knowledge in their everyday lives.

■ Conclusion

Parents and practitioners must collaborate to create an outdoor play environment to support children’s agency in their learning and development. Activities such as creating a vegetable garden at their ECD centres align with Rogoff’s (2008) *participatory appropriation plane*, which emphasises the importance of involving children in real-life activities that have meaning for and relevance to their lives. By involving children in the planning and implementation of a garden, parents and practitioners can create a hands-on, experiential learning opportunity that develops a range of skills – from problem-solving and teamwork to literacy and numeracy. Such a garden project can help children develop an appreciation for sustainable development and the importance of caring for the environment.

Furthermore, outdoor play, such as this vegetable garden project, can extend beyond the ECD centre to children’s homes, encouraging families and friends to engage in similar projects and promoting a sense of community. Involving children in the entire process – from planning the garden, preparing the ground and planting the seeds to harvesting and even cooking – will teach them about healthy eating habits, the importance of environmental sustainability and the value of collaborative efforts. Social interaction with peers, parents and practitioners can also shape children’s understanding of outdoor play and its significance for their development and well-being. It is, therefore, important for parents and practitioners to engage in collaborative efforts to create an environment that promotes outdoor play and supports children’s agency in their learning and development. Parent–practitioner collaboration in supporting outdoor play to educate for sustainable development is thus possible.

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■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU 01232-20-A2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

The use of entomophagy learning resources to foster education for sustainable development⁵

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■ Abstract

With its rapidly growing population and all climate change scenarios forecasting food insecurity, the African continent must consider local solutions as part of its adaptation strategy for future generations. Insects have been proposed as a means to ensure sustainability in food production, as mini-livestock fits neatly into the biodiversity economy. To address the negative perception of insects in society, it is essential to incorporate indigenous knowledge about entomophagy – the consumption of insects as food – into the current Eurocentric curriculum of South Africa. By recognising insects as a valuable and sustainable food source, we can promote cultural diversity, ecological awareness and responsible food practices. This chapter reports on newly developed entomophagy learning resources and applications in the Natural Sciences and Technology (NST) subject topics to deliver education for sustainable development (ESD) in the intermediate phase. Entomophagy learning resources, such as information worksheets about edible insects, may foster appropriate knowledge and skills to develop sustainable food crops in the form of mini-livestock. Focus group interviews and a self-administered survey were used to gather data to allow for a comprehensive exploration of perspectives, experiences and insights of in-service teachers on entomophagy as a teaching topic. Thematic analysis revealed that the teachers agreed that the lifecycles, harvesting, preparation and socio-economic value of edible insects could be integrated into the NST subject to promote the value and potential of insects as food sources. An interpretive research paradigm with a case study design was used to gain a deeper understanding of primary school teachers' interest in integrating edible insect information worksheets into NST themes. The study found that once prompted, NST teachers had the prior knowledge and skills necessary to interpret and critically analyse the entomophagy learning resources to foster ESD in primary schools. Teachers can support several sustainable development goals by integrating resources on edible insects into the NST curriculum.

■ Introduction

The birth of the eight-billionth baby on Earth on 15 November 2022 was celebrated by the United Nations (UN) as a milestone. However, it also created concern about an increase in economic inequality and a setback for sustainable development among humanity (UN News 2022). In this chapter, sustainable development is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (UN 1987, p. 16).

Increasingly, pressure will be put on the world's agricultural system to produce enough food by 2050 for the growing world population (Capone et al. 2014). If renewable resources are consumed at a rate faster than they can be regenerated, they will no longer be available for future generations, and human living conditions will deteriorate. Food security and sustainable practices are closely aligned (Berry et al. 2014). A contributing factor to missing the food security target in southern Africa could be that the promotion of indigenous knowledge about foods such as insects has been neglected in schools (Dzerefos & De Sousa 2020) and the food production sector (Hennig 2022). Insects are a highly nutritious food with vast potential to feed the growing population (Elhassan et al. 2019), but this has not been exploited in Africa.

The rationale for this chapter is to introduce the topic of entomophagy through learning resources on edible insects to in-service teachers in Gauteng, a province of South Africa. By promoting the benefits of insects to society, education for sustainable development (ESD) can be promoted. Previous research has recommended that environmental education (EE) in Gauteng schools should be integrated with the curriculum and adequate resources should be provided to support the implementation (Ramsaroop & Van Rooyen 2013). The two approaches – EE and ESD – are closely linked, as they both aim to foster knowledge, awareness and skills necessary for individuals to understand and address environmental challenges, promote sustainable practices and contribute to a more sustainable future. Both approaches emphasise the importance of integrating environmental considerations into all aspects of education, thereby empowering individuals to become active global citizens who can make informed decisions and take responsible actions to protect the environment and promote sustainability.

In this chapter, we explore the implementation of entomophagy learning resources within the Natural Science and Technology (NST) curriculum in South African primary schools. The goal is to enhance acceptance and foster critical thinking about sustainable food resources for humanity. Integrating knowledge about edible insects can promote ESD to foster sustainable development in South Africa. The teacher's prior knowledge, including traditional practices and willingness to make use of these resources to promote the national curriculum, may offer guidance on approaches to ESD that have not yet been optimised. In our research, teachers participated in discussions to broaden their understanding of the challenges faced by humanity, including the growing human population and food production. Learning resources on edible insects that integrate both indigenous knowledge and science provides one solution to educate learners who can find solutions for improved food security and sustainable development.

■ Research questions

The aim of this research is to determine the use of entomophagy learning resources in NST to foster ESD in primary schools.

The research questions are:

- How can primary school teachers integrate entomophagy learning resources into the NST school curriculum?
- What are teachers' perceptions of the integration of entomophagy resources into ESD?
- Which topics in the NST curriculum can be taught by using mealworms (*Tenebrio molitor*) as learning resources?

Investigating these questions should make it possible to determine the use of entomophagy learning resources in NST to foster ESD in primary schools.

■ Conceptual framework

The conceptual framework of this chapter consists of four interrelated concepts, namely ESD, entomophagy, food security and the place of ESD and entomophagy in the primary school curriculum. The relevant topics are discussed in depth in this chapter.

■ Development of education for sustainable development

After World War II (WWII), the pursuit of sustainable development led the UN to organise various summits and conventions where world leaders and environmentalists could collaborate and develop solutions (see Table 3.1). During these summits and conventions, environmental concerns such as waste reduction, poverty, famine relief, climate change adaptation, biodiversity conservation and improved agricultural practices were discussed (UN Environmental Programme [UNEP] 1978). The topic of EE was also discussed in various forms but only gained significant recognition in the 1960s and 1970s as a response to growing environmental concerns. It was introduced by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to describe observable anthropogenic changes in the environment (UNESCO 2000). Primarily, EE focuses on imparting knowledge and raising awareness about environmental issues. The concept of EE serves as the foundation for promoting sustainable living (Lukman & Glavič

2007; Omer & Noguchi 2020) and led to the establishment of the UN Environmental Programme (UNEP; Irwin & Lotz-Sisitka 2005). According to Pellaud, Ndiaye and Khushik (2019), EE encompasses more than biophysical and social aspects, as it also has ethical, cultural, political and economic dimensions. These dimensions align with O'Donoghue's environmental model, which emphasises the interconnectedness between society, culture, economic activities, political decision-making and the integrity of the biosphere (Rosenberg 2020). United Nations Educational, Scientific and Cultural Organization not only introduced the concept of EE but actively promoted its implementation as well. According to Huckle and Wals (2015), EE is seen as a lifelong learning process that begins in early childhood and continues throughout all educational phases.

In the 1990s, the concept of ESD emerged. It gained international recognition during the UN Conference on Environment and Development held in Rio de Janeiro in 1992, also known as the Earth Summit. The Agenda 21 document, which resulted from this conference, called for the integration of sustainable development principles into education at all levels and emphasised the role of education in achieving sustainable development. Thus, ESD takes a broader approach than EE by integrating social, economic and environmental dimensions of sustainability. As such, ESD goes beyond understanding environmental challenges and seeks to empower individuals to analyse complex issues critically, promote social equity and make informed decisions that balance environmental conservation with social well-being and economic prosperity. Also, it emphasises the need for systemic thinking, interdisciplinary approaches and transformative learning to create sustainable societies (Dzerefos & De Sousa 2020). The role of ESD has become increasingly important in the new millennium, concurrent with warnings of climate change (Scholes, Scholes & Lucas 2015). Sustainable living can be encouraged by having unfamiliar food sources integrated and explained to learners in teaching and learning resource materials.

The UN conference in Stockholm (see Table 3.1) focused on improving the preservation of the environment (Sauve, 1996). The conference led to the establishment of the UNEP. Principle 19 of the UNEP highlighted the protection of the environment to attain environmental sustainability through education for all generations (Lee, Lee & Popuri 2020). Principle 2 of the UNEP (UN 1973) states that:

[T]he natural resources of the Earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management. (UNESCO 1978, p. 99)

TABLE 3.1: Timeline of events contributing to environmental education, sustainable development and education for sustainable development.

Date	Event or conference	Location	Focus	Relation of the event or conference to the study
1948	International Union for Conservation and Natural Resources	Paris, France	Environmental concerns and strategies for conservation	The importance of education is to ensure sustainable development and food security for more than 8 million people and their descendants.
1972	UN Stockholm Conference	Stockholm, Sweden	UN Conference on the Human Environment	Over 100 countries discussed the potential of EE to address global environmental challenges, including sustainable agricultural practices and food security.
1975	Establishment of the Belgrade Charter	Belgrade, Yugoslavia	UNESCO organised an international environmental workshop	At the workshop, a global framework for EE was developed. The charter states that EE should prepare individuals for life through an understanding of the major problems of the contemporary world. It must also provide individuals with the skills and attributes towards improving life and protecting the environment.
1977	The Tbilisi Declaration	Georgia, USSR	Guiding principles of EE were published in the Tbilisi Declaration	The declaration focused on EE, emphasised the need for educational programmes to promote sustainable agriculture practices and highlighted the importance of involving local communities, especially indigenous people.
1987	The Brundtland Report (known as <i>Our Common Future</i>)	USA	The report emphasised the importance of the world participating on a path of sustainable development	The report highlighted the concept of sustainable development and linked food security to environmental sustainability, calling for a balance between food production and natural resource management.
1992	Rio de Janeiro (known as the Earth Summit)	Brazil	Known for Agenda 21. Sustainable development was accepted as a goal, and Chapter 36 of the Agenda focused on the importance of ESD in the 21st century	The summit brought together government leaders to discuss sustainable development. It resulted in the adoption of Agenda 21, a plan of action for sustainable development, which included commitments to promote sustainable agriculture practices.

Table 3.1 continues on the next page→

TABLE 3.1 (Continues...): Timeline of events contributing to environmental education, sustainable development and education for sustainable development.

Date	Event or conference	Location	Focus	Relation of the event or conference to the study
1997	The Thessalonica Declaration	Greece	Reaffirmed UNESCO's commitment to ESD	The declaration was signed by the ministers of agriculture of the European Union. It aimed to establish a comprehensive and sustainable food production and distribution system, considering the concerns of producers and consumers. The declaration called for a common agricultural policy that promoted competitiveness, environmental sustainability and social cohesion in rural areas.
2002	The World Summit on Sustainable Development	Johannesburg, South Africa	Support for the use of education to promote sustainable development and a recommendation to the UN to consider the Decade for ESD	The summit built on the Earth Summit and renewed commitments to sustainable development. It established the Global Partnership for Agriculture, which focuses on increasing food production in developing countries, promoting sustainable agriculture practices and reducing poverty.
2005–2014	Decade for ESD	Paris, France	Declaration of 2005 to 2014 as the Decade for ESD	The decade promoted the idea of sustainability in education and raised awareness about the importance of sustainable development. The decade aimed to integrate ESD at all levels to foster critical thinking and problem-solving skills among learners.
2009	The Bonn Declaration	Bonn, Germany	Call on countries to work collaboratively to ensure sustainable development	The declaration was signed by the ministers of agriculture of the G20 nations. It called for a coordinated global response to address food insecurity and malnutrition. The declaration aimed to reduce food waste, increase agricultural productivity and support small-scale farmers.

Table 3.1 continues on the next page→

TABLE 3.1 (Continues...): Timeline of events contributing to environmental education, sustainable development and education for sustainable development.

Date	Event or conference	Location	Focus	Relation of the event or conference to the study
2000–2015	The Millennium Declaration		Through the UN, commitments from world leaders to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women to achieve targets were designed; indicators to monitor progress from 1990 to 2015 were identified	The MDGs contributed to addressing global issues related to poverty, hunger, health, education, gender equality, environmental sustainability and international partnership. Specifically, MDG 1 aimed to eradicate extreme poverty and hunger, which is crucial for achieving food security. MDG 2 focused on achieving universal primary education, which can enhance people's ability to secure food. MDG 3 emphasised gender equality, which can empower women and enhance their access to food. MDG 7 aimed to ensure environmental sustainability, which is crucial for achieving long-term food security.
2015–2019	The Global Action Programme on ESD	UNESCO, Paris	A follow-up programme to the Decade for ESD to generate and scale up ESD and accelerate sustainable development	A UN initiative that focuses on ESD through sustainable agriculture practices and involves and empowers local communities to develop sustainable practices
2015–2030	The 17 SDGs	UN Sustainable Development Summit, New York City, USA	Through 17 SDGs and 169 targets, global challenges are highlighted, and countries are guided towards achieving sustainable development by 2030	The following goals specifically relate to food security: SDG 2: Zero hunger; SDG 12: Responsible consumption and production; SDG 13: Climate action and SDG 15: Life on land
2020	ESD for 2030	On 25 September 2020, the United Nations General Assembly unanimously adopted the Resolution 70/1, Transforming our World: the 2030 Agenda for Sustainable Development	ESD for 2023 aims to increase the contribution of education to building a more just and sustainable world	The 2030 Agenda envisions a secure world free of poverty and hunger, with full and productive employment, access to quality education and universal health coverage, the achievement of gender equality and the empowerment of all women and girls, and an end to environmental degradation. This study will provide an alternative to combat hunger in the form of edible insects and empower women to create creative ways to sell edible insects as food sources.

Daviet (2016) and Laininen (2019) both agree that education can be a powerful force to transform how people think about the environment. Education is, therefore, an 'essential tool for achieving a sustainable future' (Sachs 2019, pp. 805–814).

The UNEP and UNESCO collaborated to host an international environmental workshop in Belgrade, during which the Belgrade Charter was formulated as a framework to guide EE (O'Neil et al. 2020, p. 100886). The framework was subsequently published in the Tbilisi Declaration and established the international standard for EE.

Following the Tbilisi Declaration, the World Commission on Environment and Development (WCED), a commission of the UN, published the Brundtland Report called *Our Common Future* (Brundtland 1987, 2017). The Brundtland Report highlighted the encouragement of effective actions by humans in order to protect the environment (Hajian & Kashani 2021). Furthermore, the report recognised that humans can distinguish irresponsible behaviour when using natural resources (Sarac, Batman & Kiper 2019). It also emphasised the importance of taking a sustainable development path. Sustainable development is described as 'development that meets the desires of the current without putting at risk the future generations to meet their own desires' (Verma 2019, pp. 1–5). Thus, sustainable living will meet all the basic needs of the world population. The three main basic components of sustainable development that are emphasised in the report are protecting the environment, focusing on economic growth and promoting social equality (Tomislav 2018). The WCED Report set the scene for EE and sustainability to promote sustainable development.

In 1992, the UN Conference on Environmental and Development, also known as the Earth Summit, was hosted in Rio de Janeiro, Brazil (see Table 3.1). At this conference, the Declaration of the UN Conference on Human Environment, adopted in Stockholm, was reaffirmed. Two important documents from the summit were Agenda 21 and the Rio Declaration on Environment and Development (Irwin & Lotz-Sisitka 2005). Chapter 36 of Agenda 21 focused on the importance of ESD (UNESCO 2005). The Rio Declaration supported Agenda 21 by defending the rights of countries.

The Earth Summit was followed by the Thessalonica Declaration, signed in Greece in 1997 (see Table 3.1). The declaration reaffirmed UNESCO's commitment to ESD and referred to 'education for environment and sustainability' (Irwin & Lotz-Sisitka 2005, p. 46). It came to the fore that all school subject areas should address issues related to the environment and sustainability.

In 2002, the delegates supported education to promote sustainable development at the World Summit on Sustainable Development in Johannesburg (see Table 3.1) (Płonka et al. 2022). The UN supported the recommendation of the World Summit and declared the period from 2005 to 2014 as the Decade of ESD. The integration of the values of sustainable development into all aspects of learning was the main goal, coupled with encouraging better behaviour that would strive towards a more sustainable and just society for all (UNEP 1978). In December of the same year (2002), the UN General Assembly adopted the UN Decade of ESD (Lotz-Sisitka 2006).

An outcome of the Decade for ESD was the UN Millennium Declaration (2000). A declaration was signed by world leaders of 189 member states to demonstrate their commitment to combatting poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women. Each MDG set targets for 2015 and indicators to monitor progress from 1990 onwards. Several of these targets are directly related to health. The eight goals of the Millennium Declaration were for the period of September 2000 to 2015 (Marten 2019). The MDGs provided the framework for measuring the progress of development and were an integral part of the road map towards implementing the UN Millennium Declaration up to 2015 (Kumar, Kumar & Vivekadhish 2016; Marten 2019).

In 2015, the UN General Assembly replaced the MDGs with Agenda 2030 for sustainable development (see Table 3.1), which contains 17 sustainable development goals (SDGs). The SDGs have 169 targets, broadly aiming to stop poverty and hunger and boost gender equality by uplifting human rights by 2035. This is performed by balancing sustainable development's economic, social and environmental domains. Sustainable development goal 2 (zero hunger) of the SDGs aims to combat hunger among the world population (Gilliam & Fulmer 2022). The number of people affected by hunger will surpass 840 million by 2030 if trends such as synthetic conflicts, climate change and economic downturns continue (Tanyanyiwa 2021). To achieve this goal by 2030, implementing swift initiatives to provide food and relief to areas under severe pressure is key (Ramanujam & Richardson 2018).

Furthermore, the coronavirus disease 2019 (COVID-19) pandemic put an additional '130 million people at risk of suffering acute hunger' (Leal Filho et al. 2020, p. 5343). According to McMichael (2021), interventions to improve the production of sustainable agricultural products will help to alleviate hunger. Education for sustainable development for 2030 roadmap sets out the urgent challenges facing the planet. It underlines the implementation of the new ESD: Towards achieving the SDGs (ESD for 2030) Framework, which aims to increase the contribution of education to building a more just and sustainable world.

■ Food security and entomophagy

Food security refers to food availability, affordability and quality for human consumption. South Africans tend to have a high-energy diet, which results in obesity, chronic disease and stunted growth (Haddad & Badham 2017). Improving food security requires sourcing local, cost-effective, safe and nutritious food to meet all citizens' dietary needs and food preferences. The failure of the national energy provider, Eskom, to provide reliable electricity for food production and transportation (Arnoldi 2023), international political instability and the COVID-19 pandemic have contributed to uncertainty and the rising cost of food (Rice et al. 2022). When considering future food security, the impact of climate change and reducing the ecological footprint for producing food are crucial (Scholes et al. 2015); hence, local food sources and production should be encouraged. Fresh, healthy food, in particular, is likely to get more expensive because of growing, distributing and storing challenges (Arnoldi 2023). The use of wild-sourced food, such as edible insects, is a frequently overlooked element of food security in Africa (Makhado et al. 2014; Potgieter et al. 2012). Insects offer a nutritious alternative to other food types (Elhassan et al. 2019) and reduce people's reliance on cultivated crops. The most abundant and readily accessible edible insect in South Africa is the mopane worm, which can be found dried and packaged in plastic bags at taxi ranks in the North-West, Limpopo and Gauteng provinces (Dzerefos 2022). Several other insect species are eaten as local delicacies in the places where they are sourced from the wild (Dzerefos & Witkowski 2015; Van Huis et al. 2013). There is potential to mass-produce about 250 wild-sourced and highly nutritious edible insects in southern Africa (Van Huis 2003). Mini-livestock production of insects requires minimal land use and produces a carbon-neutral, water-efficient, high-protein food source (Kelemu et al. 2015), suitable either for direct human consumption or for feeding animals. Furthermore, natural areas where insects are wild-sourced have the dual role of being important carbon sinks and should be managed for this purpose to reduce global warming (Roffe, Fitchett & Curtis 2020) and the impacts thereof (Engelbrecht & Monteiro 2021).

■ The national curriculum and indigenous knowledge

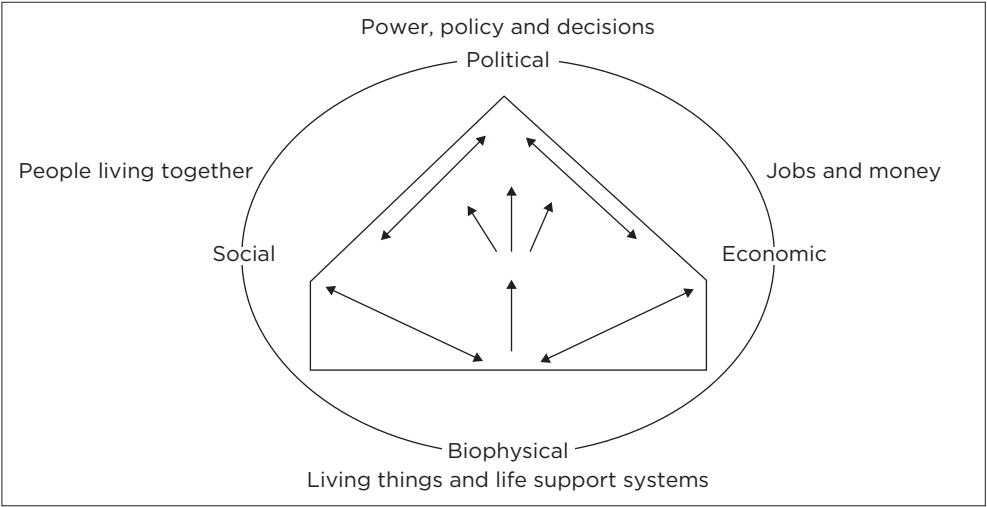
Following the change in government in 1994, outcomes-based education was introduced to South African schools but was adapted in 2000 to the revised *National Curriculum Statement* (Department of Basic Education [DBE] 2002). Ongoing implementation challenges led to the replacement of the *National Curriculum Statement* with the *Curriculum and Assessment*

Policy Statement (CAPS) for Grades R-12 (DBE 2011). The CAPS curriculum provides detailed and standardised curriculum and assessment guidelines to enhance the quality and consistency of education across schools and promote greater accountability in the education system. It also aims to empower teachers with clear instructional guidance and assessment tools to support effective teaching and monitoring of learner progress. The CAPS principles relevant to this study are social transformation and upholding socio-ecological justice. In addition, the CAPS encourages teachers to incorporate indigenous knowledge into teaching and learning processes where relevant and appropriate. Furthermore, it emphasises the importance of integrating indigenous knowledge systems into the curriculum to promote cultural diversity, respect for different knowledge systems and the development of learners' cultural identity. While the CAPS does not provide specific guidelines on how indigenous knowledge should be incorporated into each subject, it encourages teachers to explore the local context, engage with community knowledge holders and integrate indigenous knowledge within the broader curriculum framework. Unfortunately, because of time constraints, indigenous knowledge is most often ignored in the classroom (ed. De Beer 2019). Entomophagy is a common practice in South Africa and can assist learners to understand nature better and the benefits that insects provide (Dzerefos & De Sousa 2020). Not only food but also pollination, biocontrol and soil enhancement are benefits that humans get from insects (Dzerefos, Halloran & De Sousa 2020), which link with several SDGs and foster sustainable thinking and lifestyles.

■ Theoretical framework

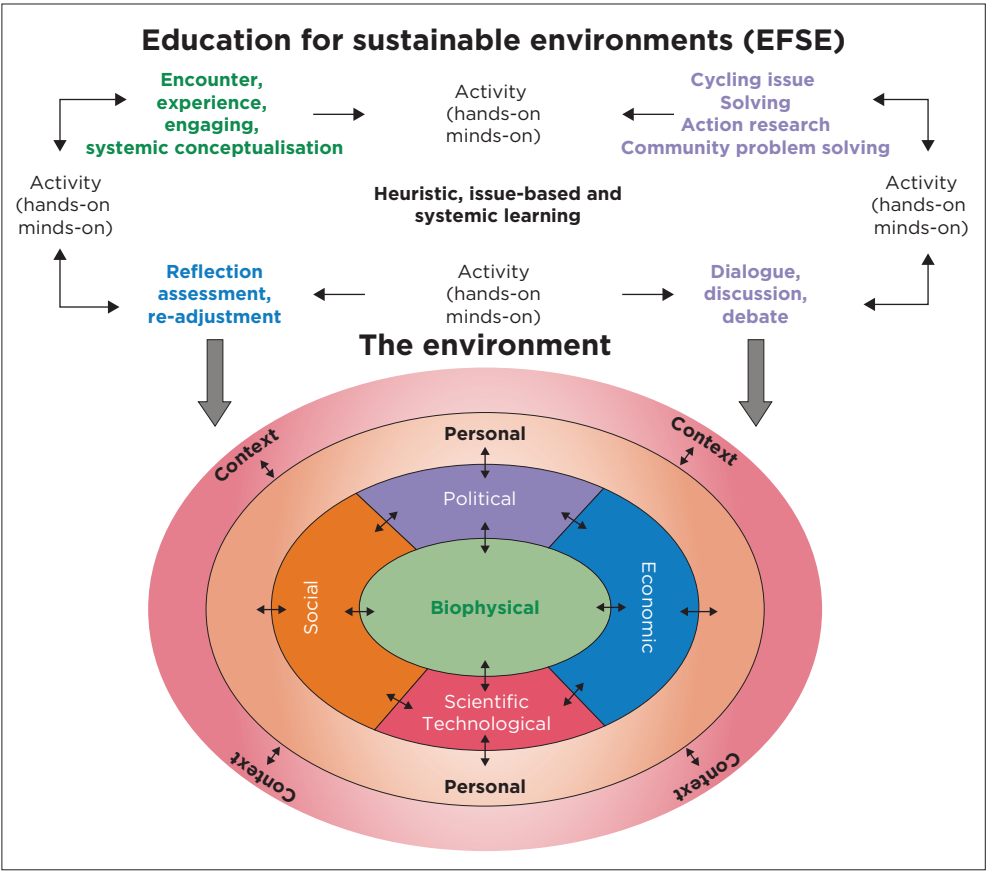
Van Rooyen's (2002) model for ESD and O'Donoghue's (1993) model for sustainability education (see Figure 3.1 and Figure 3.2) both provide frameworks for integrating sustainability into education, but they differ in their approach and focus. Van Rooyen's model places greater emphasis on systems thinking and transformative change, while O'Donoghue's model focuses on the practical integration of sustainability into the educational process. Both models offer valuable frameworks for teachers looking to integrate sustainability into their teaching and contribute to a more sustainable future.

In an ESD context, O'Donoghue's model 'recognises and explores the connections between society, cultural, economic activities, political decision making and the state of the Earth's life support systems' (Rosenberg 2009, p. 4). This theory is in contrast with the original belief where the focus was only on the natural or biophysical component (Reddy 2008). These connections with the environment are viewed as a



Source: O'Donoghue (2006, pp. 345–357).

FIGURE 3.1: O'Donoghue's model for the environment.



Source: Van Rooyen (2002).

FIGURE 3.2: Van Rooyen's model of the concept 'environment' for education for sustainable environments.

socially or culturally shaped or constructed phenomenon. Humankind is an integral part of the environment, and humans shape the environment through their social and cultural behaviours (Barsbai, Lukas & Pondorfer 2021).

A study by UNESCO of the learning process in ESD revealed that in addition to gaining knowledge, values and theories related to sustainable development, learning in ESD also needs to ask critical questions, clarify one's values, envision more positive and sustainable futures, think systemically, respond through applied learning and explore the dialectic of tradition (Tilbury 2011). Furthermore, Tilbury states that the theoretical framework of ESD is built on the belief that education has the power to transform individuals and society as a whole and is essential for promoting the changes needed to achieve a sustainable future. It also recognises that sustainability challenges, such as climate change, resource depletion and social inequality, are complex and interconnected and that addressing them requires a holistic and transformative approach to learning.

Ramsaroop and Van Rooyen (2013:598) argue that:

[T]he O'Donoghue model does not consider the technological, cultural-historical, moral and aesthetic dimensions as recommended in the Tbilisi principles of EE. [Van Rooyen's model (see Figure 3.2) identifies seven dimensions], namely the biophysical, social, economic, political-juridical, scientific, technological, personal and contextual [(Ramsaroop & Van Rooyen 2013)]. None of these exist in isolation; [instead], there is a dynamic, interactive relationship between the different dimensions that is simultaneously [interdimensional] and holistic. [Van Rooyen's] model places the biophysical environment as its central focus, rather than human needs and [well-being], situating people as part of the web of life. This model emphasises the importance of the biophysical dimension, on which past, present and future generations will continue to rely for [their] survival.

At the core of the ESD framework (see Figure 3.2), therefore, is the belief that education should empower individuals to think critically, creatively and ethically and to take action to address the global challenges of the 21st century (Dzerefos et al. 2020). These challenges involve fostering the skills, knowledge, attitudes and values that are necessary for individuals to live and work in a way that is environmentally, socially and economically sustainable (Laurie et al. 2016).

■ Methods

■ Research paradigm

The interpretivist paradigm underlies the qualitative research conducted in this chapter. This paradigm was chosen because we believed that the construction of knowledge could take place while interpreting, describing

and understanding an event in a particular context (Cruz & Tantie 2017). This particular context is when we want to understand the subjective world of human experience, in this case, teachers' experiences using entomophagy teaching and learning resources in NST classrooms.

■ Research design

This study followed a case study design, where teachers were introduced to entomophagy through an information worksheet, video and discussions. Yin (2009, p. 2) defines case studies as 'an empirical inquiry that investigates a modern phenomenon within its real-life context when the boundaries between phenomenon and context are not apparent'.

To facilitate the teachers' daily instructional practices and gather data on their experience with entomophagy, we developed a standardised learning resource. Expanding upon the existing information available to teachers regarding edible insects in South Africa (Dzerefos & De Sousa 2020), an info-worksheet focusing on a non-indigenous insect – the silkworm (*Bombyx mori*) (refer to Figure 3.6) – was developed. Silkworms have long been kept by children for recreational purposes and are capable of thriving in various climatic regions across the country. The life cycles of the silkworm and the indigenous and popular edible insect, the mopane worm (*Imbrasia belina*), exhibit comparable stages of complete metamorphosis, involving the transformation of a caterpillar into a reproductive moth. Furthermore, both species belong to the *Lepidoptera* family.

In this research, the rearing of silkworms posed some limitations, primarily because of their seasonal availability, with eggs hatching only in spring. While refrigeration of the eggs was possible, only a portion of them successfully hatched out of season. Moreover, maintaining silkworms proved to be challenging, as they required daily feeding with fresh mulberry leaves. The regular cleaning of frass (insect larval excrement) and dried leaves was necessary, especially during the early stages when the caterpillars were small and prone to being misplaced or inadvertently crushed while being transferred to a new food source. Despite the silkworm being a suitable proxy for the mopane worm, as both reach the adult stage as moths, its upkeep proved difficult. In contrast, the mealworm, which undergoes metamorphosis into a beetle, was readily available and easy to keep alive. To facilitate the classroom rearing of mealworms, we developed an information worksheet (see Figure 3.5).

■ Sampling and data generation methods

This study employed a purposeful sampling methodology to select intermediate phase teachers who taught Grades 4–6 learners and met

specific criteria for teaching NST. Another important criterion was that the sample teachers were selected from five primary schools situated in the urban periphery, specifically the southern region of Johannesburg in the Gauteng province of South Africa. These schools were geographically close enough to enable the teachers to attend our workshops conveniently.

Because of the closure of schools as a result of COVID-19, the data were gathered through two virtual workshops. The participants were shown a video describing entomophagy, indigenous knowledge, indigenous knowledge systems and ESD. The video was prepared by using Microsoft (MS) PowerPoint and presented via WhatsApp Messenger and Active Presenter. A Google Forms survey was administered to establish the participants' prior knowledge and experience of entomophagy, ESD and indigenous knowledge. In addition, information worksheets on mealworms (see Figure 3.5) were given to the participants, as well as a poster and a book about edible insects, so they would feel confident to present lessons on this topic in the classroom. Also, the life cycle of the mealworm was described to the participants.

A total of 15 teachers from five schools responsible for teaching NST in Grades 4–6 were purposely selected based on contribution and willingness during the first virtual workshop, and five took part in a focus group discussion during the second virtual workshop. The focus was on how they could integrate learning resources (see Figures 3.5 and 3.6), developed by a National Research Foundation (NRF) project of the North-West University, South Africa, to enrich the NST curriculum. Document analysis was utilised as the third method of data generation in this study. This analysis involved a thorough examination of the current national curriculum issued by the DBE. Ethical clearance was provided by the North-West University's Faculty of Education Ethics Committee (EduREC) (NWU-00487-17-A2).

Anonymity was secured via the use of pseudonyms in referring to participants' data, for example, P(01) as Participant 01 (see Table 3.2).

Permission to use the gathered data was obtained from both the provincial Department of Basic Education and the management of the schools. The participants were informed that their participation in the study was voluntary. The recruitment process started with an independent individual obtaining consent forms from participant teachers to eliminate any potential for coercion. Throughout the research process, the independent person responsible for recruitment and the consent forms also ensured the privacy and confidentiality of the participants. This person held a senior position at the first author's workplace.

TABLE 3.2: Biographical data of participants.

Participant	Gender	Languages spoken	Years of teaching experience
01	Male	Tshivenda	5
02	Female	isiZulu	3
03	Female	isiZulu	6
04	Female	isiZulu	8
05	Female	Sesotho	21
06	Male	Afrikaans	2
07	Female	Sepedi	7
08	Female	Tshivenda	1
09	Male	Tshivenda	5
10	Female	Sepedi	26
11	Female	Tshivenda	12
12	Male	Tshivenda	40
13	Female	Tshivenda	25
14	Female	Sepedi	30
15	Male	Sesotho	10

Source: Palmer (2022).

■ Data analysis

The data were analysed inductively through coding, categorising and the identification of themes. Together, the codes formed the primary document or heuristic unit in the software program ATLAS.ti™.⁶ Thematic analysis is the process of coded extracts, and the entire data sets of the focus group interview and the self-administered survey with thematic maps were created through ATLAS.ti to identify and reflect on relevant quotations, which were then coded thematically. Thereafter, the codes were categorised and re-categorised to form subcategories and, ultimately, themes (see Saldaña 2009).

■ Results

The participants – ten females and five males – ranged in age from 18 to 60 years. Gauteng attracts people from other provinces and countries because of numerous employment opportunities. Although Gauteng does not have a history of entomophagy, many of the teachers were originally from the northern provinces of South Africa, namely Limpopo, Mpumalanga and North West, and indicated prior knowledge of entomophagy. Rich data were gathered from the self-administered survey, the focus group interview and document analysis, where a combined approach of deductive and

6. The version we used was: ATLAS.ti 24.1.0.30612 to 24.1.1.30813.

inductive coding was used. The data were arranged into three themes according to the three secondary research questions: (1) integration of entomophagy and ESD learning resources to broaden knowledge; (2) teachers' perceptions of entomophagy and ESD resources; and (3) teaching NST topics through entomophagy.

■ Theme 1: Integration of entomophagy and education for sustainable development learning resources to broaden knowledge

Information on the rearing of mealworms in the classroom and an information worksheet were developed in collaboration with a private school teacher, shown on the cover page (see Figure 3.6), and a public-school special needs teacher. Mealworms are a highly nutritious food source that provides a good balance of protein, healthy unsaturated fat, including omega-3 and omega-6 fatty acids, and essential vitamins and minerals (iron, calcium, magnesium and zinc) (Elhassan et al. 2019). They require very little input to survive (Dzerefos 2019).

Prior to this study, the fifteen NST teachers had not considered entomophagy in their teaching, possibly as learning resources were not readily available (Dzerefos & De Sousa 2020). Nevertheless, the NST primary school teachers revealed that they had a prior understanding of the importance of entomophagy learning resources in the classroom based on the following verbatim quotations:

'Yes, it's very important to bring this topic in our classrooms.' (Participant 05, Female, age unspecified, 20 September 2021)

'We will bring this topic into the classroom so that we broaden the knowledge and for learners to know the different kinds of foods.' (Participant 04, Female, age unspecified, 20 September 2021)

Furthermore, a sense of ecosystem services loss and indigenous knowledge of sourcing food freely from nature came to the fore in the following explanation provided by a teacher who lived and worked in a densely populated urban area:

'Yes, we grew up with it, and then it is something that we and our parents used to get for free. And it is something that helped us while we were growing up. We knew that it also gives some nutrients. So that is the reason we grew up eating this thing [*sic*], and again from my province, we used to get it for free, but now since I relocated [*to*] around Gauteng, I have to buy it even though it was something that I used to get for free.' (Participant 01, Male, age unspecified, 20 September 2021)

The participants had prior knowledge of the nutritional value of insects. Participant 06 remarked: 'So my view [...] the insects taste very good, and

they are very healthy. Yes. I've eaten them since I was still young' (Participant 06, Male, age unspecified, 20 September 2021). Participant 10 also knew about edible insects consumed in other countries.

Although the teachers concurred that learners needed to learn and gain knowledge about ESD and how their behaviour influences life on Earth, there was a misconception that this involved developing bush survival skills rather than an ability to discern between sustainable and unsustainable lifestyle practices. Participant 03 mentioned:

'So, I think if more people can be knowledgeable about insects, it'll be good that even if we were to run out of food, like there's no meat and stuff like that, we can still eat insects.' (Participant 03, Female, age unspecified, 22 September 2021)

In contrast, ESD aims to develop critical thinking in learners so that they will take responsibility for their actions and protect the environment for future generations. Part of this growth in thinking is about appreciating insects as an opportunity instead of seeing them as a threat. This view was supported by Participant 02, who said: 'The more they learn about environmental issues, the more they will avoid future environmental issues because learners know now what to do and what not to do' (Participant 02, Female, age unspecified, 22 September 2021).

■ Theme 2: Teachers' perceptions of entomophagy resources in education for sustainable development

The Google Forms survey and the focus group discussion showed a range of opinions on entomophagy from the fifteen teachers. The responses to the survey showed that 83% of the participants would consider eating insects and introducing them in their classes. The remainder were unsure or felt disgusted and did not want to interact with insects. Participant 08 was the most enthusiastic and said that she 'would love to taste that just out of curiosity' (Participant 08, Female, age unspecified, 22 September 2021). She reminisced about eating locusts in the rural areas as a child on the advice of her grandmother:

'She used to catch some for us and we trust our grandmothers. They know what is good; they know what is not good; they know things that can get us sick. [...] if she says something is good, you have to eat it. You must trust that.' (Participant 08, Female, age unspecified, 22 September 2021)

Similarly, Participant 07 said that she 'grew up with this thing' (Participant 07, Female, age unspecified, 22 September 2021), which shows that even in the urban centres of Gauteng, people experience entomophagy. Although Participant 15 had not eaten insects as a child, he said:

'I would want to taste an edible insect because they are a nutritious traditional food source that has been used to supplement diet[s] across Africa for many years. They are also rich in protein, carbohydrates and micronutrients, such as zinc and iron.' (Participant 15, Female, age unspecified, 22 September 2021)

In contrast, two teachers (Participants 03 and 13) said they would not taste insects, and Participant 13 used the term 'disgusting', even though Participant 07 urged them to be 'open-minded about different types of food from other people and places' (Participant 07, Female, age unspecified, 22 September 2021). Participant 03 referred to the sensory aspect of taste and expected insects to be 'bitter, not too sweet' (Participant 03, Female, age unspecified, 22 September 2021); he mentioned insects' taste and 'hard skin' as reasons that put him off entomophagy. Another promoter of entomophagy, Participant 11, reminded the other participants: 'Remember, when we talk about nutrients, the learners have to know about different types of food' (Participant 11, Female, age unspecified, 22 September 2021). It should be noted that mealworms have high nutritional value and are widely used as human and animal food (Elhassan et al. 2019; Frank & Wilmer 2018).

Mealworm productivity is high, and a farm kept in a fish tank at a private school produced so many mealworms that the teacher asked for a recipe. A graduate chef, Rebecca Bourhill, created a date ball recipe and included it in the information worksheet. The mealworms were blended into flour before use so that even the squeamish could take part and enjoy the dish. Despite the effort to develop a tasty, non-threatening recipe, Participants 01 and 02 suggested that it be removed from the mealworm information worksheet. Participant 01 felt that the recipe represented another culture and wanted something more African. Perhaps if they had tasted the date balls, they would have realised the value of the recipe, but it was not possible because of COVID-19 protocols. The role of indigenous knowledge in future food production was an important point of discussion related to ESD. Participant 02 said that 'it is important for the learners to be taught how to include insects in their lives, because they will need to be given a deep knowledge of those indigenous ways' (Participant 02, Female, age unspecified, 22 September 2021). Furthermore, Participant 02 contemplated ways to extend the life of insect food through refrigeration and drying and regarded traditional preservation methods as worthwhile class demonstrations. In the past, surplus insects would have been sun-dried on a corrugated iron sheet and stored for later use. Other participants mentioned the wisdom of preserving insects, especially in times of excess, such as swarming locusts.

■ Theme 3: Teaching Natural Sciences and Technology topics through entomophagy

During the focus group interview, the teachers agreed that entomophagy can be included easily in the NST curriculum. Several topics, including food groups, food processing, life cycles, nutrition and food chains, were suggested by teachers (Table 3.3). The CAPS document Grades 4–6 has four NST learning outcomes: (1) life and living; (2) matter and materials; (3) energy and change; and (4) planet Earth and beyond. Entomophagy fits strongly into Learning outcome 1 (Table 3.2) and also Learning outcome 4 as insects are being researched for food which could be propagated while undertaking space travel (Van Huis et al. 2013). While the suggestion to dissect insects is not covered in the South African curriculum, it has been used mindfully to teach students of the same age group in Japan (Hay & Dzerefos 2022). Overall, the fifteen teachers were found to be well versed in the official document of the DBE, and they recognised that edible insects are one of the solutions to overcoming poverty and generating income for the unemployed.

TABLE 3.3: Topics applicable to entomophagy with reference to curriculum content for Natural Sciences and Technology (DBE 2011) and a teacher participant focus group ($n = 5$).

Focus group responses	
Grade 4 curriculum	
Structures	Life cycles
Living and non-living things	Food groups
*Structure of plants and animals	Food chains
Plant growth needs	Food webs
*Habitats of animals	*Food processing and storing, e.g. fermenting, cooling and drying food
Grade 5 curriculum	
Structures	*Compare indigenous knowledge of food preservation with methods used today
Plants and animals on Earth	Nutritional profile of food, including proteins, vitamins and minerals
Grade 6 curriculum	
*Processing	Animal diversity and structural adaptations
Nutrients in food and the importance of good nutrition	*Different habitats used by animals, and when and where to collect for food
	*The seasons and availability of food
	Dissecting different insects

Source: Adapted from Palmer (2022, p. 108).
An asterisk (*) indicates alignment with indigenous knowledge.

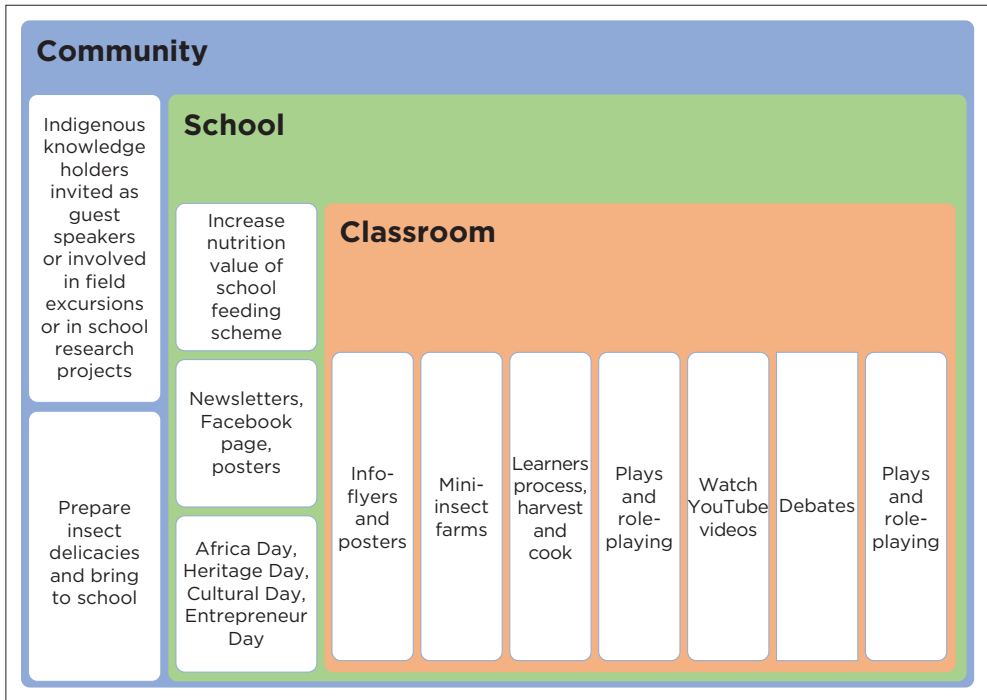
Mealworm resources provide opportunities for teachers to expose learners to rearing mini-livestock, such as insects, and recording the changes observed. This activity not only brings nature into the classroom and hones scientific observation skills but it can also result in preparing a sweet treat for own consumption or feeding the mealworms to domestic animals. Palmer (2022, p. 134) points out that ‘posters and info-worksheets on edible insects are significant game changers for promoting edible insects in the NST classroom’.

Another positive outcome of the study was seeing that entomophagy learning resources have the potential to arouse learners’ interest, irrespective of their ability, learning style or social, ethnic or cultural background. We encountered a teenager who owned a pet bearded dragon (*Pogona vitticeps*) and used mealworms and crickets to feed his pet (Figure 3.4). In the case of the special needs school, an autistic learner was so enthralled by the mealworms that the teacher permitted him to take them home for a few weeks (Dzerefos 2019). The entomophagy resources created a learning environment that encouraged learners to be self-motivated and conduct self-directed learning. This view is supported by the following response: ‘I think we are raising different kids, and if we were to give them knowledge about the insects, some of them would actually pursue a career in insect harvesting and farming’ (Participant 08, Female, age unspecified, 22 September 2021). In addition, the following comment was made: ‘This is a very helpful tool for the teacher to incorporate into the NST classroom and to create awareness for ESD’ (Participant 07, Female, age unspecified, 22 September 2021). Several case studies from South Africa confirm that indigenous knowledge plays a role in teaching Natural Sciences (ed. De Beer 2019).

During the focus group discussion, the participants offered valuable suggestions for promoting entomophagy at the classroom, school or community level (see Figure 3.3). They emphasised the importance of excursions to showcase the process of harvesting and processing insects. Other suggestions included organising opportunities for learners to taste cooked insects, sharing recipes for insect-based snacks to be sold at the school canteen, writing articles in the school newspaper to encourage the consumption of insects and integrating entomophagy into teaching and learning strategies through activities such as role play and debating.

■ Discussion

The qualitative analysis of the input of fifteen primary school teachers in this study resulted in three themes deductively and inductively derived from the data: (1) integration of entomophagy and ESD learning resources to broaden knowledge; (2) teachers’ perceptions of entomophagy resources



Source: Authors' own summary.

FIGURE 3.3: Recommendations from a teacher focus group on promoting entomophagy.

in ESD and (3) teaching NST topics through entomophagy. The first theme focuses on integrating entomophagy resources with the concept of ESD and addresses the first objective of this study, which is the integration of entomophagy resources into the NST curriculum. According to the verbatim quotes, the participating primary school teachers had prior knowledge of the nutritional value of insects, which suggests they could incorporate entomophagy learning resources into the NST curriculum. The teachers were able to integrate entomophagy – a familiar practice in South Africa – into the broader principles of ESD by discussing the growing human population and the challenges of producing nutritious food. In contrast, Ramsaroop and Van Rooyen (2013) reported that teachers in Gauteng perceived their knowledge and skills in EE to be relatively low, especially in areas such as ecosystem functioning, biodiversity and environmental problem-solving. Providing entomophagy learning resources in NST gave the teachers carte blanche to use their prior knowledge of insects as a food source to deliver the curriculum content. Sourcing food from the wild, it is necessary to develop indigenous knowledge of the sustainability of the resource, such as the influence of the weather on the insect population, what the insects feed on and whether activities such as felling trees and

using pesticides would affect the insect crop. By considering the factors influencing the survival of a mealworm kept in the classroom or a wild-sourced popular insect, such as the mopane worm, entomophagy can promote the analytical discourse on sustainable development in Africa, as the starting point is a familiar practice to many teachers. Furthermore, the resources contributed to learning and fostering ESD, as described in the model for the environment proposed by O'Donoghue et al. (2006). This model embraces the interconnections between society, culture, economy, political decision making and ecosystem services essential for life on Earth (Rosenberg 2009).

In the past, communities that faced food insecurity or malnutrition incorporated insects into their diets to provide a sustainable and affordable source of nutrition. For several reasons, insect protein has been proven to be more environmentally sustainable than protein derived from cattle, pigs and poultry (Van Huis et al. 2013). Regarding land requirements, insect farming requires significantly less land than traditional livestock farming, thereby reducing the need for land conversion and preserving natural habitats. Insects can be reared in vertical farms or compact spaces (Dzerefos 2019), which require minimal land area. In contrast, raising livestock for meat production requires extensive land for grazing or growing feed crops. Furthermore, insects are highly efficient at converting feed into edible protein and require significantly less water compared to traditional livestock. In addition, insects have the potential to contribute to a circular economy by utilising organic waste as feed and converting it into pathogen-free, valuable protein (Liu et al. 2022). Notably, insects emit lower levels of greenhouse gases compared to traditional livestock, especially ruminant animals such as cattle, which produce significant amounts of methane, a potent greenhouse gas (Scholes et al. 2015). Teachers can use the benefits of entomophagy to engage learners in discussions about sustainable food sources (Dzerefos & De Sousa 2020).

In Palmer's (2022) study, teachers expressed that their cultural background facilitated their acceptance of consuming edible insects. The practice of entomophagy has deep historical roots in various African cultures. It continues to influence individuals' food preferences (Tan et al. 2015), which makes it a valuable tool for teachers to promote cultural diversity and preserve indigenous knowledge. Learners bring cultural knowledge rooted in their lived environments when they enter the classroom. Science teachers can leverage this indigenous knowledge to enhance learner engagement and accessibility to scientific concepts (ed. De Beer 2019). The connection between people's preferred diets and their cultural backgrounds (Zmora, Suez & Elinav 2019) may present a challenge for some to consider insects as food, but this increases the impact of the learning resources, as it is an opportunity to challenge societal attitudes

towards insect consumption with scientific discourse (Dzerefos & De Sousa 2020).

The second study objective relates to the teachers' perceptions of the integration of entomophagy resources in ESD. This study explored the subjective experiences and viewpoints of teachers, providing valuable insights into their perceptions of using entomophagy as an educational resource. All but one teacher regarded an easy-to-use insect farm, such as that used for the mealworms, as a beneficial teaching resource in the classroom (Palmer 2022), which resonates with the recommendation by Dzerefos and De Sousa (2020) to introduce ESD to children through insect propagation. Furthermore, insect farms can serve as alternatives or complement field excursions, especially in cases of limited affordability or time constraints to complete the curriculum (De Beer 2019).

Bringing live insects into the classroom serves to stimulate learners' interest in insect metamorphosis and increases scientific observation and knowledge (see Figure 3.4). An example includes an actively eating and wriggling mealworm changes into the dormant, non-active stage of the pupa. A few weeks later, a beetle emerges from the pupa for the purpose of mating and distribution. So, three distinct forms of the mealworm, with different functions, can be observed in the classroom. Furthermore, mealworms can be prepared in a traditional way or disguised by grinding



Source: Photograph taken by the author, C Dzerefos, while conducting the study. The photograph has been reproduced for publication with permission from the author and learner.

FIGURE 3.4: A learner holding mini-insect farms to grow mealworms and crickets for his pet bearded dragon.

them into flour, mixing them with other ingredients to add taste and then baking them into mealworm date balls for a nutritious sweet treat. Mealworms offer so many choices and opportunities for food processing that learners can do research and experiment, which also provides an opportunity for entrepreneurship and economic development. An exemplary local case that teachers can look to for inspiration is Matomani, an entomophagy enterprise operating between the Limpopo and Gauteng provinces of South Africa. This food business specialises in cultivating and commercialising mopane worms (Hennig 2022) and offers its products for sale through its website and the national distributor Takealot. The company has diversified its product range to include whole, dried mopane worms and stone-ground mopane worm flour, both intended for culinary purposes and snacks. Worth mentioning is the fact that Matomani has introduced a delectable dark chocolate-covered energy bar containing mopane worms, which is exquisitely packaged and enjoyed by even the most apprehensive consumers.

This study, conducted in Gauteng, found that out of the fifteen primary school teachers who received the entomophagy learning resources, fourteen expressed a keen interest in receiving additional resources on edible insects. The inclusion of entomophagy learning resources in the NST school curriculum holds promise for enhancing learners' awareness of ESD. The teachers narrowed down the focus to identify two curriculum learning outcomes (1 and 4) and specific NST topics (Table 3.2) that could be taught by using mealworms as learning resources, thereby completing the third objective of the study. They did not only restrict the promotion of entomophagy to the classroom but also shared ideas to involve the whole school and the community (Figure 3.3). The NST topics that can make use of mealworms include food groups, food processing, life cycles, nutrition and food chains. The teacher feedback focused on the utilisation of info-worksheets on non-indigenous insects, the silkworm (*Bombyx mori*) and the mealworm (Figure 3.6) among teachers. Findings by Palmer (2022, p. 111) indicated that these resources facilitated 'action learning and appealed to learners with varying academic abilities'. Dzerefos (2019) confirmed that a mealworm farm was well received at a South African special needs school. Teachers have a responsibility to cater to diverse learners' abilities, learning styles and interests (Ahmed 2017), but they may not have adequate time to find resources that appeal to all learners.

Leveraging place-based knowledge, such as understanding the availability and processing of edible insects, supports the development of a biodiversity economy. This educational model emphasises using the local community and environment as a learning context and fostering interdisciplinary and experiential learning, cultural understanding and respect.



INSECT ECOLUTIONS*
Mealworms (Tenebrio molitor)
A Japan-South Africa Joint Initiative

Mini-livestock farming with mealworms

*Ecolutions is about finding ecologically sound solutions for food security, poverty and unemployment.

 **National Research Foundation**
Supporting the use of beneficial insects

 **NWU**

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Mealworms (Tenebrio molitor)

Mealworms are the immature or larval stage of the darkling beetle known as *Tenebrio molitor*. They require a bedding of bran. A clear container is recommended so that the different layers of the mini-farm can be viewed. A double layer of newspaper is placed over the bedding and mealworms can be harvested easily from the newspaper. Moisture is supplied through half a raw gem squash and potato peelings. The mealworm egg, caterpillar, pupa and adult darkling beetle stages can be found year-round although the cycle may slow down in winter.

Uses

Feed for animals: Mealworms are nutritious for pet snakes, geckos, bearded dragons, turtles, frogs, poultry and carnivorous fish.

Food for humans: The Netherlands and Denmark are leading the way in producing mealworms for humans to eat. Mealworms have high protein rich in amino acids such as isoleucine, leucine and lysine as well as high oleic acid, linoleic acid and palmitic acid.

Warning: Insects can accumulate pesticides in their tissues. Ensure that all mealworms intended for human food have been grown under healthy conditions and only fed organic, clean feed.



Mrs R. Quinton, of Lebone II College of the Royal Bafokeng, providing the class mealworm farm with extra bran.



Record Sheet

The record sheet below is recommended for Grade 4 to 6 Natural Science and Technology. By keeping a record of how many mealworms can be removed for food or feed concepts of productivity, profitability and the influence of the seasons can be investigated.

Date	Event
	Receive eggs
	Eggs hatch
	Larva size 1 cm or less
	Larva size over 1 cm
	Pupa
	1st beetle to emerge
	1st beetle to turn dark brown
	Eggs laid
Total duration of life cycle =	

Mealworm date delight

Ingredients:
1 date bar to puree
3 tbsp peanut butter
½ cup desiccated coconut
¼ cup homegrown mealworms
3 tbsp cocoa
3 tbsp sunflower seeds

Directions: After harvesting wash the mealworms under running water and freeze overnight. Dry them at 180°C for 40 minutes and use a hand blender or food processor to turn them into flour. Chop up the date bar and place in half a cup of boiling water. Leave to stand for a couple of hours then puree with a hand blender or food processor. Add ¼ cup mealworm flour, half a cup date puree, all the peanut butter, coconut, cocoa and sunflower seeds to the food processor and blitz together. Use washed hands to form into mouth-size balls and allow these to set in the fridge.

Health tip: Oven-dried mealworms can be substitutes in any recipe calling for nuts, raisins and chocolate chips. Mealworms have a mild nutty flavour.

Why are mealworms useful as a teaching tool in the classroom?

For scientific observation: Learners can recognise distinct stages and behaviour throughout the year (eggs, larva, pupa, beetles, mating, moulting, laying eggs and even death).

For efficient production: Mealworms are low maintenance and given some extra food and bedding can survive the school holidays without their humans.

References

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Source: Created by the author, C Dzerefos, for the purpose of the study. The information worksheet has been reproduced for publication with permission from the author.

FIGURE 3.5: The mealworm (*Tenebrio molitor*) information worksheet provided to teachers in Gauteng to encourage them to include entomophagy in their lessons.

Examples from Japan demonstrate the effectiveness of place-based education in promoting the rearing of edible insects and involving knowledge exchange between elders and high school learners (Nonaka 2009). In Nonaka's study, Japanese teenagers were so enthused that they raised funds and constructed a museum of edible insects in the community. In South Africa, place-based education can be especially useful in helping promote cultural understanding and respect and providing opportunities for interdisciplinary learning and hands-on, experiential learning. Implementing place-based education facilitates subject integration, such as Mathematics, to calculate water and food input to produce protein. In addition, it capitalises on South Africa's wealth of edible insects, which have been extensively explored and documented for their nutritional content, life cycles and contribution to socio-economics (Elhassan et al. 2019; Frank & Wimer 2018; Hlongwane, Slotow & Munyai 2021; Kelemu et al. 2015; Van Huis et al. 2013) and the willingness of teachers to share their own experiences and learn about entomophagy.



■ Conclusion

The curriculum is a formal attempt to increase learner knowledge, productivity and ability, and the benefits thereof can spill over to parents and siblings. Rethinking our relationship with the natural world, such as considering insects as a boon rather than a curse, can be achieved using entomophagy learning resources in the NST curriculum. The study found that the participating NST teachers, once prompted, had prior knowledge and the skills necessary to interpret and critically analyse the entomophagy learning resources. Furthermore, they recognised school-level opportunities for topics on edible insects during cultural celebrations and classwork. While NST teachers have a good understanding of the NST subject, they often lack the confidence to integrate edible insects with specific topics successfully. However, this gap is being filled with resources produced since 2020. The non-indigenous insect information worksheets on mealworms and silkworms should be used in conjunction with learning resources developed for indigenous species such as mopane worms (Dzerefos et al. 2020) and edible stink bugs (Dzerefos & De Sousa 2020) for holistic Afro-centric education.

By integrating resources on edible insects into the NST curriculum, teachers can support several SDGs. Foremost is SDG 2 (zero hunger), which addresses access to safe, nutritious and sufficient food for all people, especially the most vulnerable, which include children, the elderly and the poor. Sustainable development goal 2 targets increasing agricultural productivity and income, improving food systems and agricultural practices, promoting sustainable agriculture and reducing food waste and losses throughout the food supply chain. In addition to addressing hunger and malnutrition, achieving SDG 2 is also important for achieving SDG 1 (no poverty), SDG 3 (good health and well-being) and SDG 12 (responsible consumption and production). Furthermore, SDG 15 (life on land) might also be achieved through increased entomophagy, as insect protein production requires less land and resources than traditional livestock. In addition, there is potential to protect ecosystems from pesticide use or removal of indigenous vegetation so that edible insects can be wild harvested. Finally, SDG 4 on quality education is the vehicle through which sustainable development must be implemented, and entomophagy, with its roots in indigenous knowledge, can help to achieve this in Africa.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-00487-17-A2) was obtained by the

authors from the North-West University's Faculty of Education Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Stakeholder involvement in reforming a Namibian Physical Science syllabus through climate change environmental education⁷

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■ Abstract

This chapter explores stakeholder involvement in curriculum development and government policy harmonisation in a syllabus to mitigate the effects

7. This chapter is based on the revised Master's (MA) thesis of WN lipinge, 2019, 'The integration of climate change in the Namibian senior secondary Physical Science syllabus through environmental education' in the Research Focus Area Community-Based Educational Research, Faculty of Education, North-West University, Potchefstroom campus, under the supervision of Professor LO de Sousa. https://repository.nwu.ac.za/bitstream/handle/10394/33199/Lipinge_WN.pdf?sequence=1&isAllowed=y.

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of climate change in Namibia through environmental education (EE). An examination of the state of climate change education in the BRICS nations and Namibia is followed by a theoretical underpinning of the research study on which this chapter is based. This qualitative case study involved content analysis and thematic analysis to inductively analyse the data. The findings of this research regarding stakeholder involvement in a Namibian curriculum review of how to integrate climate change in the Physical Science syllabus (Grades 11 and 12) through EE revealed that teachers are dealing with the concepts of climate change in isolation in Physical Science, and there is agreement that climate change issues are not addressed in detail in the syllabus. Recommendations are offered for Namibian curriculum review guidelines on how to integrate climate change in the Physical Science syllabus through EE. The multi-stakeholder engagement and collaboration in reforming the Namibian Physical Science syllabus may significantly contribute to reducing the effects of climate change by raising awareness about reducing human risks emerging from the harmful effects of climate change and managing these risks through education in Namibia.

■ Introduction

Educating the community is essential because it increases awareness and teaches communities to manage the effects of climate change (Magis 2010; Trott 2020), especially because studies have shown that we live on a finite planet with limited resources and possibilities (Radzi, Osman & Mohd Said 2022). Environmental sustainability and preservation are key to ensuring that natural resources support modern and future resource needs (Lehtonen, Salonen & Cantell 2019). This can only be accomplished if societies worldwide are included in the fight against environmental degradation and climate change because communities' activities significantly contribute to the challenge of changing climates. Rapid population growth and consumerism strain the environment and lead to activities that exacerbate climate change and show the fragility of the environment and the effects of climate change on human livelihoods. Given the seriousness of climate change and its impact on the environment and livelihoods, it is vital for learners and society to learn about preventative and mitigatory measures of climate change (Lehtonen et al. 2019).

Climate change education is one of the thematic focus areas of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in its education for sustainable development (ESD) for 2030 roadmap (UNESCO 2020b). The outcome document of the Paris Climate

Conference of Parties (COP 21) states that the parties need to enhance climate change education (UNESCO 2020a). Climate change education is defined as a process through which climate change-related issues are integrated into the educational process by using a variety of pedagogical approaches beyond the formal education programme. Climate change education raises consciousness of climate change and the value of leading a sustainable life (Shohel et al. 2021). The integration of climate change education in secondary science education has been purported to play an important role in increasing public understanding about the consequences of and solutions to the changes experienced (Sharma 2012). Education can uphold the claim to be essential in addressing climate change challenges (Mochizuki & Brayn 2015). High school learners are a crucial constituency in the case because they are future leaders and next-generation policymakers and activists. Teaching about climate change improves learners' behaviour and attitudes towards the environment in a positive way (Boon 2010). Hence, high school curricula need to incorporate climate change education, especially in African countries where the effects of climate change are strongly felt through rampant droughts, deforestation and incessant flooding. Africa is one of the continents that are most vulnerable to climate change (Crawford & Terton 2016; UNESCO 2020a; Zeidler et al. 2013). Therefore, the research study shared in this chapter aimed to explore how climate change can be integrated into the Namibian senior secondary Physical Science syllabus through environmental education (EE).

Climate change is caused by the emission of greenhouse gases fuelled by anthropogenic activities (Nkoana 2020), and therefore, humankind should make decisions to mitigate or eliminate its harmful greenhouse gas emissions. These decisions are dependent on an awareness of the causes, risks and outcomes of and solutions for climate change. To this end, climate change education is essential to addressing climate change in all education systems (Simpson et al. 2021), both formal and informal. United Nations Educational, Scientific and Cultural Organization's (2020a) Paris Agreement urged all present to ensure that measures are taken to enhance climate change education, public awareness and community participation.

Community-based initiatives and strategies for reducing the effects of climate change and increasing knowledge and expertise about climate change are more likely to be successful and transformative because they engage with vital stakeholders at the grassroots. Grassroots communities and other social stakeholders cannot be excluded from climate change education issues, as they are an essential aspect of the solutions and preventative interventions needed to combat climate change (Ruiz-Mallen

et al. 2022). Community action and engagement in climate change education are essential interventions because the effects of climate change do not spare any sector of society. Businesses, governments, communities and individuals are affected by climate change. Climate change education promotes community action and social engagement in climate change issues (Trott 2021). Community leaders should spearhead the new green learning initiative to engage stakeholders in implementing climate change mitigation strategies – an intervention that takes advantage of grassroots knowledge and creativity that can be utilised in enhancing climate change education (Kwauk & Winthrop 2021). Teachers in schools can be a good starting point for stakeholder engagement.

Priority action area 2 of UNESCO's ESD for 2030 (UNESCO 2020b) calls on teachers in education and training settings to focus their attention on promoting the whole-institution approach to ensure that learners learn what they live and live what they learn. Thus, teachers worldwide can develop capacities to foster societal transformation for a sustainable future by integrating ESD into their teaching and learning. Teachers are tasked with ensuring that learners learn what is truly relevant to their lives in order to ensure that what they learn helps to ensure the survival of our planet at a local level. Education for sustainable development can provide the knowledge, awareness and action that enables learners to transform themselves and their community. Therefore, ESD is important in teaching and learning because it enables learners to make informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity. Thus, ESD is about lifelong learning and an integral part of quality education. Furthermore, it is holistic and transformational education that addresses learning content and outcomes such as climate change, pedagogy and the learning environment. Education for sustainable development achieves its purpose by transforming society. Because teaching and learning activities must develop learners who are change agents who take part in transformative action, priority action area 2 of UNESCO's ESD for 2030 needs teachers' attention. Teachers need to include ESD in their teaching and place emphasis on how each learner undertakes transformative action for sustainability. Learners must be given the opportunity to be exposed to real-life examples of local environmental issues. They can then engage with one another and discuss how they can influence their community and transform it towards a sustainable future. Education for sustainable development in action is citizenship in action. United Nations Educational, Scientific and Cultural Organization (2020b) suggests integrating sustainability issues into all kinds of learning, specifically those linked to the 17 sustainable development goals (SDGs), for example, climate change.

■ The global state of climate change education

On a global scale, many countries are yet to create effective strategies to provide climate change education in their countries. Hence, notwithstanding its essential role in addressing climate change, education is not fully utilised (Mochizuki & Brayn 2015). Reid (2019) highlights the role of education in preparing communities to manage global climate change, raising awareness and ensuring that the SDGs are met. The role of educational institutions globally ensures that modern social, political, environmental and scientific systems are adapted to address the challenges posed by climate change. In this regard, universities and other learning institutions are essential in mitigating the effects of climate change through education, awareness and research by using strategies to develop interventions and new techniques for mitigating the impact of climate change (Molthan-Hill et al. 2019).

Researchers and teachers globally have committed to studying and teaching about climate change education to broaden access to crucial information about mitigating climate change or addressing its effects on businesses, communities and society (Rousell & Cutter-Mackenzie-Knowles 2019). Teaching about climate change is vital because it raises awareness among learners who are likely to share the information with peers and family members (Rousell & Cutter-Mackenzie-Knowles 2019). Ruiz-Mallen et al. (2022) point out the importance of including young people in climate change awareness, education and activism because they are a significant population group who can actively participate in reducing the effects of climate change in communities in countries across the globe. Current and future generations are growing up in a global 'village' characterised by the effects of climate change and uncertainty about the future ability of the earth to sustain human needs (Rousell & Cutter-Mackenzie-Knowles 2019).

It is imperative for educational stakeholders globally to ensure effective climate education intervention to equip learners with the skills and knowledge required to manage the effects of climate change. It is now globally recognised that climate change education is essential for addressing the challenge of climate change and sustainability currently facing most parts of the world. Climate change education is significant because it helps societies learn about the effects of climate change and strategies to address or reduce its effect on communities. However, despite agreeing on the role of climate education in addressing climate change, educational practitioners and other stakeholders disagree about the content of climate change education, the people responsible for implementing it, how to transform current teaching and learning systems to incorporate climate education and how to monitor and evaluate climate

change to keep it in line with desired outcomes (Reid 2019). Educationists are unsure how to design effective climate change education policies to respond to the growing threat of climate change (Mochizuki & Brayn 2015). While these issues need to be addressed, they do not reduce the need for a global approach designed to broaden climate change education. Molthan-Hill et al. (2019) suggest that a transdisciplinary approach that integrates climate education across many academic disciplines offered to learners effectively broadens information about climate change among learners.

Hence, it is essential to explore how various government and national education boards address climate change education within their countries. Namibia attended the 10th BRICS Education Ministers Meeting as a special invited guest nation even though it is not currently a member of the BRICS (South African Government 2023). The relevance of the BRICS group and Namibia's particular setting interact in intricate ways to influence both regional and international affairs. This section explores climate change education in the BRICS countries (Brazil, Russia, India, China and South Africa) because of the similar stage of development in the southern hemisphere countries.

■ Brazil

Climate change education in Brazil is influenced by the country's Constitution of 1988. Chapter 6 of the *Constitution of Brazil* deals with the environment. Among many other things, it states that every citizen 'has the right to an ecologically balanced environment' that enables them to lead a healthy life, survive and create economic opportunities (Government of Brazil 1988, p. 150). Essentially, the Constitution states that a healthy environment is a public benefit. To ensure that citizens enjoy this right, the Constitution and the Government of Brazil are responsible for, *inter alia*, promoting 'environmental education at all levels of teaching and public awareness of the need to preserve the environment', as stated in Article 225(51)(7) of the Brazilian Constitution. These sections of the Constitution indicate that EE issues, such as climate change education, are central to the Brazilian education system and that climate change education should be taught under ESD and EE because it will help learners understand its consequences and causes (Mochizuki & Brayn 2015).

The Brazilian government developed the *National Plan on Climate Change* (Government of Brazil 2008) through the Ministry of Education to manage how local schools teach about climate change to increase the resilience and capacity of society to deal with imminent changes (Trennepohl 2010). One of the goals of the *National Plan on Climate Change* is to use education as a tool for dealing with climate change. For example,

it seeks to coordinate and enhance cooperation on climate change issues among the government and social stakeholders by incorporating teachers, researchers and learners in raising awareness thereof and finding solutions to these issues. This strategy includes educating society about the risks posed by climate change to livelihoods and business operations that have an impact on socio-economic stability. Educational courses, training and the publishing of information on climate change were identified as interventions to educate Brazilian citizens about climate change (Government of Brazil 2008).

However, Trajber and Mochizuki (2015) argue that most policy documents, sectoral plans and government strategies use climate change education as an afterthought to increase public awareness and broaden EE. Trajber and Mochizuki believe that climate change initiatives included in state policies fall short of the required well-thought-out strategies to teach and educate learners and society about climate change. Hence, they confirm Mochizuki and Brayn's (2015) suggestion that Brazil lacks a coherent framework for broadening climate change education like many countries. As of late, Brazil has deployed EE to develop interventions to help society manage environmental challenges (Dos Santos et al. 2020).

■ Russia

In Russia, climate change education is addressed under 'environmental education for sustainability' because it is believed that climate change is an environmental issue (Shutaleva et al. 2020, p. 1). Russia does not have an effective framework for climate change education (National Intelligence Council 2009), which slows down efforts to address and mitigate climate change effects. Like many other global economies, Russia is one of the biggest emitters of greenhouse gases, mainly because of its dependence on fossil fuel exports and industrial activities that rely on fossil fuels (Makarov, Chen & Paltsev 2020). Anisimov and Orttung (2018) indicate that, among many other variables, climate change education can play a crucial role in creating climate change awareness and conscientising citizens about the need for state policies addressing the climate challenge. They believe that climate education in Russia can be used as an effective tool to address the challenge of climate change and create solutions for problems caused by the country's emissions.

Activism with regard to climate change in Russia does not happen freely, as in other European countries such as Sweden and Norway, because of Russia's laws and heavy-headed law enforcement, which deters learners from participating in climate change issues (Bellona 2019). Climate change education in Russia suffers the same fate. However, this does not mean that

learners do not understand the issues surrounding climate change or the need to address them (Bellona 2019). Anisimov and Orttung (2018) indicate that having an understanding and knowledge of climate change is essential because it leads to adopting responsible lifestyles and measures that conserve the environment and reduce emissions. Moreover, it is essential because behavioural change is identified as one of the strategies that can be used to manage climate change (Lehtonen et al. 2019). The changing climatic conditions encountered in many parts of the country necessitate the 'need for environmental education for sustainable development' (Shutaleva et al. 2020, p. 2). Knowledge and education about environmental and ecological issues are vital because human beings are part of the earth's biosphere, and changes and challenges in the biosphere affect people's survival. It is essential to study the impact of climate change on people (Shutaleva et al. 2020). Russia intends to include climate change education in the curriculum to promote behavioural change and increase awareness (National Intelligence Council 2009).

■ India

India is one of the countries that experience severe effects of climate change. Despite this, most Indians have a poor understanding of climate change issues, a fact that can be attributed to the lack of climate change education in the country (Yashwant 2022). The lack exists despite climate change education forming a significant part of teacher training in the country. For example, the education programme for teachers at the Centre for Environmental Education has a significant climate education component. Similarly, the National Council for Teacher Education and the *National Education Policy* have significant climate change content (Jones, Mitra & Gupta 2022). While the country is ranked as one of the countries most vulnerable to the effects of climate change, data show that most citizens of India do not know about climate change, which shows there is limited climate change education in the country (Jones et al. 2022). Although EE is compulsory in India's formal education system, it is poorly resourced, underfunded and does not receive enough attention (Yashwant 2022). P'rayan (2022) refers to the lack of climate change education in India, which is supported by the country's poor performance on the World Economic Forum Environmental Performance Index of 2022, where the country was ranked as one of the lowest performers.

Although the President of India recently advocated for the inclusion of climate change education in school syllabi, the National Council of Educational Research and Training removed content about climate change from the school syllabus (P'rayan 2022). According to Jones et al. (2022), the new national education policy of the Indian government should include

educational material about climate change to conform with the United Nations' SDGs. The responsibility to teach and broaden climate change education is left to science teachers in secondary schools who do not have adequate resources. As a result, despite an educational framework supporting climate change education, schools in India are not adequately resourced to enhance it.

■ China

Education stakeholders have been calling for the inclusion of climate change education in the Chinese primary and secondary curricula for several decades. This resulted in the inclusion of climate change education in basic education curricula across China (Tang 2022). The government of China recognises the importance of education and knowledge in sustainable development; hence, it developed several climate change and sustainable development education policies and strategies (Han 2015). According to Han, various educational interventions, such as curriculum development to keep learning content consistent with new climate change information, establishing ESD schools, districts and ESD teaching models and mobilising the involvement of stakeholders in education and monitoring and evaluation, have increased climate change education in China.

However, in China, poor education and access to information are identified as variables influencing participation in human activities that have an impact on the environment and accelerate climate change (Wang & Zhou 2020). Wang and Chen's (2022) study in China emphasises how climate change education can be used among Chinese learners to convey information and awareness about climate change. Visual materials about the effects of climate change were used to invoke fear, emotions and anxiety triggered by videos of floods, landslides and droughts believed to be caused by climate change to send a grim message about the dangers of climate change (Wang & Chen 2022). The results of this research show that the learners responded to several forms of climate change education. This is significant because it shows that stakeholders and educational practitioners can design educational programmes to increase awareness of climate change in China. Therefore, we believe that increasing access to climate change education can help address climate change issues and promote behavioural changes. Education is an effective tool that can teach and educate people about climate change, its effects and how to mitigate it.

■ South Africa

Educational practitioners in South Africa follow a universal strategy to address climate change by addressing the teaching and learning of

climate change issues in formal education programmes at primary, high school and higher education levels, ensuring that school learners understand climate change concepts (Anyanwu, Le Grange & Beets 2015). Interventions for broadening climate change education in South Africa include Fundisa for Change and the *National Climate Change Response Plan White Paper*.

The Fundisa for Change (2022) initiative equips teachers in South Africa with the required skills to teach environmental and climate issues. *Fundisa* is isiZulu word that means ‘teach’. The initiative contributes to climate change education by ensuring that teachers have the required skills and knowledge to impart to learners (Songqwaru & Shava 2016). Given the importance of teachers as stakeholders in climate change education, the Fundisa intervention is significant because it trains teachers and ensures that they can teach the content about climate change contained in school curricula (Fundisa for Change 2022).

The *South African National Climate Change Response Plan White Paper* (South African Government 2011) acknowledges that climate change is multidisciplinary and affects society at all levels. Hence, the dissemination of information and knowledge of climate change is vital because these enable stakeholders to manage climate change by finding solutions to its effects. The White Paper indicates that incorporating climate change education in formal education curricula will raise awareness and contribute towards finding solutions to the challenges it poses. According to the White Paper:

[C]limate change education should be part of the broader framework of education for sustainable development, and should equip South African citizens to re-orient society towards social, economic and ecological sustainability. (South African Government 2011, p. 45)

The *Curriculum and Assessment Policy Statement* (CAPS) document of the Department of Basic Education (2011) does not make direct reference to climate education in the general aims of the South African curriculum. However, it does state that the CAPS, in all subjects, is based on seven principles, of which environmental and social justice is one. Teachers are required to infuse the principles and practices of social and environmental justice and human rights as defined in the *Constitution of South Africa* in their teaching and learning. The *National Curriculum Statement Grades R-12* or CAPS (Department of Basic Education 2011, p. 5) also aims to develop learners who are able to ‘critically show responsibility towards the environment and the health of others’. It means that teachers need to integrate climate change issues into the themes of their subjects where they see fit through ESD.

South Africa's National Development Plan (Department Statistics 2019:40) projects to improve education, training and innovation by linking its plan to SDG 4.7 (quality education), which states:

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

■ The state of climate change education in Namibia

Learners in Namibia are regarded as significant stakeholders in climate change education because their knowledge of and access to information influence their attitudes and behaviour, and the degree to which they contribute to the climate change discourse is dependent on their attitudes, knowledge and understanding of the concept (Shikangalah 2019). Knowledge of a concept is essential in shaping human behaviour. It is essential for learners to receive information about climate change causes, adaptations, mitigation and risks through formal education systems because solving the problem of climate change depends on behavioural and attitudinal change (Loubser & Simalumba 2016).

Tshiningayamwe (2018) reveals that climate change education is poorly integrated into school curricula across the African continent, especially in southern Africa. This means that education stakeholders should develop immediate strategies to integrate climate change education into the curriculum, given that it is an essential concept that affects people's livelihoods. Climate change education in Namibia is addressed by the Namibian National Institute for Educational Development (NIED) and through EE and ESD.

■ The national institute for educational development

The NIED is a Namibian educational institute responsible for developing educational curricula in schools across the country (Wilmot 2016). In recent years, the NIED has incorporated EE themes such as climate change education in formal education curricula as a response to Namibia's increased focus on climate change issues, which has been triggered by climate change and global warming developments occurring nationally, regionally and globally (Tshiningayamwe 2018). Namibia cannot afford to ignore climate change because it is real and affects citizens' daily lives.

■ Environmental education

In Namibia, subjects such as Biology, Physical Science and Geography, which focus on environmental aspects such as environmental management and conservation, global warming and climate change, among many other things, integrate EE. The aim of EE is to integrate content and knowledge about the environment and to highlight how it affects people's livelihoods. Furthermore, EE focuses on the effects of human activities on the environment (Loubser & Simalumba 2016). As such, EE can be used to integrate knowledge about climate change into the formal education system because its objective is to provide learners with more knowledge about the environment and what affects it (Anyolo, Karkkainen & Keinonen 2018).

■ Education for sustainable development

In Namibia, ESD imparts skills in utilising the environment in a way that does not compromise its sustainability (Anyolo et al. 2018). Thus, ESD is essential in conveying knowledge about reducing human activities that impact climate change and empowering learners to make informed decisions and take responsible action for environmental integrity (UNESCO 2021). This type of climate change education is vital because it equips learners and society with knowledge about how humans can change their behaviour to help sustain the environment (Tshiningayamwe 2018) and respect cultural diversity for present and future generations (UNESCO 2021).

In Namibia, ESD is guided by the *National Environmental Education and Education for Sustainable Development Policy* (Ministry of Environment, Forestry and Tourism 2019). This government policy document highlights the importance of responsible, sustainable development, particularly in light of the impact of human development on the environment. Next, the *National Environmental Education and Education for Sustainable Development Policy* highlights the impact of climate change on the environment and livelihoods in Namibia.

■ Namibia's *National Environmental Education and Education for Sustainable Development Policy*

The official *National Environmental Education and Education for Sustainable Development Policy* was published in 2019. The objective of the policy is to guide and inform environmental issues in Namibia by promoting environmental literacy and using effective communication methods to

disseminate information. It also seeks to create environmental awareness, develop environmental protection skills, promote behavioural and attitudinal changes and bolster the political will to preserve the environment (Ministry of Environment, Forestry and Tourism 2019). The policy was developed against the backdrop of the inclusion of environmental sustainability in Namibia's development agenda. Despite the numerous challenges faced by Namibia regarding climate change, natural resource depletion, the contamination of water bodies, deforestation, pollution, droughts and soil erosion, the country aims to incorporate sustainability into its social and economic development plans. The policy is based on the following 13 guiding principles:

- Understand that the environment consists of natural and man-made environments.
- Environmental and sustainable development education are lifelong processes; hence, they should be incorporated into pre-school and tertiary education learning programmes.
- Environmental and sustainable development education should be multidisciplinary and holistic.
- Environmental issues should be understood from a national, regional and global perspective.
- Stakeholders should be cognisant of historical perspectives and current and future environmental issues.
- Ensure multi-stakeholder and cross-border cooperation in preventing environmental calamities.
- Incorporate environmental issues in development plans.
- Ensure that multiple stakeholders are involved in planning.
- Enable all stakeholders to be conversant with the causes and symptoms of environmental problems.
- Highlight the complex nature of environmental problems to foster critical thinking, environmental literacy and finding solutions.
- Utilise several approaches, including practicals, to teach and educate about environmental issues.
- Use existing knowledge and resources about EE and ESD to address environmental issues.
- Utilise monitoring and evaluation techniques to assess EE and ESD programmes.

The *National Environmental Education and Education for Sustainable Development Policy* (Ministry of Environment, Forestry and Tourism 2019) aims to achieve its objectives through citizen engagement, advocacy, training, learning materials, curriculum development, pedagogical interventions, research and public centres providing information and knowledge about EE and ESD. The policy is noteworthy in this chapter

because it aims to use education to address environmental issues. Hence, EE and ESD as lifelong processes should be incorporated into programmes from pre-school to tertiary education in all subjects.

■ Climate change education in Namibia's Physical Science syllabus for Grades 11 and 12

A syllabus guides how learners will be taught (Tokatli & Keşli 2009). The Physical Science syllabus for Grades 11 and 12 (hereafter referred to as the Physical Science syllabus) was developed by the Ministry of Education and the University of Cambridge in 2010 to reflect the guidelines set by the Namibia National Curriculum Guidelines (NIED 2008). The syllabus is a contract between teachers and learners because it outlines the functions and responsibilities of both parties. The syllabus also highlights the learning outcomes and the skills expected from learners (NIED 2009). The Physical Science syllabus encapsulates the modern skills that policymakers believe learners should possess. Given the current challenge of climate change, the Physical Science syllabus should include concepts such as EE and climate change affecting society because Physical Science deals with earth sciences such as meteorology, geology, chemistry and other related topics. Incorporating climate change education in a syllabus enables learners to receive current content knowledge about the causes and effects of climate change (UNESCO 2013).

While the Namibian Physical Science syllabus deals with EE concepts such as natural and man-made environments, human activities, the impact of energy generation on the environment, conservation, recycling, sustainability, non-renewable resources, emissions, rainfall, industrialisation and global warming, it does not cover climate change issues (NIED 2009). The current syllabus covers issues affecting Namibian society, but the climate change issues affecting Namibia do not form part of EE. We are, therefore, in agreement with Vogel, Schwaibold and Misser (2015), who state that the complexity of the effects of climate change on fragile socio-natural ecosystems in Africa requires educational approaches that produce solutions.

■ Theoretical underpinning

A theoretical framework is a process of organising a network of theories that are relevant to a specific study (Kumar 2014). The theoretical basis for the research conducted in this study is centred on Bruner's theory of development for curriculum development. Bruner's theory regards

education as a process of change brokered between individuals and culture (Stenhouse 1975). Bruner's (1966) theory argues that educational reform should improve curriculum development and educational principles and practices and that curriculum development should present useful knowledge. The theory concentrates on curriculum development that is based on ideas of intellectual excitement and creative interest in a subject through experimental explorations and constructed realities of contexts that are complementary rather than contradictory (Stenhouse 1975). In order to improve teachers' practice, learners are engaged using exploratory approaches to involve the learners in the curriculum process (Stenhouse 2012).

Bruner's (1966) theory is based on an approach that seeks a change to complement the ever-changing internal and external environment. Stenhouse (1975) developed an approach by stating that curriculum development should not be stagnant but rather an ongoing process that can accommodate changes within the latest developments. Therefore, educational development needs to be in the form of principles that are open to change of critical enquiry and should be capable of undergoing a translation that best suits different contexts of practice (Stenhouse 2012).

As explained above, Bruner's theory focuses on a change process. The aspects of change correspond with the transformational perspectives that underpinned this research. This research study aimed to transform the nature and content of the current Physical Science syllabus in Namibia because there is a need to transform the current syllabus in order to accommodate climate change education in today's society, which is threatened by the effects of climate change. We believe that there is a need for curriculum change and transformation in learning, which are achievable through the integration of climate change in the Namibian Physical Science syllabus for Grades 11 and 12.

■ Research design and methodology

The case study research design followed a qualitative approach within the interpretivist research paradigm. A case study enables researchers to study specific subjects closely (Yazan 2015), and this case allowed us to obtain in-depth data from participants, as suggested by Yin (2014). The data were collected from document analysis and through semi-structured, one-on-one interviews and a focus group interview. Purposive sampling was used. The official Namibian curriculum document, senior secondary Physical Science syllabus (Grades 11 and 12) and official Namibian policies on climate change and EE formed part of the documents analysed.

Six Physical Science school teachers from six senior secondary schools in the Kalahari cluster circuit region, one Physical Science subject adviser and one NIED official participated and were purposively sampled as the most knowledgeable about the senior secondary Physical Science syllabus. The Kharas region has a total of six senior secondary schools that form part of the Kalahari cluster circuit. All the selected schools in this study are in one education district, namely the Kalahari circuit in Namibia.

We deemed it necessary to explore how climate change can be integrated into the Grades 11 and 12 Physical Science syllabus in Namibia through EE. The research involved exploring, through content analysis, which climate change objectives contained in the *National Policy on Climate Change for Namibia* are addressed in the Namibian *National Curriculum for Basic Education* and the Namibian Senior Secondary Physical Science syllabus. A thematic analysis was also undertaken of the climate change issues that are addressed in Grades 11 and 12 by the participating Physical Science teachers, subject adviser and NIED official to establish how EE can be implemented in the senior secondary Physical Science syllabus to address those issues.

■ Innovative Namibian curriculum review guidelines on how to integrate climate change in the Physical Science syllabus through environmental education

The aim of the research was to establish how climate change can be integrated into the Physical Science syllabus (Grades 11 and 12) through EE. The guidelines recommended from this research are that climate change education should aim to enable all learners to address the causes of climate change. This is achieved through teaching and learning activities that will not only create awareness but also provide problem-solving skills that are practical. For example, EE projects that require learners to create or plan for alternative sources of energy should be initiated, in line with the second objective of the *National Policy on Climate Change for Namibia* (Ministry of Environment and Tourism 2011, p. 6), which states that the 'Namibian senior secondary Physical Science syllabus should develop action and strategies for climate change mitigation', and this may be achieved through, for example, the development and implementation of renewable energy and energy use efficiency, clean development mechanisms and enhanced carbon sinks.

Table 4.1 presents guidelines on how climate change can be integrated into the Namibian Physical Science syllabus (Grades 11 and 12) through EE.

TABLE 4.1: Curriculum review on how to integrate climate change in the Physical Science syllabus (Grades 11 and 12) through environmental education.

Current syllabus sections for Grades 11 and 12	Current topics	Current themes	Learners' specific objectives	Suggested guideline topics or themes to address climate change	Suggested guidelines to address EE in Grades 11 and 12
General science section	Scientific skills	Recording data Drawing graphs and tables	Use column headings of the table to be directly transferred to the axes of a constructed graph; draw the graph as the whole diagrammatic presentation	Teachers should use temperature changes and rainfall patterns in Namibia to show how global warming is taking place	Learners are active participants: From Grades 8 to 12, they should have their five years' records of temperature changes in their local environment. Depict it by using diagrams and make conclusions relating to global warming and climate change. The basics about climate change should be taught in the lower grades and then need to be expanded on in more detail in the higher grades so as to work through the higher cognitive levels whereby learners get to evaluate temperatures or rainfall patterns and concentrate on the issues of climate change.
Physics section	Thermal Physics	Measuring temperature Melting and boiling	State and apply examples of how a physical property that varies with temperature may be used for the measurement of temperature Understand the process of melting and boiling with reference to climate change	Drought increases environmental temperature Water pollution domes Water in Namibia: sources, access, storage, pollution and quality Reasons for water shortages – catchments and water management	Learners should be taught about the causes and effects of climate change, and focus should be placed on limiting the amount of carbon dioxide in the atmosphere, ways to reduce climate change and causes of climate change Experiential learning about pollution should occur by making EE relevant and involving learners in problem-solving activities where they interact with the private sector to investigate local environmental issues
Chemistry section	Nuclear Physics	Radioactivity	Describe radioactive isotopes, such as ^{235}U , as a source of energy (a reference to isotopes)	Reduction of emissions and the role of different forms of ownership in sustainable use of natural resources, sustainable energy resources, the exploitation of resources, local environmental health problems, degradation and the impact of humans on the environment, solution-based waste dumps, radiation and pollution	Encourage learners to plant trees, make the environment more sustainable by limiting the amount of carbon dioxide in the atmosphere, list the causes of climate change and investigate how to reduce the effects of climate change at school Experiential learning about pollution in the local community

Table 4.1 continues on the next page→

TABLE 4.1 (Continues...): Curriculum review on how to integrate climate change in the Physical Science syllabus (Grades 11 and 12) through environmental education.

Current syllabus sections for Grades 11 and 12	Current topics	Current themes	Learners' specific objectives	Suggested guideline topics or themes to address climate change	Suggested guidelines to address EE in Grades 11 and 12
Energy	Major sources of energy and alternative sources of energy		Outline the advantages and disadvantages of various energy sources Highlight environmental considerations and the distinction between finite and renewable sources	Biomes of Namibia, solar energy, sustainable energy, renewable and non-renewable sources and lack of infrastructure, for example energy in rural areas, the impact of contemporary socio-economic issues – unavailability of natural resources and exhaustion of natural resources	Engage learners to actively implement renewable energy and use energy efficiency in their local environment by means of an audit task with reporting. Teach about the clean development mechanism and enhanced carbon sinks (these suggestions are strategies found in the <i>National Policy on Climate Change for Namibia</i>).
	Chemical reactions	Production of energy	Describe the production of heat energy by burning fuels	Energy, renewable, non-renewable, environmental impact and energy balance or energy budget Burning of fossil fuels	Increase learner awareness and knowledge about climate change. Empower people to participate in the planning, development and implementation of appropriate responses to climate change by means of a project-based assignment that reinforces decision-making.
	Industrial uses and application chemistry	Metallurgical industrial plant Chemical industrial plant	Outline industrial and domestic water uses Describe the composition of clean air as being approximately 79% nitrogen, 20% oxygen and the remainder as being a mixture of noble gases, water vapour and carbon dioxide	Impact on the environment as a result of mining – acid drainage, dust pollution and modern mining Overutilisation of resources for production Environmental changes caused by humans The environment – the problem, protecting, sustainability and global and local impact	The Ministry of Education has to train teachers and focus on environmental concerns such as climate change in the syllabus National curriculum developers must include topics related to climate change and promote EE The government can support schools with funds to take learners on field trips (These are all proposed suggestions from the participants that have been reformulated and taken into consideration for this research.)

Table 4.1 continues on the next page→

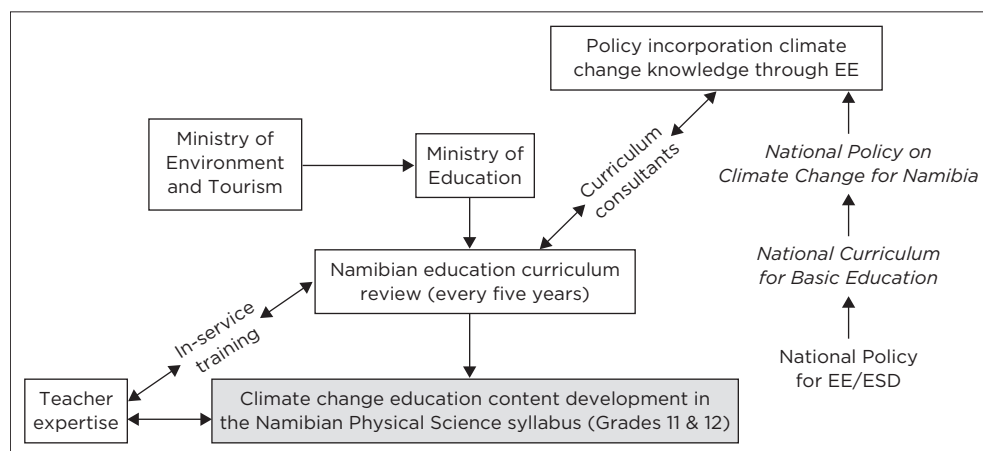
TABLE 4.1 (Continues...): Curriculum review on how to integrate climate change in the physical science syllabus (Grades 11 and 12) through environmental education.

Current syllabus sections for Grades 11 and 12	Current topics	Current themes	Learners' specific objectives	Suggested guideline topics or themes to address climate change	Suggested guidelines to address EE in Grades 11 and 12
Energy	Environmental chemistry		State the common pollutants in the air as being carbon monoxide, sulphur dioxide, oxides of nitrogen and lead compounds	Climate change, greenhouse gases and greenhouse effects, global warming, sustainable development, reuse, recycling, plastics, extraction and use of materials, including pollution and recycling scrap metals	Start with the basics by defining climate change and global warming
			Investigate the effects of dangerous chemicals on the environment	Design a recycling scheme	Advocate for the sustainable and equitable use of natural resources by means of teaching activities that are based on indoor and outdoor investigations

The guidelines in Table 4.1 recommend how EE can be incorporated into the senior secondary Physical Science syllabus to address climate change. It is recommended to be based on a holistic approach, to examine major environmental issues from local, national, regional and international points of view, to use Namibian situations to seek solutions for local environmental problem-solving and to plan for learners to play active roles in planning their learning. The suggestion also includes opportunities for making decisions and accepting the consequences thereof, developing critical thinking and problem-solving skills, making use of indoor and outdoor learning environments for practical activities and first-hand experiences and including different education approaches to teaching and learning about and from the environment.

The proposed guidelines for integrating climate change in the Namibian Physical Science syllabus through EE from the research findings were not the only findings of the research study. This study also revealed that stakeholder involvement is essential in reforming the Namibian Physical Science syllabus. While teaching climate change issues is vital in raising awareness and providing learners with knowledge and skills, it should be noted that teaching by teachers is a by-product of public policymaking in the education sector. This means that teachers and other stakeholders in the education fraternity are guided by basic education policies developed by policymakers in government, as shown in Figure 4.1.

One of the challenges regarding implementing climate change education in Namibia's Physical Science syllabus identified in this research study was the lack of synergy between teaching and learning guidelines and national



Source: Authors' own creation.

FIGURE 4.1: Sectors and stakeholders in a Namibian strategy to include climate change education in the Physical Science syllabus.

education policies dealing with environmental issues and climate change (Iipinge 2019). As a result of this gap, teachers cannot include climate change content in their teaching schedules because it is not provided for. For example, while the *National Policy on Climate Change for Namibia* (Ministry of Environment and Tourism 2011) proposes integrating the activities of several stakeholders to promote climate change mitigation and management activities and mainstreaming climate issues, the *National Curriculum for Basic Education* (NIED 2019a) and the newly revised *National Curriculum for Basic Education* (NIED 2018a, 2018b) that was implemented for Physics and Chemistry for Grades 10 to 11 and for Grade 12 (NIED 2019b) do not provide any strategies to implement climate change education in the teaching and learning systems of Namibian schools (NIED 2019a). Given the significant role of education in addressing climate change issues, this omission is counterproductive because it deters teachers from addressing these issues in classrooms across the country. As a result, learners are deprived of current knowledge content, research data and findings about climate change. In this regard, the participating subject adviser (Participant subject advisor, Female, February 2018) shared the following:

'The Ministry of Environment and Tourism should work in collaboration with the Ministry of Education because teachers need to be trained intensively on how to integrate it [climate change] cross-curricular issues that in some cases fall under the portfolio of a particular ministry. In this case, in as much as climate change is an educational matter, it is also an area that the Ministry of Environment and Tourism focuses on.'

Furthermore, the Namibian *National Environmental Education and Education for Sustainable Development Policy* also needs to be considered by curriculum consultants when they address climate change education in the Physical Science syllabus.

If the inclusion of climate change in the Physical Science curriculum (Grades 11 and 12) is to be successful, the subject teachers need to be knowledgeable about the issue. Therefore, teachers, as experts, are urged to research the topic thoroughly and be knowledgeable about all facets of climate change. Implementing climate change education in schools can only be successful if it includes ongoing research and teacher training.

The majority of the participating teachers (see Table 4.2) said that the topic of climate change should be covered in greater detail in environmental chemistry, as an energy topic or as a stand-alone subject in the Physical Science syllabus. Teachers T1 (Participant T1, Male, February 2018), T3 (Participant T3, Female, February 2018) and T5 (Participant T5, Female, February 2018) were of the opinion that it would be best if climate change was introduced under environmental chemistry in order to address issues related to climate change in a more direct focus. Teacher T2 said that the

syllabus should 'add more examples about causes of climate change' (Participant T2, Female, February 2018). Teacher T3 suggested that 'learners should know more about it [global warming] in detail' (Participant T2, Female, February 2018). Teacher T4 (Participant T4, Female, February 2018) suggested the 'production of CO₂, this is the main gases that contribute to ozone depletion' as a topic; and Teachers T5 (Participant T5, Female, February 2018) and T6 (Participant T6, Male, February 2018) suggested that global warming should be included as a topic. Furthermore, teachers should be given assistance in the form of in-service training so that they can update the syllabi for each subject taught in the junior and secondary levels of education to include a more explicit emphasis on climate change. As a result, Namibia will be able to develop a solid understanding of regional trends in climate change and no longer rely on outside organisations.

The research found that the Ministry of Education and the Ministry of Environment and Tourism should come up with practical, innovative strategies to upgrade the current policy documents, namely the *National Curriculum for Basic Education* and the senior secondary Physical Science syllabus (Grades 11-12) for Namibia, to enhance synergy to ensure climate change and other issues are effectively, efficiently and cost-effectively addressed by the relevant sectors and stakeholders. Education and

TABLE 4.2: Biographical information of participants.

Participant (with pseudonym)	Field of expertise	Gender
Teacher 1 (T1)	Four years' teaching experience. Holds a Basic Education Teacher Diploma (Namibia), Junior Secondary in Physical Science and an advanced certificate in Learner Support Education.	Male
Teacher 2 (T2)	Three years' teaching experience. Holds a Bachelor's degree in Junior Secondary Physical Science qualification.	Female
Teacher 3 (T3)	Senior teacher with six years' teaching experience in Junior Secondary Physical Science teaching and one year in the senior secondary phase. Holds a Bachelor's degree in Physical Science.	Female
Teacher 4 (T4)	One year's experience in the senior secondary phase at the current school. Holds a Bachelor's degree in Pure Science.	Female
Teacher 5 (T5)	Senior teacher with 15 years' experience in both the junior and secondary phases at the current school. Holds a Basic Education Teacher Diploma (Namibia) in Physical Science, an advanced certificate in curriculum studies and an Honours degree in Learner Support Education.	Female
Teacher 6 (T6)	Senior teacher with eight years' experience in senior secondary Physical Science teaching. Holds a Basic Education Teacher Diploma (Namibia), Advanced certificate in Curriculum Studies and Honours degree in Leadership and Management, Laws and Systems in Education.	Male
Subject advisor	Kalahari circuit Physical Science subject advisor	Female
NIED official	National Institute for Educational Development (NIED) official for Physical Science	Female

Source: Authors' own creation.

government departments in all spheres should work together on a cooperative basis to deal with climate change by harmonising policies and legislation to reflect an integrated approach in planning, decision-making and implementation with respect to climate change.

Climate change is a global concern that should, as far as possible, be integrated into sectoral policies for sustainable development (Iiping 2019). Research in Malaysia (Kanapathy et al. 2021) 'revealed that six aspects contribute to the integration of sustainable development concepts into the chemistry curriculum, namely educational policy, awareness, resources, curriculum, pedagogical approach and stakeholders' engagement'. Therefore, greater stakeholder involvement is strongly recommended for Namibia. Kanapathy et al. also found that integrating sustainable development concepts through the subject chemistry cannot be implemented effectively without policies because they are dependent on education policies at the governmental and institutional levels. Therefore, management at top levels (in the ministries) has a great influence on the integration of particular concepts into syllabi. Furthermore, Kanapathy et al. suggest that the pedagogical approach and curriculum should focus on deepening the knowledge of the concept that is being studied through the subject. Therefore, the current research proposes that in Namibia, climate change education should feature more prominently in the Physical Science syllabus and that policies and laws must be harmonised to reflect an integrated approach with regard to climate change.

The NIED official (Participant NIED official, Female, February 2018) interviewed in this study stressed that teachers play a significant role in implementing the products of curriculum development. The NIED official was in line with the views of Bruner's development theory that advocates for the curriculum as a process that should welcome changes, and in this case, the official welcomed climate change in the curriculum development of Physical Science as a global and national concern. The subject adviser (Participant subject advisor, Female, February 2018) urged the 'Ministry of Environment and Tourism which is responsible with [for] the formulation of the National Policy on Climate Change for Namibia to work timeously in collaboration with the Ministry of Education to train teachers intensively on how to effectively address climate change to educational policies and documents'. Teacher T2 (Participant T2, Female, February 2018) insisted that the '*Ministry of Education has to train teachers and equip them with current knowledge*'. The NIED official (Participant NIED official, Female, February 2018) urged responsible stakeholders to provide 'a list of climate change issues linked to the Physical Science subject in order for curriculum developers to implement it through curriculum reforms which take place every five years'. The NIED official concluded by supporting Bruner's development theory, saying that 'curriculum development and

implementation is a process that needs to undergo changes and not a one-size-fits-all [approach]’.

Kanapathy et al. (2021:1445) found that at the school level, the involvement of internal stakeholders, which are made up of:

[M]anagement, teachers, parents and learners, needs to be addressed to ensure the successful integration of concepts through a subject. The external stakeholders identified in [their] framework are the Ministry of Education and non-governmental organisations. The government is [viewed] as a [key] stakeholder [in] policy formulation, [while] non-governmental organisations are indirectly involved in assisting the government to implement programmes that are related to ESD.

The NIED official (Participant NIED official, Female, February 2018) shared that the Namibian education curriculum is reviewed every five years but emphasised the need for researchers to provide current information, trends and statistics about climate change to provide curriculum developers with updated information concerning climate change. The latest contributions are crucial in the development of a curriculum that addresses issues and challenges relevant to Namibian society and, according to lipinge (2019), will be useful in integrating and incorporating current climate change concepts in the *National Curriculum for Basic Education*. Takinana and Baars (2023) used Freeman’s 1985 stakeholder theory to examine key stakeholders involved in programme development because the theory states that stakeholders significantly influence project design and development. The six key stakeholders that were identified were business, education, government sectors, curriculum consultants, students and local communities. lipinge’s research found that teachers are key stakeholders in curriculum development because teachers interact with learners on a day-to-day basis and are conveniently placed to know the contents (and deficiencies, where they exist) of the Physical Science syllabus. Measures to incorporate new subjects or themes into the curriculum need to take note of teachers’ input. The curriculum review guideline, if used as a guide to integrating climate change concepts through Physical Science, enables specific aspects of climate change education to be addressed through EE, thereby indirectly encouraging teachers to integrate the content into their subject.

The *National Policy on Climate Change* (Ministry of Environment and Tourism 2011) for Namibia emphasises:

[T]he need and importance to raise awareness, build capacity and empower stakeholders at local, regional and national levels and at individual, institutional and systemic levels to ensure a collective and timely response to climate change. (p. 23)

The difficulty with teaching about climate change in Namibian schools is that there is no alignment between the senior secondary Physical Science curriculum, the *National Curriculum for Basic Education* and the *National*

Policy on Climate Change for Namibia. The *National Policy on Climate Change for Namibia* encourages sectoral and stakeholder collaboration for effective and efficient climate change adaptation and mitigation measures. In order to guarantee that it is addressed at the proper levels at all times, it is also necessary to prioritise climate change concerns, incorporate them into sectoral policies and mainstream them into development planning (Ministry of Environment and Tourism 2011).

The introductory section of the Physical Science syllabus in the *National Curriculum for Basic Education* solely addresses the insights and understanding of global issues that are rapidly changing the world and affect quality of life, for example, global warming and environmental degradation, the management of natural resources and globalisation. The Physical Science Grades 11 and 12 syllabus makes no mention of the integration of climate change as an EE issue (NIED 2008). This suggests that learners who study Physical Science in Grades 11 and 12 are deprived of learning about and comprehending the effects of climate change both locally and globally.

The topic of climate change impacts and community actions is still not critically addressed or covered in the newly revised *National Curriculum for Basic Education Physics* and *Chemistry* syllabi for Grades 10 to 12 (NIED 2018a, 2018b). This suggests that learners studying Physics and Chemistry (Physical Science) within the new curriculum for Grades 10 to 12 will be deprived of learning more about the effects of climate change locally and globally. It is against this backdrop that stakeholder involvement in curriculum development and government policy harmonisation within the Physics and Chemistry syllabi (Grades 10–12) are needed to mitigate climate change in Namibia through an EE and ESD national policy. An exploration of the *National Policy on Climate Change for Namibia* (Ministry of Environment and Tourism 2011) and the *National Curriculum for Basic Education* (NIED 2008) reveals the absence of a link between the two policies regarding the topic of climate change.

Namibia cannot afford to ignore the pressing issue of climate change. The government should develop policies that actively aim to address climate change by including pertinent stakeholders in society according to the recommendations made by this research study. The dissemination of fresh information on climate change through EE teaching and learning must be the main goal of climate change mitigation measures. As a result, this study suggests that at the policy level, the government should create and carry out programmes that aim to distribute information about climate change through EE. The deliberate design of education policy for syllabi to impart new knowledge and skills for learners to lessen the effects of climate change should be a priority.

This study discovered that the cross-ministry government policies – *National Environmental Education and Education for Sustainable Development Policy* and the *National Policy on Climate Change*, which aim to promote EE and the environment – do not affect teaching and learning in Namibian schools. Not much is accomplished locally to educate learners about climate change. In order to achieve a systematic balance in topics and themes about important global issues, this study suggests that the Ministry of Education make sure that the content of existing policies is reconstructed and expand themes related to climate change from basic to complex knowledge and understanding from the lower grades to the senior grades. These themes should include EE, such as learning about climate change, using a critical thinking approach in the *Namibian National Curriculum for Basic Education* and the Physical Science curriculum in the Namibian junior and senior Physical Science syllabus. In order to raise societal awareness and knowledge of climate change through environmental learning, the Ministry of Education should collaborate and create synergy with other departments, such as the Ministry of Environment and Tourism. To ensure that teachers are equipped with the most recent information, skills and techniques for teaching about climate change in all topics through EE, the Ministry of Education should also allocate funding to teacher training.

■ Recommendations for stakeholders in the Namibian education sector

This research recommends that Namibian education stakeholders should ensure that teachers and teacher-training professionals have up-to-date knowledge about climate change. Data and knowledge content about climate change are changing; hence, the personnel responsible for teaching learners should have the skills and know-how to impart new knowledge so that Namibian learners are given current knowledge about climate change issues. This knowledge will inspire learners to mitigate the effects of climate change or pursue careers or professions that help reduce the impact of climate change, such as green technology and environmental conservation. Environmental sustainability relies on conscious citizens, especially the youth engaged in activities to reduce the effects of climate change, raise awareness or implement strategies promoting sustainability. Hence, teachers are essential in inspiring future leaders and professionals to care for the environment.

Stakeholders involved in education in Namibia from the informal sector, such as the business community, non-governmental organisations, donors and community organisations, should ensure that schools and educators receive the resources required to sustain climate change education

(Iipinge 2019). The EE concept and climate change require demonstrations, laboratory time, field trips and excursions to achieve the learning objectives in school subjects. These activities require resources that most Namibian schools do not have. Hence, stakeholder support is needed to complement the efforts of the government and schools in promoting climate change education.

The Physical Science syllabus should be revised to reflect the current realities of climate change. Currently, the Physical Science syllabus does not promote climate change education, which makes it difficult for Namibian teachers to include climate change content in their teaching schedules because the syllabus does not support it. Until it is addressed, climate change will be taught on a voluntary and unstructured basis. Hence, curriculum developers should ensure that climate change education is explicitly included in the syllabus (Iipinge 2019).

Community involvement is vital for achieving the goals of mitigating the effects of climate change. Therefore, stakeholders in the education sector should insource community support in promoting indigenous knowledge about climate change issues so that it can galvanise support for reducing the effects of climate change, mitigating its risks and developing effective management initiatives. In addition, society should be conscientised to pay attention to climate change issues.

■ Conclusion

This chapter explains how stakeholder involvement in curriculum development can be utilised to develop a Physical Science syllabus to include climate change education through EE in Namibia. Stakeholder involvement is vital because it galvanises social support for a common social or economic challenge. The effects of climate change are felt across societies; hence, broad stakeholder involvement is vital for finding solutions to raise awareness. The chapter provided an overview of climate change education by emphasising that governments across the globe are beginning to incorporate climate change education in formal education curricula because it is a topical issue with severe implications for the future of humanity. The experiences of the BRICS countries are vital for Namibian stakeholders because they can be used to evaluate climate change education strategies before implementing them in the country. This chapter also shared how EE and ESD are managed in Namibia through the *National Environmental Education and Education for Sustainable Development Policy*. Guidelines on how climate change can be integrated into the Namibian Physical Science syllabus (Grades 11 and 12) through EE were put forward, and the chapter provided a strategy for sectors and stakeholders involved in curriculum development and implementation in Namibia to

include climate change education in the Physical Science syllabus. It is our belief that government policy harmonisation with regard to climate change and EE in the Physical Science syllabus (Grades 11 and 12) will lead to greater stakeholder involvement in curriculum development.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-00701-17-S2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Embodied experiential place-based education: A possible map to expand the prioritisation for an environmentally literate and sustainable citizenry through life orientation⁸

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■ Abstract

The integration of environmental and sustainability concepts into educational policy as emphasised by the Department of Basic Education (DBE)

8. This chapter is based on a more than 50% reworking of the following published work:

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holds profound significance. Learners today are increasingly confronted with pressing issues such as climate change and pollution within their immediate surroundings. Recognising that environmental literacy and sustainable citizenship are central to Life Skills education, this conceptual chapter proposes a paradigm shift wherein life orientation (LO) classrooms transcend traditional boundaries to become extensions of learners' lived environments. Drawing on the curriculum and assessment policy statement and experiential learning theory, this conceptual paper proposes a practical framework for LO teachers to integrate embodied place-based education in their classrooms. This framework not only contextualises learning content within real-world environmental challenges but also empowers learner to advocate for change within their communities. This chapter explains the concept of embodied experiential place-based education and how it can serve as a pathway to promote the importance of environmentally literate and sustainable citizens, addressing education for sustainable development. Integrating a focus on environmental literacy and sustainability in the LO curriculum allows teachers to empower learners to become agents of change within their communities.

■ Introduction

The inclusion of concepts such as the environment and sustainability within education policy statements (DBE 2011a, 2011b) is important because learners have become increasingly exposed to critical issues such as climate change, pollution and environmental degradation in their lived environments. Too often, learners are unprepared to confront such urgent challenges because they learn that it is enough just to learn about them. Because environmentally literate and sustainable citizenry is a key focus within Life Skills education policies, learners must learn to understand these complex environmental challenges from various perspectives and be comfortable raising their voices. It can therefore be argued that Life Skills education should be viewed as a life practice in which both the life orientation (LO) teacher and learners engage and bring in the so-called non-cognitive processes such as emotions and social processes regarding environmental concerns. The importance is therefore to (re)envision the LO classroom as an extension of the learner's lived environment and to realise the role that embodied experiential place-based learning can play to encourage learners to participate as agents of change regarding unsustainable practices. What matters is that a practical orientation towards the quality and relevance of teaching-learning practices can open new spaces to promote learner commitment to regenerate interactions with the lived environment on sensory, affective,

cognitive as well as imaginative dimensions. I contend that this type of teaching-learning could have potentially transformative effects on Life Skills education in that it can contribute to ensuring an environmentally literate and sustainable citizenry.

As this chapter takes the form of a positional paper, I cover the intersections between environment-literate and sustainable citizenry and the connection with place-based embodied education. However, it is not possible to unlink the aforementioned from the curriculum and pedagogy because they are closely intertwined and impact each other. I conclude by sharing a practical framework which can open possibilities to infuse embodied experiential place-based learning for the enhancement of an environmentally literate and sustainable citizenry which LO teachers can adapt to their own distinctive contexts.

■ Theoretical framework

When arguing for embodied experiential place-based education that can foster an environmentally literate and sustainable citizenry through Life Skills education, the LO *National Curriculum Statement* (hereafter CAPS [*Curriculum and Assessment Policy Statement*]) Grades 7–9 and 10–12 serve as a point of departure. Additionally, a literature survey was conducted to gain a deeper understanding of and insight into the topic under investigation (Maree 2016) pertaining to:

- A conceptual clarification of experiential learning to prioritise an environmentally literate and sustainable citizenry.
- The suggestion of a guiding framework that can be adapted by LO teachers to their distinctive contextual environments for continuous learning is how learners should (and could) evolve into environmentally literate and sustainable citizens.

It is against this background that I now look at whether CAPS provide opportunities for addressing environmental and sustainable issues. Such an exploration is necessary given the importance that South African education policymakers hold preferred and cherished ideas of learners. Notable here is that ‘children must acquire and apply knowledge, values, and skills (hereafter, KVS) that are meaningful to their lives’ (DBE 2011a, 2011b). It would be fair to claim that the phrase ‘making learning meaningful to the lives of learners’, opens possibilities to include current real-world problems within the live environment from which learners can generate knowledge as a basis to question uncritical learning of given truths (DBE 2011a, 2011b). This curriculum principle challenges the traditional classroom-bound locus and textbook-based instruction regarding environmental and sustainable issues within the

learner's live environment. According to Lee and Schottenfeld (2012), such traditional methods cannot successfully transform the learning of knowledge into a change in values and behaviours. On the contrary, the following curriculum aims (DBE 2011a, 2011b) are proposed for sustainability:

- Identify and solve problems and make decisions using critical and creative thinking.
- Work effectively as individuals and with others as members of a team.
- Organise and manage themselves and their activities responsibly and effectively.

The curriculum aims are consistent with the nature of experiential learning, namely direct and purposeful involvement, and addressing a real-world problem in a natural setting (Arnold, Warner & Osborne 2006) as a means of developing competencies and values clarification. Such activities, according to Lee and Schottenfeld (2012), can consist of various in-class to off-school activities including service-learning projects. I argue that if LO teachers draw on experiential learning as an embodied pedagogy for sustainability education, learners become the central focus of the learning process. This line of thinking is extended by Gravett and De Beer (2015) as well as Freire (2000) who refers to the individual as an agent for social change and not a mere conveyor of textbook knowledge as an outside source. This serves as a powerful counterpoint to the instrumentalist views of teaching and learning which education policy statements support. The notion 'counterpoint' opens possibilities that knowledge on environmental and sustainable matters within the live environment can be constructed from different perspectives with an emphasis on experience as a learning method with knowledge being gained through critical- and creative thinking. In this regard, CAPS is to be commended for promoting relevance and learner engagement through holistic education in three domains: cognitive, affection and conation (DBE 2011a, 2011b).

It is therefore argued that experiential learning, when infused into learner activities, could, firstly, better contextualise the learning content on unsustainable environmental practices and, secondly, LO can be used to speak to society about the importance of an environmentally literate and sustainable citizenry. This making of a possible future builds on curriculum principles such as to encourage agency in learners to 'identify and solve problems and make decisions using critical and creative thinking' (DBE 2011a, 2011b). This policy imaging of learners can encourage teachers, and specifically LO teachers, to (re)shape their pedagogy towards strengthening the transformative nature of education regarding empowerment, enablement and development (Nel & Coetzee 2018). Thus, teaching environmental and sustainable issues alone means that learners stop

learning/knowing (own emphasis). At a conceptual level, knowing oversimplifies one aspect within the KVS model, namely that learning or knowing about environmental and sustainable issues is simply a cognitive process to know, control and master the world around us.

According to Banks (2020), the most meaningful and effective way to prepare learners is to use their knowledge and experiences to think of actions they can take to actualise their feelings and moral commitments. This alluded to what Greene (2020) says that ‘knowing is a moment of praxis’ which may entail a continuous search for embodied ways of becoming. For this reason, learning and knowing without action can be regarded as an inadequate response to increased environmental concerns. Thus, to narrow the dislocation between policy statement visions and the classroom, it is reasonable to argue that learners need to be engaged as active human bodies at all levels (emotionally and cognitively) on matters that affect them in the lived environment (DBE 2011a, 2011b). Valuing the whole learner (mind-body) as a key area of enquiry can therefore ensure that they may experience Life Skills education regarding environmental concerns through multiple entry points (Scoffham 2020b; Yoo & Loch 2016). This approach can potentially afford opportunities to equip and empower learners with meaningful place-based embodied KVS to mitigate the challenges that environmental concerns present to their well-being in their lived environment.

■ Life orientation curriculum: Making connections

Education policy statements require LO teachers to teach both environmental and sustainable content KVS. Teaching-learning, in the context of the aforementioned, requires specific instructional strategies and techniques to enable the development of an environmentally literate and sustainable citizenry. According to CAPS (DBE 2011a, 2011b), one of these curriculum prescriptions focuses on the identification and solving of problems and making decisions using critical and creative thinking. The context in which learners are to require these competencies is specified as one in which human rights are respected and social justice is fostered (DBE 2011a, 2011b). Considering this, a pedagogical reorientation towards unsustainable practices appears necessary.

Although the DBE envisages the classroom as a community of enquiry, teacher behaviour does not always encourage the policy imaging of learners as set out by the curriculum designers. According to Green and Condry (2016), however, final-year pre-service teachers’ perceptions regarding a shift to prescribed teaching-learning strategies as envisaged in CAPS (2011a, 2011b) are not easy and straightforward because of the

practical demands thereof. Although participants in Green and Condry's (2016) study reported that they are enthusiastic about the pedagogy contained in current education policy documents, they would be unlikely to implement it if it is merely an add-on and could not perceive practical ways in which it could be introduced. This view is particularly relevant for this chapter because we need a different way of facilitating classroom teaching-learning to create opportunities for learners to (re)construct and share their narratives on environmental concerns in their lived environments. In line with this, I want to propose that the life and worldview, which relates to the LO teacher's awareness of environmental concerns within the learner's lived environment, need to be recognised as a shaping factor or force. Epistemological questions such as: 'What is knowledge?' 'How do we obtain knowledge?' 'What do people know?' and 'How do we know what we know?' are central towards a critical reflexive attitude towards real life (Lapan, Quartaroli & Riemer 2012). This begs the question: What imaginary moral role can embodied experiential place-based education play in helping LO teachers guard against a laissez-faire approach: the notion that teachers should do nothing to guide learners to take a critical obligatory stance against environmental concerns in their lived environment? In my exploration to answer this question, it is important to look at the inclusion of the environment and sustainability in the LO curriculum and the implications it may have for teaching and learning.

■ The concepts 'environment' and 'sustainability' in the life orientation curriculum

The concepts 'environment' and 'sustainability' are integral to both the Senior and Further Education and Training (FET) phases. What is interesting is that both concepts have been expanded to one that includes an intersection between natural and social dimensions. Furthermore, an environmental and sustainable interest is also embodied in one of the seven curriculum principles, namely:

'Human rights, inclusivity, environmental and social justice: infusing the principles and practices of social and environmental justice and human rights as defined in the *Constitution of the Republic of South Africa*'. (DBE 2011a, 2011b:4-5)

This is a recognised strategy for building an environmentally literate and sustainable citizenry to address sustainable challenges as indicated in Table 5.1. Life orientation as a compulsory school subject has the powerful potential to play a significant role in preparing learners to 'make informed decisions and choices and to take appropriate actions to live meaningfully and successfully in a rapidly changing society' (DBE 2011a, 2011b). The importance hereof links perfectly with the emphasis on sustainable capable citizens as recognised through the United Nations sustainable development

goal (SDG) 4 (quality education), target 4.7, that by 2030, all learners will have the necessary knowledge and skills to promote sustainable development (UNESCO 2019). It is therefore encouraging that South African environmental scholars such as Le Grange's (2008) suggested that the environment and sustainability be viewed as 'order-words'. The reason is that these concepts are embodied in the South African Constitution (SA 1996, p. 11) where the focus is on producing a new social order. I, therefore, agree with Gough (2004; in Le Grange 2008) 'that when we view concepts as order-words the focus shifts from what [*the*] concept *means* (own emphasis) to what it *does* or *produces* (own emphasis) in specific locations'. Thus, focusing on environmentally literate and sustainable citizenry will not only integrate critical- and creative thinking but also rely on active learning. According to Cargas (2020), active learning (physically and mentally) not only improves retention of content but also stimulates critical- and creative thinking when learners connect new information with their own experiences. These present new opportunities, create fresh imaginations and alternative meanings and turn in which an environmentally literate and sustainable citizenry might be rethought. For LO, this is particularly encouraging because the curriculum underscores the need for social and environmental responsibility which creates a means for learners to investigate their own values and beliefs (refer to Table 5.1).

Table 5.1 shows how the inclusion of environmental concerns in the Senior and FET LO curricula is a growing consciousness from policymakers of such problems and their associated risks for society. Through the inclusion of environmental problems into the LO curriculum, learners will be able to see how related the environment is to their daily lives. Although the effects of deepening environmental concerns, such as that which are displayed in Table 5.1 are felt by local communities (Reddy 2011, p. 11; Republic of South Africa 2022-21), the root causes to many of these environmental concerns are often found in human activities. Hence, the emergence of sustainability and the orientation towards education to address environmental concerns have reached unprecedented levels. In moments such as this, questions like *what is education for?* (Orr 2004) or *what and how should we learn?* (Le Grange 2004a) remerge. However, challenging times also present new opportunities and fresh imaginations to address deepening environmental concerns. Bokova's (2014) reference to the importance of education is such an example:

More than ever, this is a time when education can – and must – play a decisive role in providing learners across the world with knowledge, skills, and values to discover solutions to today's sustainable challenges. (p. 3)

What the aforementioned description serves to clarify, even though sustainability is a contested terrain (see, e.g. Le Grange 2007a), is that education can serve as a vehicle to transform learners' perspectives and

TABLE 5.1: A breakdown of significant environment and sustainable content within the life orientation curriculum.

Topic	Health	Values, ethics and action competence	Sustainable development				
Senior phase (Grades 7–9): Social and environmental responsibility	Personal health and hygiene	Caring for the environment	Volunteerism				
	Health and safety	Moral obligations					
	Local environmental health problems	Personal and community strategies to deal with environmental health					
	Impact of environmental health on personal and community health	Human rights					
	Environmental health, laws and policies						
Topic	Climate change	Water	Health	Food security, etc.	Pollution	Values, ethics and action competence	Sustainable development
FET phase: Social and environmental responsibility	Causes and impact on development, mitigation and adaption	Unequal access	Environmental degradation and impact on health	Food security	Waste dumps	Community responsibility	Volunteerism
			Environmental health and disasters	Use of harmful substances in food production and inhumane farming	Personal statement that includes environmental responsibility		
					Social and environmental justice		

Source: DBE (2011a, 2011b).

behaviour, which in turn can inculcate sustainable practices. Whitehead (2022) argues similarly that education serves as a driver for change. He, however, pays more attention to principles such as values, a life-long process of individuals (including communities) learning to live a satisfying, productive and worthwhile life for themselves and others. Although Life Skills education through LO fits into all these two descriptions, the challenge lies in finding an appropriate way that contributes to fostering the ideals of an environmentally literate and sustainable citizenry in learners. This may not be an easy or simple task. The challenge, according to Reddy (2011), is for teachers to (re)contextualised policy discourses into pedagogical actions. It is important to address the concern raised by Ruthanam, Reddy and Pillay (2021) and Nsubuga (2011) regarding the need to support teachers in integrating environmental concerns into their lessons. By considering embodied experiential place-based education as a possible solution, teachers can be empowered to bring about the necessary pedagogical change. Through embodied experiential place-based education, the boundaries between school and the surrounding environment can become more permeable when part of learners' school experience is directed towards local phenomenon (Smith 2007). I want to add that such an approach, at an operational implementation level, links with Cargas's (2020) view that the importance of real-world problems motivates and increases learning. My argument is that embodied experiential place-based education is suited to this requirement because it can encourage learners to evolve into agents of change who can help mitigate the impact of environmental concerns at the grassroots level. It is therefore worthwhile to reflect on embodied- and place-based education and thereafter indicate the intersection between these two approaches with experiential learning, at an educational level and how it can serve as an asset to narrow the knowing-doing (body-mind) gap for learners on issues that affect their well-being in the lived environment.

■ Embodied education

The term 'embodied', according to Wright and Monsour (2020), presumes that our body and its experiences present a way of knowing. Within the South African context, Le Grange (2004b, 2019) expanded the discussion on embodied education by applying it to social praxis and its relation to embodiment. For him, embodied education constitutes a contemporary pedagogical theory of learning that emphasises the use of the body in the educational practice and the teacher-learner interaction inside and outside the classroom (cf. 2004b). This argument is supported by Munro (2018), Hoffman (2021) and Schedul et al. (2022), who see the body as situated in the environment and, as such, interact with that environment daily. Notwithstanding the fact that these scholars pointed out the need for an

embodied pedagogy, it seems that they have not gone beyond a theoretical exploration of the notion of what counts as performative. However, if teacher-learner bodies are not passively located in the world, embodied educational experiences afford both the teacher and the learner the opportunity to examine their contributions towards addressing environmental concerns through bodily actions. Bodily actions, which links with Pineau's (2022) notion of the 'performing body', provide an indication of how curriculum instructional strategies and techniques can be developed to enable learners to be problem-solvers using critical and creative thinking inside and outside the four walls of the LO classroom. Flowing from this, my interest is to shift the angle of vision namely that embodied education practices to encourage an environmentally literate and sustainable citizenry are necessary for at least the following reasons:

- A departure from existing classroom-bound, textbook-centred practices towards adopting current education policy statements pedagogies
- Learners and teachers may enlarge their vision and become more aware of their interrelatedness and social responsibilities in their lived environments
- Avoiding the disconnecting of knowledge from lived experiences and context.

Given the aforementioned, I draw on the principle of embodiment and relate it to LO and argue that if learners can make embodied connections – at a multisensory level – with environmental concerns in their lived environment, they will be able to translate head knowledge into positive sustainable behavioural outcomes. In this way, it is possible that learners can become what Aliakbari and Faraji (2011) referred to as social critics of environmental concerns in their lived environments which affect their lives.

■ Place-based education

Ontong and Le Grange (2014) explain place-based education as follows:

Using place as a starting point will enable students to understand the localness of environmental problems, even those that transcend national boundaries, and that solutions to environmental problems often require local action. (p. 28)

Key to the aforementioned is that the remoteness of the environment is eliminated for learners because of their exposure to the place/environment that reproduces environmental problems. Furthermore, learning is situated within the everyday environment where learners can generate knowledge in an authentic setting. Life Orientation teachers can therefore use place-based learning as an essential basis to contextualise the often-abstract curriculum content regarding environmental concerns (see Table 5.1). In this way, teachers can create in learners a sense of agency around being part of the solution. Furthermore, attributes such as critical and creative

thinking and key characteristics of responsible citizenship (Kemp & Bolshaw 2020) can be encouraged through a lens of personal experiences.

■ **Intersections between embodied-, experiential- and place-based education**

If learning about environmental and sustainability issues involves emotional as well as cognitive processes (Scoffham 2020b), then education can be viewed as a holistic endeavour. For this reason, educating an environmentally literate and sustainable citizenry cannot be about filling learners with knowledge. It is about learners' constructing (rather than absorbing) ideas from their experience within the environment. Therefore, if the environment/place serves as the foundation of environmental consciousness (Scoffham 2020a), then the whole becomes visible in the educational process (see, e.g., Le Grange 2019). Thus, if embodied experiences are located within the interactions of place/environment, then both beg consideration in education to enhance a holistic environmentally literate and sustainable citizenry. The importance hereof is neatly captured in the words of Higgs and Smith (2015) namely that we use our senses and our experiences to interpret the world/place/environment we are connected to. I want to add that the local place/environment can be harnessed to draw on learners' lived experiences because it can provide them with an opportunity to express their values and skills. However, Smith (2007) raised an important point that learning activities which focus on a real-world problem be chosen carefully to ensure that learners come to perceive themselves as capable of identifying such a problem that would benefit their attention.

This brings me to a discussion on affordances for infusing embodied experiential place-based environmental and sustainable education in the formal LO curriculum.

■ **Affordances for infusing embodied experiential place-based environmental and sustainable education within life orientation**

The question that should be asked is: Why is the emphasis on a need for education and not learning? With reference to Le Grange (2007b, 2011), learning about environmental concerns can be seen as a lesson of hypocrisy because learners learn that it is enough to know them without having to do anything to address them. On the other hand, education always involves an element of risk (Biesta 2004; Le Grange 2004b). The centrality of risk in environmental and sustainable Life Skills education through LO is the embodying of KVS to realise the aims as outlined in CAPS. Prominent among the stated aims are phrases such as the 'guiding' role of LO teachers

in terms of encouraging learners to make informed and responsible decisions about their own health and well-being and the health and well-being of others and to 'expose' learners to their constitutional rights and responsibilities (DBE 2011a, 2011b). These aims challenge teachers to courageously step away from a teacher-centred approach and create a space for learners to think carefully about how to apply KVS to one's local context. Therefore, if KVS are essential in the pursuit of an environmentally literate and sustainable citizenry, pre-determined lesson outcomes cannot be seen as drivers to envisage change in learners. My argument is that KVS regarding grassroots environmental concerns are developed through a process of interaction with others. Drawing on the work of Wright and Monsour (2020), it becomes clear that if education for sustainable development (ESD) blends cognitive thinking (knowledge) and effective learning (personal feelings and empathy), then it is possible for learners to use their knowledge as a basis for values and skills development. It is worth emphasising that such learning supports Magano's (2011) view of meaningful Life Skills education which makes a strong case that learning is evident when learners are responding to real-life challenges by the application of what they have been taught.

Mortari's (2003) suggestion that such education is an indication of thoughtfulness suggests that the dislocation between education policy imaging of learners and the classroom can be narrowed. Thus, to strengthen ESD, it is important to contextualise environmental issues in the learner's lived environment to ensure interest and motivation. The significance thereof within the context of current education policy statements is crucial because of the emphasis on the 'localisation of learning', 'meaningful learning' as well as 'holistic education' (DBE 2011a, 2011b). Each of these dimensions is vital for quality Life Skills education and, therefore, demands a (re)envision of the quality (SDG 4) and relevance of teaching-learning practices regarding environmental concerns. Merely learning *about* (own emphasis) these issues in a trouble-free manner through prescribed learner textbooks becomes irrelevant. The reason is that textbooks divorce the learner from his or her lived environment (Swarts 2022). It can therefore be argued that the adolescent learner requires nothing less than a pedagogy that examines environmental concerns within their lived environments in a constructive manner. Such a pedagogy links with what Gruenewald (2003) refers to as a critical pedagogy of place that allows for a safe space to investigate environmental concerns. Learning in this way becomes more meaningful because the curriculum is put into practice by linking it to current real-world problems (Plevin 2016). Therefore, if policy statements emphasise the importance of the application of KVS in real life (DBE 2011a, 2011b), it seems reasonable to argue that strengthening learners' KVS regarding environmental concerns in a resourceful manner and embodied educational experiences is paramount.

In this way, learners may experience Life Skills education on environmental concerns in totality (i.e. body, mind and soul), which Graham, Berman and Bellert (2015) refer to as ‘teaching that matters and learning that lasts’. This links directly with LO pedagogical interventions. According to CAPS, such interventions ‘include opportunities to engage in the development and practice of a variety of life skills to solve problems, to make informed decisions and choices and take appropriate actions to live meaningfully and successfully in a rapidly changing society’ (DBE 2011a, 2011b). These actions are especially important in transforming knowledge into values and skills because the implementation ability from knowledge to action is a core competence for a responsible citizen (DBE 2011a, 2011b). It is here that embodied experiential place-based education plays an important role because it can effectively balance the cognitive-, affection- and conation domains of education regarding the environment and sustainability.

Given the fact that sustainability education embraces critical- and creative thinking as well as social opportunities for dialogue which together invite action towards change (Wright & Monsour 2020), the focus on environmental and sustainable issues should therefore be process-oriented and not product-orientated per se. The reason is that environmental outcomes are developed through a process of interaction with others in a specific environmental context. For this reason, LO teachers need to include approaches to learning that will help cultivate critical awareness and well-being. The development of these capacities will necessarily embody the whole learner (mind-body) when addressing environmental and sustainable issues in the lived environment.

■ **Embodied experiential place-based education: A solution-based action-orientated teaching-learning approach to navigate the prioritisation for an environmentally literate and sustainable citizenry**

Although the focus is on ‘problem-solving’ within education policy statements, I want to propose a solution-based action-orientated approach towards addressing environmental concerns at a grassroots level. The principal thought that prompted this is based on the following:

- *Learning*: Environmental concerns within the learner’s lived environment can be viewed as a suitable source to encourage the application of critical and creative thinking skills to address a particular environmental concern.
- *Teaching*: To reinvigorate learners’ desires to understand the place and environment around them and to prepare them to use their knowledge, it is suggested to link the LO classroom with the learners’ lived environment.

- *Assessment:* A meaningful developmental assessment strategy that encourages the application and integration of knowledge in an authentic way is important.

According to Schoffield (2017), one of the challenges within a solution-based action-orientated approach towards environmental concerns is to consider the learner's point of entry and confidence levels in problem-solving. This I suggest is one of the risk futures of environmental learning within the context of LO if teachers afford learners the opportunity to experience Life Skills education in a hands-on manner. This supports my previous comment that knowledge alone is insufficient to address environmental concerns; learners need to apply and integrate their knowledge for the expression of values and skills. One of the advantages of a solution-based approach, which supports the fifth objective of environmental education (UNESCO 1978), is the focus on engagement with and discussion of proposed solutions (Hoffman 2021). For example, a lesson on pollution and waste dumping can begin with an environmental award to the developer of a solution. This may intrigue learners to react with curiosity and encourage them to participate which can be considered as a source of agency. For LO, this is not a far-fetched idea because learners want to talk, participate, debate, express their feelings and share information (Magano 2011) which can significantly contribute to the development of an environmentally literate and sustainable citizenry.

■ How can grassroots environmental concerns be dealt with in life orientation environmental lessons to enhance education for sustainable development?

If Life Skills education entails much more than mere instruction and teaching (DBE 2011a, p. 25), then LO has a significant role to play in both educating for change and activating responsible citizenship in learners. The voices of children are important and can be powerful. This is possible if teachers create a space for learners to raise their voices around environmental concerns in their lived environment on which they have prior knowledge. Drawing on the work of Latz (2017), 'creating space' for a voice rather than 'giving a voice' is only possible through active engagement where the narratives of participants come through loud and clear. This highlights the importance of recognising the social context of learning. Fraser (2006) is of the opinion that learning is influenced by social interaction, interpersonal relationships and communication with others. I, therefore, argue that learners' physical (bodily) involvement with investigating environmental concerns in the lived environment (where they collectively construct knowledge), which can be transferred to the LO classroom, supports the

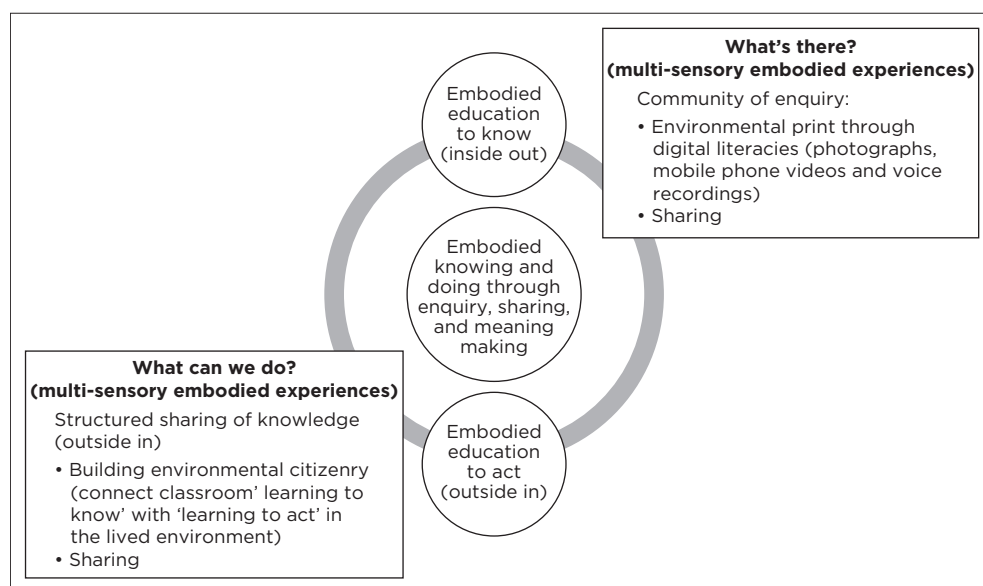
anchor idea of holistic development within the framework of sustainability (O’Sullivan & Sakr 2022) and current South African education policy statements. Thus, teaching for an environmentally literate and sustainable citizenry (see Table 5.1) will require LO teachers to create a pedagogical space in which learners can intellectually and emotionally be engaged in developing deep and meaningful understandings regarding grassroots environmental concerns. In this way, LO teachers are not the knowing agents alone, they become what Weldemariam (2022) refers to as ‘become-with and learn with their learners’. Considering this, the holistic approach (see Figure 5.1) can be seen as an initiative rather than a panacea to re-awaken an environmentally literate and sustainable citizenry using a variety of social constructivist strategies outside and inside the LO classroom. Although the focus is on unleashing learners’ problem-solving skills, and critical and creative thinking potential through indigenising the LO curriculum with a grassroots environment and sustainable education experiences, this framework also demonstrates that critical knowledge is an important component which can govern learner behaviour. Interestingly, Jickling et al. (2006) argue that ‘when learners ask ethical questions on environmental issues, they acquire knowledge that will enable them to participate as active and informed citizens’ at a local level as depicted in Figure 5.1.

Figure 5.1 shows that LO teachers need to steer clear of indoctrination, to provide learners with opportunities to engage with the environment, to form their values and to build their skills. Through this open-ended approach, LO teachers can join their learners on a journey towards environmentally literate and sustainable citizenry. The aim of these pedagogical interventions, which is grounded in learners’ imaginations, experiences, creativity and expressive potential and perspectives on environmental issues in their lived environment, coincided with Scharmer’s (2019) idea of turning the inside out⁹ and the outside in.¹⁰

Within the first educational phase – what’s there? (inside out phase) – learners together with the LO teacher will have a direct multi-sensory, fully contextualised and actual experience of a specific environmental concern within the lived environment. Immersing themselves in the lived environment (physically, emotionally and socially) makes the abstract of such an environmental concern concrete. This embraces Ellis, Cupido and Samuels’ (2021) opinion that walking is a form of embodied knowing. Freire (2000) importantly points out that through ‘reading the world’, while walking,

9. ‘Inside out’ means that learners leave the LO classroom and engage with environmental concerns in their lived environment. The lived environment becomes the classroom.

10. ‘Outside in’ means that the environmental concerns in learners’ lived environment are brought back into the LO classroom where they can be at the centre of joint or participatory enquiry.



Source: Author (2024).

FIGURE 5.1: Elevating voices and actions regarding environmental and sustainable issues through multiple embodied experiential place-based enquiry.

learners can see their lived environment anew. Learners learn how to open their eyes, minds and hearts to what is really going on. This can be viewed as empowerment education which involved learners in group efforts to identify concerns, to critically assess the root causes thereof and to develop strategies to address them (Latz 2017). Experiencing the environment in an active manner becomes useful and relevant because it involves skills such as observing and recording environmental concerns, collecting, analysing, seeking patterns, interpreting and communicating with others. This embodied knowing through environmental print (videos, photographs, drawings, etc.) can then be brought to the LO classroom.

During the second educational phase – what can we do? (outside in phase) – the LO classroom becomes a space for meaningful learning through constructive, engaged conversations that are embedded in environmental prints from the lived environment. Embracing techniques such as pointing out what are the concerns and why do they exist? and making suggestions (appropriate responses or reactions) can be valuable. Life orientation teachers can utilise chalkboards or whiteboards to further engage learners with the new environmental content. Through summaries, the highlighting of keywords, making connections, drawings and so forth, the chalkboard or whiteboard becomes an audio-visual aid. Through all these methods, talk, which Burke (2019) sees as an essential part of children's learning, can help to create a community of enquiry regarding

environmental concerns in the LO classroom. Not only do these activities bring learner bodies ‘in conversation’ with their lived environments, but the learners are also able to scaffold their own understanding of environmental concerns through critical and creative thinking. This can be followed up with an activity such as a letter to ward councillors or community leaders, to sensitise them to the well-being impact of environmental concerns on the local community.

These contextualised embodied educational experiences can ensure that the learners’ reality is neither muted nor removed, as is the case with static, often outdated, textbooks with pre-designed learner activities. This embodied action may encourage the becoming of enlightened citizens who want to participate in decisions concerning their society. Additional small collaborative projects or initiatives can be organised, such as greening campaigns in and around the school premises, joining established community volunteering projects, starting vegetable gardens and so forth. As more and more people become aware of how a clean environment can influence their standard of life (Waititu 2021), the incorporation of social media at the grassroots level can be used to create environmental awareness. Multi-media content through videos, photos and other formats can be disseminated to a bigger audience through photos, videos and other formats. Through all these suggested activities, it is possible that learners can be embodied with environmental and sustainable KVS that can enhance their responsibility through ‘thought in action’ (Le Grange 2004a). In this way, learners can become what Wood (2021) refers to as ‘action learners’ and ‘action leaders’. It is important that learners learn these skills and clarify their own values as they identify issues and join their societies in appropriate activities and services. In this case, CAPS (the curriculum-as-plan) could potentially have a transformative effect on learners when it is supported by the notion of the curriculum-as-lived (CAPS in use). The latter – which can be considered as attuned to learners – has the potential to systematically free the LO classroom space from outdated prescribed textbooks as a nonhuman representation of environmental and sustainable issues in the learners’ live environments.

■ Assessing for an environmentally literate and sustainable citizenry

Schudel et al. (2022) cautioned that assessing environmental-related learning experiences can be complex because of its open-endedness. Although I am in agreement with these scholars, my argument would be that LO teachers integrate formative assessment practices both inside out and outside in learning experiences in order to consider how such experiences enable (or not) the educational goals. Higher-order level

TABLE 5.2: Assessing learner contributions regarding a specific inside out and outside in environmental concern.

Learner name	Making relevant observations	Ability to raise important questions about grassroots environmental concerns	Interpreting situated environmental concerns	Awareness and the ability to articulate and find 'joint solutions'

Source: Author (2024).

cognitive questions can be considered a meaningful way to assess learners' thinking on environmental concerns and possible sustainable solutions within the lived environment (see Table 5.2). As a teacher makes observations, they can assess their learners' progress by answering the following questions:

1. Did learners grasp the concept of environmental concerns within the lived environment?
2. Did learners go beyond what you as the teacher had hoped for with this environmental activity?

■ Possible challenges for implementing place-based embodied education within life orientation to enhance education for sustainable development

Placed-based embodied education, for the purpose of this chapter, has much potential because it should occur in situ in grassroots environmental concerns and be inclusive. This orientation is important for LO learners so that they can take ownership of their education pertaining to environmental concerns within their lived environment. However, to do things in a new way that we have not thought of before may be challenging. Risk assessment and managing the inside out and outside in learning environments are important. For example, controversial environmental concerns that need political interventions and that are outside the scope of the LO curriculum should be avoided. Where learners' safety is at risk, teachers should embrace the significant opportunity that exists in technology-based learning. Technology (the use of cell phone videos) should be seen as a *shining light* (own emphasis) that can brighten up teaching-learning around grassroots environmental concerns.

Other challenges that may hamper the infusion of place-based embodied learning within LO centred around three broad concerns, namely (1) the compulsory nature of the subject which ends up in overcrowded classrooms (Swarts, Rens & De Sousa 2019), (2) teachers who are not pedagogically prepared to teach LO topics effectively (Swarts 2021; Swarts, Rens & De Sousa 2015) and (3) teachers perceptions and poor understanding of the concept 'environment' (Benjamin & Adu 2019; Ramsaroop & Van Rooyen 2013).

Despite the aforementioned challenges, it is important for teachers to realise that it is worth an attempt to infuse place-based embodied education with LO lessons to encourage an environmentally literate and sustainable citizenry. Current environmental calamities that learners face in their daily lived environments are a sign for LO teachers to work harder and make a difference. 'There are needs. The time is right. The potential exists. If not now, when? If not now, why?' (Deever 1996 cited in Le Grange 2002).

■ Conclusion

In this chapter, I clarify what is meant by embodied experiential place-based education and how it can be used as a pathway to encourage the importance of an environmentally literate and sustainable citizenry. The advantage of focusing on environmentally literate and sustainable citizenry in the LO curriculum is that teachers can support learners to reinvent themselves as agents of change within their lived environments. Therefore, if the aim of social and environmental responsibility is to help learners make responsible decisions about their environment, then LO teachers must be willing to tap into their own creative ideas and be prepared to think about how environmental concerns could be integrated in ways that will encourage sustainable citizenry. This, I argue, can be achieved through embodied experiential place-based embodied educational strategies because it has the potential to mobilise learners (including the teacher) into collective action to address a grassroots environmental concern in the lived environment.

I conclude by acknowledging that readers will derive their own understandings and responses from this chapter which can provoke further contributions towards an understanding and the implementation of an embodied experiential place-based educational approach within LO to address unsustainable practices within a participatory context.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-00287-24-S2) was obtained from the Research Ethics Committee of the Faculty of Education for no-risk or low-risk research carried out with human participants by the authors.

Project-based teaching, citizen science and education for sustainable development: A partnership for youth-centred teaching and learning¹¹

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■ Abstract

The benefits of the inclusion of project-based learning (PBL) regarding education for sustainable development (ESD) in educational institutions are gaining support. Not only does it allow for the incorporation of

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Muller, I 2018, 'A Citizen Science water quality monitoring project's contribution to environmental education, social learning and adaptive management', Doctoral degree (PhD) thesis in Water Studies at the North-West University, Potchefstroom campus, South Africa, with supervisor Professor J Tempelhoff, and co-supervisors, Professor M Grösser and Professor L de Sousa, available at https://dspace.nwu.ac.za/bitstream/handle/10394/31956/Muller_I.pdf?isAllowed=y&sequence=1.

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project-based teaching and learning among students, presenting them with a choice of and a voice on how to attempt real-world problems linked to ESD, but it also supports self-directed student-centred approaches to collaborate and appreciate the input of peers. Therefore, PBL is the go-to teaching strategy when knowledge is transferred to youth, as it provides guidance with boundaries but, at the same time, also the freedom to empower youth in action.

As a citizen science expert, I believe that the inclusion of citizen science activities in a subject, with a mix of PBL and ESD, can enhance teaching and learning to a great extent. In this chapter, the experience from a variety of project-based teaching and learning projects, with youth of different age groups – from teenagers to pre-service teachers – is shared to indicate the variance and range of inclusion of citizen science regarding ESD in PBL. The projects are discussed as case studies and indicate how the infusion of ESD and citizen science promotes teaching and learning regarding subject knowledge and real-life skills. The chapter, therefore, can serve to indicate the way forward in teaching and learning in an interdisciplinary way to meet 21st-century requirements. This chapter aims to present the why and how of PBL as a teaching and learning strategy by infusing ESD, promoting the teaching and learning of subject knowledge and nurturing real-life skills in teaching praxis to promote the youth as citizen scientists.

■ Introduction

We live in a world of complex problems that are highly resistant to easy solutions. Findings shared during the Conference of the Parties or COP 27 deliberation in Egypt in November 2022 indicated that sea levels are rising at double the rate since 1993, greenhouse gases trap heat and the average increase in temperature is 1.15°C higher than during the Industrial Revolution (Tempelhoff 2022). Climate change experts are of the opinion that the current generation will be the last to propose workable, active solutions to maintain a sustainable earth. An alternative approach to education, which is more focused interdisciplinarity and emphasizing critical thinking, is proposed to create resilient communities prepared to face climate change scenario (Masterson et al. 2019).

The Department of Basic Education (DBE) in South Africa initiated a review process of the school curriculum in 2017. A small research group, named E³, had the mandate to roll out a blueprint for a tested pedagogy to address youth education with the ability to manage unemployment and promote employability and education for a sustainable future. The E³ team

indicated that project-based learning (PBL), which is interdisciplinary, focuses on multiliteracies and makes learning fun, is the preferred choice. The DBE proposed that career pathing, which regards learner ability as unique, can be strengthened by PBL (Corporate Social Responsibility News 2022).

The Salesian Institute Youth Projects responded to the DBE proposal and indicated that a pedagogical approach that supports a range of competencies such as critical thinking, connecting and character will provide the youth with the skills needed to promote employment ability (Chawula 2020). Therefore, meeting the challenges of the 21st century and providing learners with the needed skills for the fifth industrial revolution require a combination of an interdisciplinary teaching strategy (PBL), linked to a tool to involve youth as co-researchers in communities (citizen science) and a guiding process regarding education for sustainable development (ESD).

This chapter aims to reach the following objectives:

- to explain PBL as a transformative, learner-centred teaching strategy with real-world application
- to indicate how citizen science supports PBL and aids with infusing ESD into the curriculum
- to indicate, via case studies, how PBL using citizen science enables ESD with real-world learning.

■ Project-based learning

In short, PBL is an interdisciplinary teaching method that actively engages learners in real-world learning in personally meaningful projects to answer complex questions. According to Bell (2010) and Genc (2014), learners engage in a series of PBL activities over a prolonged time to gain in-depth subject knowledge and skills such as critical thinking, collaboration, creativity and communication. The much-required sense of agency, or the ability to take responsibility for one's learning, is also promoted by PBL (Parker, Stjerne Thomsem & Berry 2022). As PBL is rigorous, learners will go beyond recalling or recognising knowledge and skills with real-world application, and they work independently while the teacher, as a facilitator, provides support (Tamim & Grant 2013). Efstratia (2014) explains that PBL is grounded in the experiential learning theory proposed by Kolb and Kolb (2005) following the cyclical process innate to action research. This cyclical process entails the identification of a problem, determining how to address the problem, acting and reflecting on the outcomes and disseminating knowledge to others (Efstratia 2014).

■ Steps in project-based learning

The Buck Institute for Education indicates that the implementation of PBL in a classroom requires seven elements. These elements are as follows: (1) a challenging problem or question to be solved; (2) a sustained enquiry to gain information and do research; (3) authenticity to view each challenge or problem in a unique context; (4) student choice and voice regarding the chosen strategy to address the challenge or solve the problem; (5) reflection on the solution to answer the challenge or the prototype built to solve the problem; (6) critique from peers and experts on the solution or prototype; and (7) revision of the solution or prototype (English & Kitsantas 2013; Stefanou et al. 2013).

■ Benefits of project-based learning

The benefits of PBL for learners are numerous and provide more reasons why we should include it as a teaching strategy in classrooms. For example, PBL presents opportunities for (1) deeper learning in a unique social context; (2) the development of skills for a career; (3) learners to engage with one another, as well as the subject content, to present their choice and voice; (4) feedback and reflection regarding a challenge; (5) learner engagement and, therefore, promoting a positive attitude towards education; (6) making connections across content areas (interdisciplinary) in a real-world context; (7) relevant and authentic experiences to engage in learning; and (8) long-term retention of subject knowledge that promotes deeper engagement with content (Bramwell-Lalor et al. 2020; Tamim & Grant 2013).

■ Challenges when implementing project-based learning

However, PBL also presents challenges for teachers who must loosen their grip on subject content and facilitate learners to do research. While PBL initially is time-consuming, once the benefits for both learners and teachers are revealed, it will be easier to implement. The main concern is not to force the connection of topics to PBL but to allow for the free flow of ideas to generate knowledge to be explored further (Aitken 2019).

Making artefacts allows for the use of unique assessment tools in PBL. A checklist can be used when the artefact is planned, and a rubric focused on skills when planning or building the artefact or one focused on the skills obtained during different steps in the PBL process can aid with the evaluation of the project for success (Trauth-Nare & Buck 2011).

Saavedra and Opfer (2012) point out that the development of assessment tools for specific purposes, such as the evaluation of the product or artefact, requires a skilled facilitator. Another challenge when PBL is implemented in classrooms can be a lack of resources to aid in the PBL process or to develop artefacts.

■ Suggestions for smooth implementation of project-based learning in classrooms

Various methods can be used to address the previously mentioned challenges. Teachers can promote PBL in classrooms by allowing small, incremental changes in their classroom praxis in a set of activities. A flipped-classroom approach, where the teacher views activities from the learners' point of view, can support the creation of activities. A workshop is a good strategy to present skills such as research, summarising, problem-solving, collaborating and citizen science to learners (Saavedra & Opfer 2012). External facilitators who are experts in various fields can promote PBL practice in classrooms. Project ideas can be generated by analysing the curriculum for topics that address real-world problems, probing a design challenge, exploring an abstract question or proposing an investigation to learners. As PBL is a learner-centred approach, it requires teachers to allow learners to take the lead in investigating a challenging problem (Aitken 2019).

The 'Citizen science' section discusses a tool that promotes the engagement of learners in their local community regarding ESD.

■ Citizen science

Citizen science, as a tool, allows youth participants to co-create projects and engage in the collection and interpretation of scientific data about a communal topic of their concern (Masterson et al. 2019). The process of collecting and interpreting the scientific relevant data allows for transformative learning when participants gain insight into and skills in the topic they engage with. The engagement can spark interest to motivate participants to advocate for the topic they are investigating, which is regarding ESD that is of relevance to promote sustainability goals regarding our natural environment (Ruiz-Mallén et al. 2016). Participation in citizen science projects allows youth to foster accountability, trust and transparency; is often low in cost; and assists in providing effective solutions to real-life challenges. Opportunities to collect scientific data emerge from real-life interaction between participants and the topic of study, as well as collaboration among the participants (Grauer 2012).

In my opinion, citizen science promotes ESD because it allows learners to collect data regarding a topic of interest or that is problematic to a community and then links it to ESD. In the 'Education for sustainable development' section, the concept of ESD is explained.

■ Education for sustainable development

According to Barth and Rieckmann (2016), ESD allows for learning in the context of socio-cultural factors and the inclusion of socio-political issues such as equity, poverty, democracy and quality of life. Furthermore, ESD empowers learners to take responsibility for and display integrity about the natural environment. Like PBL, ESD embraces a transformative learning approach by addressing subject content and outcomes with the inclusion of pedagogy and the learning environment while respecting cultural diversity (Bramwell-Lalor et al. 2020).

To indicate how to incorporate citizen science as a tool regarding ESD in the curriculum, Table 6.1 showcases topics from the *Curriculum and Assessment Policy Statement* or CAPS (DBE 2011) for Natural Science and Technology, Senior Phase, Grade 7. The table provides suggestions for citizen science tools to enable the collection of data from a local community, as well as how ESD is addressed by using citizen science data that can be collected. The type of implementation suggested in Table 6.1 can apply to younger and older age groups.

It is evident from the table that the South African curriculum for Grade 7 Natural Science and Technology contains relevant topics to accommodate the collection of data via citizen science and allow for the infusion of ESD to engage learners. The challenge is, however, to spark the interest of teachers to identify opportunities to do so and create suitable learner activities to promote skills regarding citizen science and ESD. To guide the incorporation of citizen science and ESD into the subject matter, I will share information about projects I attempted in the form of case studies. I used the proposed elements of the Buck Institute of Education for PBL implementation to discuss and interpret the information of each case study, as suggested in English and Kitsantas (2013) and Stefanou et al. (2013).

■ Examples of project-based learning via case studies regarding education for sustainable development and the incorporation of citizen science

The projects discussed in this section include a variety of ways to incorporate citizen science as a tool to support ESD in PBL in Natural and

TABLE 6.1: Example of topics in the Grade 7 Natural Science *Curriculum and Assessment Policy Statement* with suggestions of suitable citizen science tools and how education for sustainable development is addressed using citizen science data.

Topic	Citizen science tool	ESD regarding citizen science data
The properties of the material shopping bags are made of and their environmental impact	A checklist is provided to learners to indicate the number of plastic, paper and material shopping bags they count on their way home from school	Read about the natural degradation time needed for the different materials. Discuss mitigation measures in use in South Africa to limit plastic pollution. Propose examples of sustainable shopping bags. When learners indicate the use of recycled materials to make shopping bags, ESD will be promoted.
The properties of the material electric cells (batteries) are made of and their environmental impact	An observation table for a household with apparatus working with batteries and types of batteries	Look at the label on a cell and identify the materials indicated to be part of the cell. Read about the impact of the material electric cells (batteries) on the environment (soil and water) and propose mitigation measures regarding the disposal of cells. Education for sustainable development will be promoted when learners can suggest ways for the disposal of electric cells that lessen the impact on the natural environment, such as water and soil.
Waste management and the sorting of waste in communities	Indicate on a checklist your household waste (disposed of in a bag) for one day	Discuss the role of local communities, such as waste scavengers and the local municipality, in waste management. Propose guidelines to sort waste in a household – think of types of waste, the reuse of waste and limiting of waste. Education for sustainable development will be promoted if learners can dispose of classroom waste in three different containers – one for plastic, one for tins and one for paper.
The sorting of household waste and the making of compost	Use the checklist of household waste (previous topic) and estimate the amount of waste that can be used for composting	The teacher can bring along a typical example of household waste for a day, and the learners can weigh the different materials and confirm by a simple calculation the amount available for composting. Let learners read about how one makes compost – the use of peels, soil, leaves and so forth – and link it to the combination of layers. Make compost by letting learners contribute material and plant a tree. Provide trees on the school grounds with compost. Education for sustainable development will be promoted if the learners can bring vegetable peels to class and use a container, such as a 10-litre bucket with holes at the bottom and place it in a bigger plastic bucket and make compost. The compost can be used in the school garden.
The transfer of heat and the wonder box that keeps heat or cold	Use an observation checklist for learners to indicate which apparatus allows for heat transfer in their households. If possible, they can indicate the power (in Watt) on the label of the apparatus. Let them indicate the material in the apparatus that isolates or conducts heat.	Discuss ways of heat transfer. Link it to real life by indicating objects that are transparent or isolated or conduct heat. Read about a wonder box or apparatus that can keep heat or cold. Let learners design and build a cool box. Education for sustainable development will be promoted if the learners can build a cool box from recycled materials and determine the temperature of water cooled in the box.

Table 6.1 continues on the next page→

TABLE 6.1 (Continues...): Example of topics in the Grade 7 Natural Science *Curriculum and Assessment Policy Statement* with suggestions of suitable citizen science tools and how education for sustainable development is addressed using citizen science data.

Topic	Citizen science tool	ESD regarding citizen science data
The transfer of heat and the design of indigenous houses	Use a checklist where the learners indicate the number of rooms, number of windows and inside and outside doors of their homes. Let them indicate the type of material used to construct the walls and roof of their home.	During a class discussion, let the learners share their findings about heat transfer in their homes via doors and windows. In groups, give them a drawing or picture of different types of homes with mud walls, wooden structures, brick walls and different types of roofs, such as grass, tiles and corrugated iron sheets. Then, let them discuss the properties of the materials to deduce the transfer of heat. Allow them to plan and draw a labelled diagram to indicate the use of materials for a house that is best to adjust to seasonal changes. Let them motivate them to choose materials for different parts of their house. Education for sustainable development will be promoted when learners can, during a field trip in the vicinity of the school, identify aspects of houses in their community regarding materials that allow for the conduction of heat.
The use of elements in everyday life	Elements are best displayed in real life on the labels of a variety of household goods. Let learners collect a label from canned food or breakfast cereal, a bar of soap or an empty toothpaste tube. Let them identify the elements on the label and ask their parents or guardians at home what they know about these elements.	In class, the learners will share their information from the labels and indicate whether the adults were able to share information about the elements. They will then read more about the identified elements and their impact on the environment. For example, sodium, which is part of salt (sodium chloride) that is harvested from salt farms occurs naturally in dry areas with a lot of sunshine. Salt in soil degrades the soil quality and can progress soil erosion. Education for sustainable development will be promoted in class if learners are able to identify different elements on labels and discuss the elements and the impact of the elements on the natural environment.
The conserving of electrical energy in real life	Learners can ask their parents or guardians in which ways they conserve electrical energy. These statements can be written on several pieces of paper. The learners can also indicate their contribution to saving electrical energy on a piece of paper.	In class, the learners can post their parents' or guardians' proposals on a drawing of a big tree on a poster. The learners can sort the proposals to save electrical energy in groups of the same type, for example, switch off the geyser when it is not in use. Once all the proposals are posted, they can count the number in a group and display the data in a histogram. Education for sustainable development will be promoted if the learners can apply the suggestions in daily life, for example, switching off lights or geysers not in use.

Table 6.1 continues on the next page→

TABLE 6.1 (Continues...): Example of topics in the Grade 7 Natural Science *Curriculum and Assessment Policy Statement* with suggestions of suitable citizen science tools and how education for sustainable development is addressed using citizen science data.

Topic	Citizen science tool	ESD regarding citizen science data
Electrical energy for the future: renewable or non-renewable energy?	Use a checklist and count the number of houses in your street with and without solar panels	In class, learners can share the number of houses with and without solar panels to get a total for the class. They can then determine the percentage of houses that have solar panels as an indication of how their community uses renewable energy. Then they can read about solar energy and the needed apparatus to set up a solar system related to the input, process and output of energy systems. Education for sustainable development will be promoted when the learners can indicate, in a class discussion, the benefits of renewable energy sources.
Ways to less wasted energy	Use an observation table and indicate the electrical apparatus and duration of use in the learners' household in a day. Check the apparatus for a power indication (watt) and include it in the observation table.	In the class, the teacher can indicate to the learners how to determine the amount of electrical energy used and the cost of the use. Electrical energy is sold in kWh = $1 \text{ kW} \times 1 \text{ h} = 1000 \text{ W} \times 1 \text{ h} = 1000 \text{ J/s} \times 3600 \text{ s} = 3,6 \times 10^6 \text{ J}$. The cost per kWh can be found on an electricity bill or prepaid electricity slip. The amount of kWh $\times$ cost per kWh $\times$ time of use (in a fraction of or hours) can be used to determine the total cost. Energy efficiency can be determined by the output or input $\times 100\%$; tables with energy efficiency information will also be available on the Internet.
	Check for a label on a refrigerator for an energy efficiency rating	Education for sustainable development will be promoted when learners are aware of the cost of electrical energy and energy efficiency as a concept.

Source: DBE (2011)

Physical Science education. I believe that although the shared information refers to my field of teaching and learning, this type of project can be utilised in any subject; thus, the topics are interdisciplinary. The age groups included in the projects run from children of about 12 years to young adults and pre-service teachers.

■ The Do One Thing project

The Do One Thing (DOT) project is a global project to challenge participants to propose one action they can carry out to mitigate the impact of climate change in their communities. Working together in a global climate change education initiative with countries such as the United States of America (USA), Finland, the Philippines and South Africa, a group of teachers and teenage learners (age 12–14) engaged in the DOT project (Malherbe 2020).

□ Challenging problem

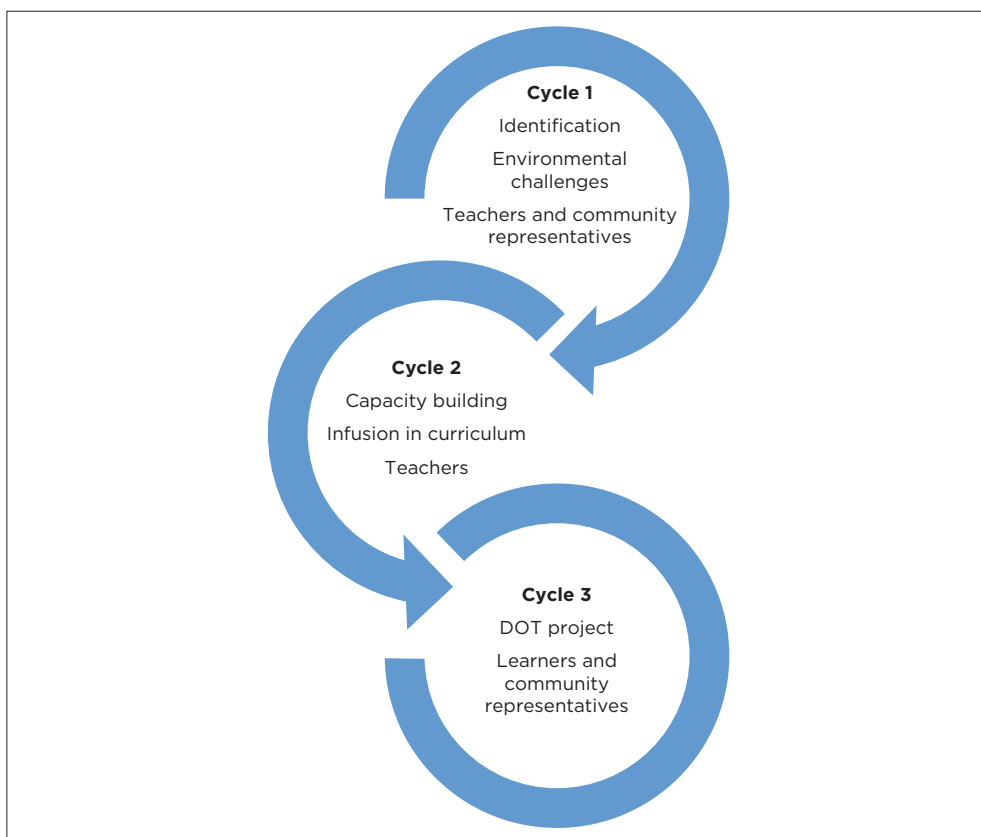
How can Grade 7 teachers use the DOT strategy to raise awareness of and encourage action to mitigate climate change among teenagers?

□ Enquiry to gain information

The DOT project relied on bottom-up, three-cycled participatory action research (PAR) to promote social learning and change in local communities (Fals-Borda 2006). During Cycle 1, teachers and community representatives, such as parents, identified environmental challenges in their local community. In Cycle 2, teachers were trained during a workshop to infuse ESD regarding climate change into the curriculum. It must be noted that teachers of a variety of subjects, including Social Science, Life Skills and Natural Science and Technology, participated in infusing ESD into the subject matter. In Cycle 3, the learners and adults known to them (parents, guardians or elders) presented their proposed action to mitigate climate change as a statement on a paper leaf. These leaves were posted on a poster tree at school by the learner participants to indicate action to be taken. Figure 6.1 shows the cycles of the climate change DOT project.

□ Unique context

In 2018, teachers of three primary schools in South Africa, one school situated in the Gauteng and two in the North West provinces, were trained to include ESD in a variety of subjects (i.e. an interdisciplinary approach) in the Grade 7 school curriculum. The same approach was followed in countries such as the USA, the Philippines and Finland as a global climate change education initiative.



Source: Muller and Wood (2021).

FIGURE 6.1: The cycles of the Do One Thing project.

□ Learner voice and choice

The learners asked family members or other adults in their community to indicate one thing they could or would do to lessen the impact of climate change. The information provided by the adults was written on a piece of paper or a paper leaf. The learners also indicated one thing they could do to lessen the impact of climate change on a paper leaf. The suggestions of the adult and learner participants were posted on a drawing of a tree at school.

□ Reflection

Once the leaves were posted on the tree, the learners discussed the findings and indicated which of the suggestions they agreed with. The learners of South Africa also engaged with peers in the USA via a Skype meeting (Muller & Wood 2021).

□ Critique – the Do One Thing tree as an artefact

The South African learners interacted with a group of peers in Louisville, Kentucky, in the USA. The learner participants were excited when they realised that the youth of a first-world country experienced the same challenges and proposed the same solutions to address the impact of climate change. These young participants agreed that, as global citizens, they must address these challenges together. I acknowledge that the lack of continued engagement with the teachers, once the project ended, could result in teaching and learning from a theoretical perspective, with the lack of the inclusion of citizen science data collection and ESD.

□ Revision – solution

As a facilitator in the DOT project, I analysed the responses on the leaves by both the learners and the adult participants. Thematic coding revealed that there was an increased awareness of the impact of climate change among all the participants. Both the learners and the adult participants indicated that climate change was a result of human action, and indicators of climate change, such as ozone depletion, air pollution and the loss of natural life, were mentioned (see Muller & Wood 2021). The learners linked their knowledge of climate change to the subject knowledge they had learnt in the classroom and, therefore, had a scientific approach in their responses on the DOT leaves. The reuse and recycling of materials, planting of trees, responsible use of natural resources such as water and walking more instead of using transport were mentioned. The adult participants displayed a personal connection and lived experience by referring to litter and the use of wood as fuel (see Otto & Pensini 2017). The challenges of poverty and using what one must to survive were mentioned as possible reasons for excessive littering. The DOT project improved the ability of the learners and adults to communicate about climate change, and the writing and posting of leaves on the DOT tree can be regarded as reflective practice (see Trott 2019). Informal environmental education, such as the DOT project, has a more direct impact on environmental awareness to promote behavioural change (Corner et al. 2015; Grosseck, Tiru & Bran 2019).

The youth indicated an increased commitment to adopting environmentally friendly behaviour to mitigate littering, reduce pollution and save natural resources in a local context (see Zanolocco et al. 2019). The citizen science activity, where learners collected statements on paper leaves from themselves and adults known to them, provided a tool for the learners to have an improved ability to communicate information about climate change (see Grund & Brock 2020). Therefore, ESD was promoted in the DOT project by incorporating citizen science as a data collection tool. The use of a tree – on

a poster or drawn on a black or whiteboard – enabled the learners and adult participants to indicate their voice and choice regarding a topic and is a powerful way to promote communication about a topic. The use of stick-it notes in classrooms to indicate unique responses of a group of learners or students on a specific topic can be promoted. Requesting learners or students to group the notes with the same intent allowed for further discussion on a topic (see Muller & Wood 2021).

In the next case study, the use of photographs to promote teaching and learning is discussed.

■ The Ripple Effect project

The Ripple Effect project was a global project in 2021 that required participants to indicate the role of water in their lives by taking and describing photographs.

□ Challenging problem

The aim of the study was to determine whether photovoice, as a participatory action research methodology, could enhance citizen science and place-based education in ESD with fourth-year pre-service Bachelor of Education teachers in Natural Science and Technology, Intermediate Phase.

□ Enquiry to gain information

Photovoice is a sound research method to gain information, as it is regarded as a research technique, a teaching-learning tool and an assessment method (Haffejee 2021). The fourth-year pre-service teachers who participated in the project were empowered by cooperating to collect data (photographs) and co-create knowledge by interpreting the role of water in their lives during collaborative discussions. Applying photovoice as a research method allows for participants to collaborate to follow these steps: (1) identify a problem of communal concern; (2) decide on photographs to be collected or taken; (3) take the photographs; and (4) follow the SHOWeD method to allow for discussion about and interpretation of the photographs (Tanhan et al. 2021).

The global coronavirus disease (COVID-19) pandemic caused the Ripple Effect project to be executed online. The written invitation of the project to pre-service teachers read as follows:

- Capture or include at least five images of what water means to you by taking pictures with your cell phone or accessing your photo albums.
- Save the images on a small scale via JPG files on your phone or computer.

- Indicate where and when the images were taken, for example, 47 Mswati Street, Sebokeng, Vanderbijlpark, 27 April 2021.
- Write a paragraph of 100 words on how taking and observing water-related images raise awareness of water as a valuable natural resource.

I believe that photovoice can be used as a teaching-learning tool in all subjects. Young participants are skilled in technology, and the use of photographs, which can be taken with any cell phone, ignites participation in projects (Sutton-Brown 2014).

In the 'Unique context' section, I indicate why the role of water is relevant to the pre-service teachers who participated in the project.

□ Unique context

The campus of the higher education institution where the project was executed is next to the Vaal River in South Africa. Consequently, the participating pre-service teachers live and work in a community with direct access to the river. The Vaal River supplies water to 16 million people in the Gauteng province. The quality of water in the river is declining because of wastewater spills by mines and industries, a lack of wastewater treatment and the poor management of the water distribution system (Janse van Rensburg 2021).

□ Student voice and choice

The pre-service teachers had freedom of choice regarding the photographs they chose to display and explain the role of water in their lives. They were allowed to use cell phones to take photographs, but they could also use archived photographs from their families' photograph collections.

□ Reflection

The SHOWeD method was used by the pre-service teachers to analyse and interpret the photographs. The reflective questions that guide the SHOWeD technique are as follows: (1) What do you *see*? (2) What is *happening*? (3) How does this relate to *our* lives? (4) *Why* does this situation, concern or strength exist? (5) What can we *do* about it? (Wang 1999).

□ Critique - photographs as artefacts

The photographs chosen by the pre-service teachers displayed the unique reality and interpretation of water as a natural resource to them. The diversity of photographs per participant supports the empowerment theory of Freire (1993), which indicates that the participants were active in and responsible for their learning by creating a unique display of

photographs and interpretations. (I acknowledge that the diversity of photographs and interpretation can be problematic if one is not skilled in visual and thematic coding and analysis.)

□ Revision to solve the challenge

Thematic analysis of the pre-service teachers' interpretation of the SHOWeD technique revealed an increased environmental awareness. The pre-service teachers intentionally created knowledge by choosing photographs and interpreting them (see Freire 1993). They displayed awareness of water as a scarce natural resource, which needs to be used with care and preserved. Furthermore, the thematic analysis of the pre-service teachers' interpretation of the SHOWeD technique regarding their photographs and discussion revealed that they could be regarded as citizen scientists. They were able to concentrate their efforts on the role of water in their lives and indicated increased environmental awareness. In addition, they indicated that they had an eco-centric attitude towards the water by displaying an awareness of water as a needed and scarce natural resource, worthy of human protection (see Ham, Mrcela & Horvat 2016). A second finding indicated that the pre-service teachers acknowledged place-based education by indicating learning in a dynamic and ever-changing context. The storage of water in tanks, the supply of water to schools by means of taps and learners drinking water on school grounds confirmed in their teaching. The pre-service teachers confirmed their social relations and sense of identity by referring to 'communities like where I am from where water pollution and sewage disposal issues have taken over' and 'after taking and observing these images I have realised as a community we must make wise water choices'.

Brandl, Alvarado and Peltomaa (2019) reason that place-based education supports the protection and maintenance of the natural environment to improve the quality of human life, therefore an anthropocentric attitude and disposition, as well as an understanding of environmental issues and ESD. A third theme that arose from the pre-service teacher responses is the advancement of individual affective learning by the sharing of emotions. The pre-service teachers indicated joy when they saw children playing in the water or viewed water in a natural setting but were filled with disgust when they witnessed the pollution and waste of water. This finding agrees with the psychological process of place-based education, which can be both emotional and cognitive (Adams, Savahl & Fattore 2017). The pre-service teachers had opportunities to interact via the project in a context like those they intended to teach. They displayed negative emotions and concern about poor water management, a collective attitude towards water and persistence and resilience to acknowledge living under the

mentioned conditions. The final finding was that the pre-service teachers displayed the ability to identify challenging scenarios regarding water and could propose mitigation measures to meet these challenges. Consequently, they demonstrated their ability to transform words into action through the process of taking photographs, reflecting on their narratives and discussing the photographs as a form of action (see Freire 1993).

I regard the photovoice project as exposing the vulnerabilities and inequalities concerning access to clean water in the communities represented by the participating pre-service teachers. Facing reality was not necessarily a comfortable experience, but it allowed for learning in a real-world setting and increased ESD and critical thinking in a complex scenario (see Jordaan & Pieterse 2021).

■ **A citizen science water quality monitoring project: Contribution to education for sustainable development**

Water quality monitoring in communities is becoming eminent in South Africa because of the lack of sound water management by municipalities and the increased demand for access to clean water because of climate change. The Physical Science Further Education and Training Phase CAPS includes water quality monitoring in the Grade 10 curriculum (DBE 2011). As a lecturer on a university campus adjacent to the second biggest river in our country, I saw the opportunity to engage pre-service teachers in water quality monitoring in a series of citizen science activities to monitor the water quality of campus dams and the river and then perform practical work at schools with Grade 10 Physical Science learners.

□ **Challenging problem**

How can a citizen science water quality monitoring project, involving Physical Science pre-service teachers and Grade 10 Physical Science learners, contribute to environmental education, social learning and adaptive management?

□ **Enquiry to gain information**

The research was initiated from a transdisciplinary perspective in three phases, namely (1) identifying and framing the problem of water quality, (2) performing the actual research and (3) bringing the results to fruition, as proposed by Hadorn et al. (2008) and Lang et al. (2012). The participatory action learning and action research set off the relationship loop when pre-service teachers visited Rand Water – the local water

system managers – to learn about water quality. The pre-service teachers indicated an interest in the water quality of communities and attended a workshop about monitoring water quality with a Somerset water quality test kit. The locally produced test kit is the size of a canned fruit bottle and includes apparatus to test indicators of water quality, such as temperature, pH, oxygen dissolved, bio-oxygen dissolved, turbidity, hardness, the concentration of chlorine and nitrate, as well as *E coli* levels (Somerset Educational 2015).

□ Unique context

The campus of 117.7 hectares mentioned in the research project has four water storage dams and a three-kilometre waterfront to a river. The dams have inlets and outflows and are filled with water from the river, rain and precipitation. The campus is earmarked to be a green campus because of its situatedness on the edge of a town and is a nature reserve where springbuck and geese share the campus grounds with students and staff (North-West University 2010). I submit that the natural environment promotes ESD, and the campus can be regarded as a suitable training ground to show pre-service teachers that classrooms do not necessarily have walls.

□ Student voice and choice

In the research loop, the pre-service teachers monitored the water quality indicators of the campus dams and the river once a month for 2 years. The pre-service teachers shared their gained knowledge and skills when they went for work-integrated learning at schools of their choice and did practical work with the provided Somerset test kit with Grade 10 Physical Science learners. To do so, these pre-service teachers were supplied with additional test kits to inform the local communities where they resided about water quality.

□ Reflection

The pre-service teachers reflected on their experience regarding the collection of water quality indicators after each monitoring experience. During these informal discussions on the banks of the river, we discussed the water quality of the river and the campus dams. These informal discussions were fruitful learning opportunities to get to know them outside the lecturing room and form personal relationships with them. They reflected on their experiences with the project at schools during their work-integrated learning by writing narratives about how they regarded learner interpretation and skills related to water quality (see Muller 2018).

❑ Critique – water quality data as artefact

Water quality data for different indicators – temperature, pH and dissolved oxygen, to mention only a few – are not easy to interpret. The pre-service teachers persisted with collecting data on the campus dams and the river over a two-year period. A project of this lengthy duration tested their resilience to commit as citizen scientists and raised their environmental awareness (see Bell 2010). The pre-service teachers presented their knowledge about water quality indicators at a local teaching and learning conference. They had freedom of choice regarding which indicator they wanted to discuss and how they summarised their findings in their presentation at the conference; they had a choice to display the collected data either as a narrative, in a table or via a graphical presentation. The academic audience accepted the presentation by the pre-service teachers with enthusiasm and praised them for their contribution to raising awareness of the water quality on the campus (see Muller 2018).

❑ Revision to solve the challenge

As the Physical Science lecturer of the pre-service teachers, I evaluated them during their work-integrated learning in classrooms at schools when they guided water quality tests with Grade 10 Physical Science learners. Not only were the pre-service teachers able to manage a classroom with about 40 learners who performed water quality tests on communal water samples but they also handled the classroom management and subject content as experts. Performing PBL in a real-life context, like a school or on campus, adds an additional element to contribute to the local communal knowledge base. The water quality project assisted in raising awareness of the condition of the water storage dams among the campus management, which resulted in the campus management erecting steel gabions to structure the road crossing to two of the dams and to minimise erosion of the dams. The water quality project will remain my Blue Flag project, as it confirmed the value of citizen science regarding ESD in a community such as the local campus (Muller 2018).

In the final case study, I reveal the unique use of storytelling as a citizen science tool in Physics teaching and learning.

■ Storytelling: A teaching tool to infuse indigenous, communal knowledge into pre-service teacher training

The project was approached from a social constructivist worldview to understand how indigenous, communal storytelling can aid with the

interpretation of topics in Physics, such as heat, sound, waves and light. The valuing of indigenous knowledge systems is promoted in the CAPS of South African school subjects (DBE 2011). Effective science education in the country depends on how well Western and indigenous knowledge systems can be integrated (Le Grange 2007). Indigenous knowledge is regarded as an alternative conceptualisation of subject knowledge and requires collateral learning, that is, the simultaneous accommodation of concepts from scientific and cultural views (Jegede 1995).

□ Challenging problem

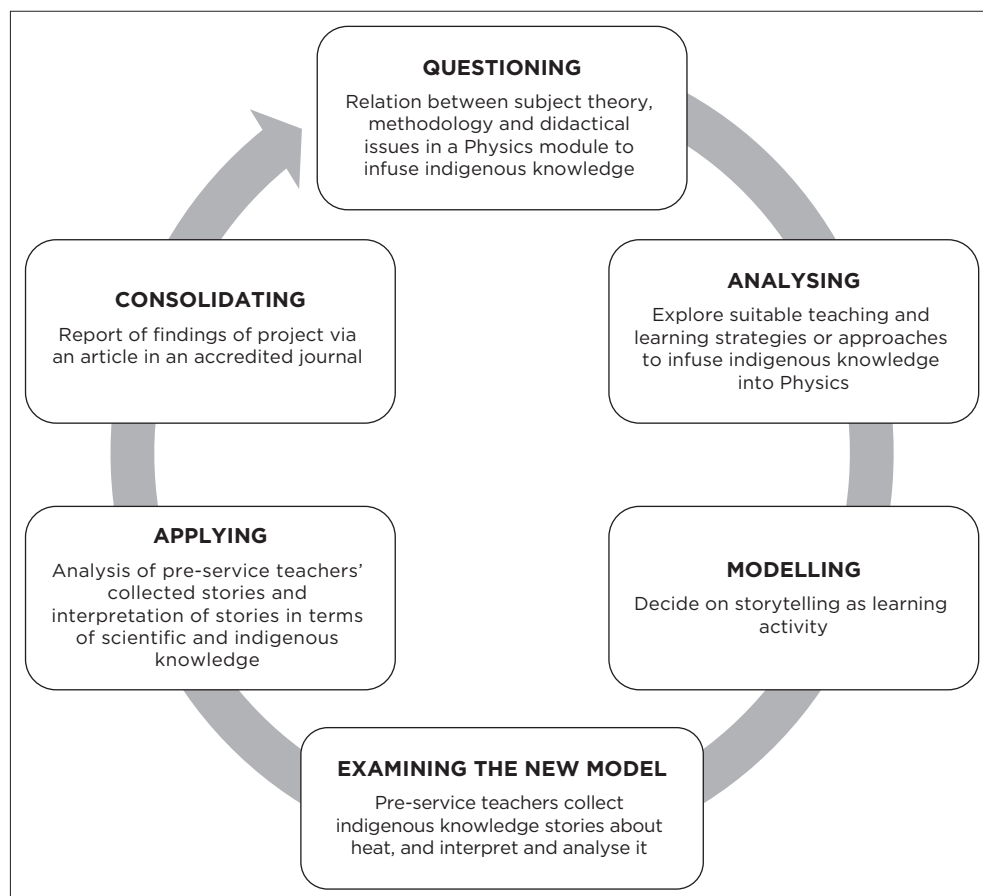
How can the collection of and reflection on indigenous knowledge stories allow for learning and the recognition of the value of communal knowledge in Physical Science?

□ Enquiry to gain information

The cultural-historical activity theory provides a theoretical framework to analyse how the individual pre-service teachers interpreted indigenous knowledge stories related to topics in Physics to the sharing of stories across different generations in their communities (see Engeström 1999). My interpretation of the steps of the cultural-historical activity theory framework to interpret storytelling as a teaching strategy employed in Physics is displayed in Figure 6.2.

□ Unique context

A participatory action research methodology was followed when fourth-year pre-service teachers, majoring in Physical Science in the Bachelor of Education (BEd) programme at a South African university, collected indigenous knowledge stories, related to the topics, from adults known to them in their local communities. The pre-service teachers audio-recorded the stories told by trusted adults in their communities or families and then wrote the stories as narratives. Then, they read back the stories to the adult storytellers to ensure validity. Thereafter, the pre-service teachers analysed the stories to determine the relevant scientific and indigenous knowledge understanding of the stories. The focus was not on the literacy level of the adult participants, but on improving the skills of the pre-service teachers to act as researchers in their communities by collecting stories and then analysing and interpreting these in terms of valid indigenous and scientific knowledge. This collection of indigenous stories was regarded as a citizen science activity.



Source: Adapted from Engeström (1999).

FIGURE 6.2: Steps to direct teaching and learning activities in indigenous knowledge in a Physics project.

□ Student voice and choice

The existence of indigenous knowledge in subjects requires us to accept an eco-cultural paradigm as a pedagogical paradigm. An eco-cultural paradigm acknowledges the growth and development of individual knowledge dependent on the socio-cultural environment in which the pre-service teachers live and operate, as suggested by Khupe (2014). The pre-service teachers had freedom of choice regarding the variety of topics (heat, waves, light or sound), the adult they requested to tell a story, the structure of the narrative and the interpretation of the narrative.

□ Reflection

The reflexive practice of the pre-service teachers consisted of writing the story told them as a narrative, reading the narrative back to the adult to ensure validity and the analysis of the narrative to indicate indigenous and scientific knowledge.

□ Critique of the story narrative

As the lecturer, I evaluated the analysis and interpretation of the written narratives. An inductive, thematic analysis was carried out of the pre-service teachers' answers to the following open-ended questions: (1) analyse the story and identify and explain concepts linked to scientific knowledge in Physics; (2) analyse the story and identify and explain concepts linked to indigenous knowledge in the story; (3) indicate how scientific and indigenous knowledge is linked in the story; and (4) indicate the value of your experience in the storytelling project. The evaluation aimed to determine whether the pre-service teachers were able to distinguish between indigenous and scientific knowledge, as well as to what extent storytelling aided their understanding of concepts related to Physics regarding heat, sound, waves and light. The project further aimed to guide the pre-service teachers to perform qualitative research and adhere to ethical conduct in research.

□ Revision to solve the challenge

Firstly, the pre-service teachers indicated that storytelling revealed to them how their communities dealt with challenges and how they improvised for an alternative future (see Prasetyo 2017). The latter finding supports ESD. The level of social interaction, according to the cultural-historical activity theory, demonstrates how the object – stories – allowed the community members to display their skills and experiences learnt by providing examples.

Secondly, storytelling allows for communal indigenous knowledge to be passed on from one generation to the next. Kurtz (2014) reasons that storytelling allows for the negotiation of knowledge transfer between different generations.

Thirdly, it was revealed that the pre-service teachers regarded storytelling that indicated communal experiences of natural phenomena as supporting scientific knowledge. For example, they acknowledged that the adults in their communities contributed to scientific knowledge by knowing when to put bread in an oven and how long the bread must bake without measuring

apparatus such as thermometers and timers. The adults indicated the use of suitable materials to design and build homes that are cool in summer and warm in winter, without explaining heat and ways of transferring heat.

Fourthly, the pre-service teachers indicated that collecting and interpreting the stories allowed them to learn about their culture and value the contribution to knowledge made by the adults in their communities. They indicated that the storytelling project revealed their identity to them and ignited their pride in their unique heritage. Moreover, they acknowledged that the storytelling project motivated them to solve problems and learn for a purpose; in other words, ESD took place. They also displayed the ability to differentiate between scientific and indigenous knowledge, in other words, collateral learning, which is regarded as a higher-order learning skill, according to Jegede (1995). The work of Amlani, Bertels and Hadler (2016) allowed me to conclude that the dominant stories in the project confirmed how communities act in times of challenges to rebuild resilience – again confirmation of ESD. Stories related to heat were most prominent, and a hands-on approach to facing challenges – making work with what one has – was evident. The storytelling project revealed that communities act responsibly and creatively and that knowledge is transferable from one generation to the next. The medium of storytelling allows for opportunities to share beliefs, hopes and concerns; it is, therefore, a safe space where all contributions are regarded as valuable.

■ Summary of the projects

Comparing the project examples in the chapter allows for an overview to indicate the intent of each project, as well as the challenges, advantages and strengths revealed during the implementation of these projects. Table 6.2 was created to summarise the intent, challenges, advantages and strengths of the different projects.

The comparative summary of the projects discussed reveals that project-based teaching, data collection strategies via citizen science and ESD proved to provide a sound partnership for youth-centred teaching and learning. At the foundation of PBL is the aim to engage participants to gain skills (Bell 2010). In all the projects mentioned, the aim was to provide pre-service teachers with opportunities to see the potential of valuable data that can be collected in their unique contexts, in other words, the enhancement of citizen science. The collection of data, as citizen scientists, allowed for the interpretation of the data, which contributes to skills such as the ability to interpret and communicate (Genc 2014). Communication uses words or statements (DOT project), methods such as SHOWeD to interpret photographs (Ripple Effect project), the representation of water

TABLE 6.2: A summary of project intent, challenges, advantages and strengths.

Name of project	Intent of project	Challenges of project implementation	Advantages of project	Strengths of the project revealed
Do One Thing	To raise awareness of community members, teachers and learners about climate change; to promote the formulation of actions to be taken to lessen climate change	To train teachers to be able to link climate change to topics in the curriculum in multiple knowledge areas	To promote communication about climate change among teachers, learners and parents or responsible adults	Global project – the youth realised that on different continents, we are facing the same challenges
Ripple Effect project	To raise awareness of pre-service teachers of water as a valuable natural resource	During the COVID-19 pandemic, all communication was online	To preserve water as a natural resource is important in diverse communities; the use of photographs of the participants' own choice allows for the unique context of the participants' real world to be communicated	The interpretation of the role of water in one's life is highly personal and often relates to experience, enjoyment and beliefs
Water quality monitoring	To empower pre-service teachers to be able to monitor and interpret water quality	The project duration was long (two years); maintaining participant motivation was a challenge	The use of the Somerset water quality test kit in the project backed the use of school classrooms as community laboratories	Water quality can be determined with simple apparatus, and local schools can serve as laboratories to promote communal health regarding water
Storytelling in Physics	To train pre-service teachers as collectors of indigenous knowledge stories, related to concepts in physical science; to allow for the training of research methodology within a module	To manage the duration of the project within in small time span; to communicate the project during the COVID-19 pandemic	The teaching strategy to use storytelling in a hard-core science subject area, such as Physics, was an authentic way to determine the ability of pre-service teachers to distinguish between scientific and indigenous knowledge	Stories are unique to culture, and each pre-service teacher displayed a personal experience during the project; the project allowed for the validation of heritage and culture in learning

quality monitoring information at a conference (water quality project) and stories (storytelling project). Higher learning competencies or skills were advanced when the participants had to make informed choices and decisions on the information they wanted to convey (see Aitken 2019). The topics used in the projects, namely climate change, water and water quality and concepts in Physics related to heat, sound, waves and light, all connected well with the aims of ESD, namely to educate to prepare for a

sustainable future, as stated by Barth and Rieckmann (2016). Raising pertinent awareness of the connection to ESD allowed for increased environmental awareness and prompted the participants to indicate specific actions that could be taken to ensure a sustainable future.

In the final part of the chapter, a strategy is revealed to incorporate PBL in the classroom.

■ The way forward to implement project-based learning by using citizen science to infuse education for sustainable development

As a teaching strategy, PBL is challenging. Adding citizen science as a data collection and analysing tool and linking it to ESD is like opening a Pandora’s box. While it is true that PBL is time-consuming and resource-demanding, as confirmed by the literature, I suggest that one initiates a project with this unique combination. If the problems related to the natural environment in local communities can be identified – that is, incorporating ESD – and one can think of a way or ways to collect data via citizen science about the problem, one can link it to a PBL activity. Small, incremental steps can support ESD and improve citizen scientist skills.

A variety of literature on strategies to implement PBL in teaching and learning is available (Bogar 2018; Laksana 2017). Trial and error with suggested strategies allowed me to formulate the sequential steps in planning PBL activities. Figure 6.3 presents my suggested six steps in PBL.

Wow moment	Brainstorm	Citizen science activity	Interpret the citizen science activity regarding ESD	Planning and creation of an artefact	Reflection
• Initiate the challenge with an activity that arouses curiosity • Learners identify the topic • Formulate the challenging problem or question	• Learners do research about the challenging problem or question • Ideas are presented in a mind map	• Learners collect data in their community about the challenging problem or question • Data collection tools: ◦ Checklist ◦ Observation table	• Learners discuss citizen science data • Present interpreted data graphically or as a narrative	• Learners plan and create an artefact • Artefacts • Photographs • Presentation • Model	• Artefacts and PBL process are evaluated • Use of rubrics, narratives and checklists

FIGURE 6.3: Six steps to implement project-based learning with citizen science regarding education for sustainable development.

The six steps are:

1. Start off with an introductory or engagement activity that will initiate curiosity and allow for the identification of the topic. Formulate a question that captures the essence of the project and is linked to real life or a problematic scenario to solve.
2. Let the learners brainstorm and indicate their ideas regarding the topic of the project by creating a mind map. Allow for reflection on their understanding by having an informal group discussion in class (Dagys 2017).
3. The citizen science activity allows learners to collect data in their community linked to the topic of the project. Provide the learners with a worksheet to guide them or allow them to indicate how they will collect the data. The data collection tool can be in the form of an observation table or checklist with relevant headings or photographs and stories, as indicated in the projects, to facilitate the process.
4. Allow the learners to reflect on the citizen science data collected by interpreting the data by using a graphical representation or a narrative or discussion linked to ESD.
5. Let the learners plan and create an artefact to indicate the collected data and the understanding of the solution to the question or communal problem. Artefacts can be a poster, a PowerPoint presentation, a prototype they will build or a model they will construct to display their interpretation or even a scientific experiment or a graphical representation (Laksana 2017).
6. Let the learners reflect on the PBL process and artefact they made by using a rubric or checklist as a guideline for the evaluation and allow a discussion of their final interpretation (Trauth-Nare & Buck 2011).

■ Conclusion

In this study, PBL allowed me, as a lecturer, to engage creatively with hard-core scientific knowledge. I enjoyed the opportunity to plan how challenges in local communities can be explored by including citizen science as a data-gathering and interpreting tool regarding the promotion of ESD. The interdisciplinary approach of PBL allows for deep learning and the enablement of pre-service teachers and learners who participate in activities. Both PBL and ESD rely on gaining insight into subject content and skills as part of transformative learning. As a teaching strategy, PBL seems difficult to implement, but the more one makes incremental changes in one's daily teaching to attempt it in small parts at first, later in bigger ones, the more one ensures that one's approach to teaching will change forever. Not only will one gain confidence in one's ability as a learning opportunity creator but the participants will also be enabled with skills

such as communication, verbally and in narrative form, the ability to collaborate, to work with novices and experts regarding diverse knowledge fields and levels and the much-needed character to serve communities towards a sustainable future. In each of the projects, the participants were able to take responsibility and indicate the personal meaning of the project to them. All of the projects adhered to the demands for students and learners in the future, namely an ability to provide solutions to maintain a sustainable earth and the gaining of skills such as critical thinking, collaboration and creativity.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-00483-17-A2) was obtained by the author from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Online teaching for enhancing education for sustainable development and the sustainable development goals in the Foundation Phase in South Africa

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■ Abstract

The coronavirus disease 2019 (COVID-19) pandemic brought about many challenges in the teaching and learning processes worldwide. The situation led to many children in their early years of formal learning deteriorating as they could not attend school. Therefore, this chapter aims to explore ways of utilising online teaching methods to enhance education for sustainable development (ESD) and the sustainable development goals (SDGs) in the Foundation Phase in South Africa. The study was conducted following the principles of the critical emancipatory research paradigm, which emphasises

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transformation and developing agency in marginalised settings. In this chapter, it is explained how participatory action learning and action research can be used to find collaborative solutions to challenges that hinder the implementation of online teaching in the Foundation Phase. Data were generated through recorded action learning set discussions and photovoice and analysed by thematic analysis. Herr and Anderson's five indicators of quality criteria from 2015 were used to ensure research integrity. The findings suggest that parents and teachers experience difficulties in assisting learners with learning online, but it can be valuable for parents and teachers to work together to create local relevant knowledge on utilising online teaching. The value of collaborative efforts in identifying assets in communities is emphasised. Such efforts not only contribute to the creation of knowledge that is especially useful because it is locally relevant but also promote ESD and the SDGs among Foundation Phase learners.

■ Introduction

This chapter aims to explore how online teaching can be utilised to enhance education for sustainable development (ESD) and the sustainable development goals (SDGs) in the Foundation Phase (five- to eight-year-olds) in South Africa. In the 21st century, the use of modern technology in many areas has rapidly increased and become a part of day-to-day operations (Almahasees, Mohsen & Amin 2021; Wang, Zhang & Ye 2021), including for sharing, transferring and extending knowledge in educational institutions (Mahyoob 2020; Shivangi 2020). The outbreak of the coronavirus disease 2019 (COVID-19) pandemic led to a total lockdown around the world, during which all higher education and basic education institutions were closed to combat the spread of the virus. With this situation, educational institutions were left with only the option of delivering lessons electronically. Researchers point out that the COVID-19 pandemic fast-tracked the move from traditional teaching to online teaching in order to ensure that learners' educational needs could be taken care of and give assurance of effective learning (Gray & DiLoreto 2016; Hsu, Wang & Levesque-Bristol 2019). Thus, a gap was left and still exists in primary schools, especially in the Foundation Phase. Research is needed to ensure that quality online teaching and learning are provided with the aim of promoting ESD and the SDGs.

The COVID-19 pandemic brought about distance between teachers, learners and parents; therefore, the use of advanced technologies was helpful in making interaction possible through live classes and content sharing via different online platforms (Burgess 2020; Donga, Caob & Lia 2020).

In this context, Jena (2020) suggests that three aspects are vital for effective online teaching and learning, namely instruction, social interaction and technology. Alqurashi (2019) stresses that interaction among learners – including socialisation, answering questions, sharing and discussing ideas, group activities and content-related interaction – has a positive impact on learner satisfaction. This idea relates to the fact that online teaching and learning broke the communication barrier that can be created by unforeseen circumstances such as the COVID-19 pandemic (Jena 2020). In the research reported on in this chapter, I sought to find ways in which online teaching could be utilised to enhance ESD and the SDGs for young learners in the Foundation Phase in South Africa after the COVID-19 pandemic. Parents and teachers need to provide reasonable support and be predisposed to assisting learners by stimulating reading to achieve affirmative learning outcomes and thereby enhancing ESD in the Foundation Phase (Bhamani et al. 2020).

Anwar (2020) conducted research in higher education institutions to evaluate the effectiveness of online teaching and learning. The results indicate that approximately 60% of university and college students experienced teaching and learning as effective, while almost 40% reported that several challenges were experienced (Anwar 2020). In China, Donga et al. (2020) conducted a study that focused on the beliefs and perceptions of parents towards online learning. The study revealed that teaching young children by using technological methods posed many challenges to learners, families and teachers because they were neither competent nor prepared for the shift (Donga et al. 2020). Research conducted by the European University Association confirms that there is a significant increase in universities in many European countries that are moving towards offering online degree programmes (Gaebel et al. 2021). In Germany, Schneider et al. (2021) conducted a study that focused on distance learning in primary and secondary schools. The findings of their study indicate that teachers used e-mail to distribute learning material and followed this up with telephone calls. Although there have been attempts to conduct research on online teaching in different countries, many studies focused on higher education institutions, which left a gap in terms of the utilisation of online teaching in the primary school sector, especially in the first 3 years of formal primary education. Moreover, in the South African context, several research studies also focused on higher education institutions, and the findings confirmed that despite the challenges faced, online teaching was effectively used to make sure that there was academic progress throughout the COVID-19 era (Dube 2020; Gumede & Badriparsad 2022; Parekh & Sinha 2020). It appears as if limited studies were conducted in primary schools, especially in the Foundation Phase.

According to Statistics South Africa (2022), a mere 11.7% of South African schools embarked on remote learning, and 70.5% of the learners who attended Grade 7 did not have access to digital assets such as laptops and smartphones. Therefore, I regarded it as important to focus on utilising online learning in the Foundation Phase so as to provide a strong base to learners from the early years with the aim of enhancing ESD in South Africa. According to the Department of Basic Education (DBE 2011), the Foundation Phase entails a critical stage of education that lays the groundwork and building blocks to initiate the learning of children five- to nine-years-old (Grades R–3). Although Grade R forms part of Foundation Phase education, which is obligatory in South Africa, it is not offered in all schools, as some schools offer education only from Grades 3 (Vilanculo 2021). The explanation provided indicates that Foundation Phase classes form the basis of primary education, where learners develop skills in language, mathematics, technology and other life skills. It can be argued that online teaching and learning in the early years of learning is crucial for learners, teachers and parents to promote ESD.

■ Enhancing education for sustainable development through online teaching in the Foundation Phase

Education for sustainable development is the type of education that aims to give learners the desire to contribute positively to making the world a better place for themselves and others (Graham, Berman & Bellert 2015). As a foundational element of sustainable development, ESD is an educational initiative that helps learners increase their capacity through engagement and action reflection (UNESCO 2017). It includes development's social, economic and environmental facets. Hays and Reinders (2020) articulate that ESD provides learners with future-focused skills, experiences, responsiveness and confidence to drive positive change. Drawing from this idea, ESD has the possibility of bringing knowledge that reassures learners to continue embracing their lifelong learning journey. Ben-Eliyahu (2021) supports this statement by emphasising that ESD is long-lasting, joyful and more effective and motivating which leads to far-reaching changes in the way education is often practised today. In this sense, I argue that online teaching may possibly contribute to achieving SDG 4, which aims to provide quality education for all children. This is possible because it [online teaching] provides equal opportunities for learning to learners regardless of their geographical location (UNESCO 2017). In this chapter, the following question is explored: How can online teaching be utilised to enhance ESD and the SDGs in the Foundation Phase?

Education for sustainable development was included in the educational system with the intention of supplying the necessary information and abilities to support the accomplishment of the SDGs (UNESCO 2014). Education for sustainable development explains the significance of educational practices that increase the value of learning and contribute to the continual involvement of individuals in circumstances where knowledge is co-created and shared throughout nations and communities (Donga et al. 2020). They further enlighten that ESD ‘enhances the cognitive, socio-emotional and behavioural dimensions of learning and encompasses learning content and outcomes, pedagogy and the learning environment itself’ (Donga et al. 2020). This idea suggests that ESD is a lifelong learning process and an integral part of quality education that allows people to use locally relevant knowledge in their day-to-day lives to benefit the entire community. Computer-generated and amplified reality is a modern and effective way to develop simulations and games as teaching and learning activities (Marais 2021; Vaibhav 2020). For example, virtual reality can be instrumental in simulating interaction among individuals and focusing on practical training in real-world scenarios (Anwar 2020). It appears that online teaching can help learners understand different concepts they learn in the early years of their education through the use of diverse activities. For example, virtual field trips can be a great way to take learners to interesting places and allow them to learn from the very comfort of their own homes (Fulton 2021). This idea may go a long way in achieving SDG 10 which advances the reduction of inequalities within and among countries (UNESCO 2017). So, with online teaching, all learners will get the opportunity to explore different knowledge with no restrictions.

Virtual Pictionary is a game that can be used to teach vocabulary to and develop the creative skills of learners aged seven to 14 years (Donga et al. 2020). Anwar (2020) explains Virtual Pictionary as an online version of the classic game where one child illustrates a word by drawing it while his or her teammates attempt to guess it. This activity can be used to teach Foundation Phase classes where learners can use mobile phones to attend lessons online while they are at home. Teachers can split their classes into two teams and then text the word to one learner by using Zoom’s private chat feature (Jena 2020). The learner can then use the screen-sharing ability of the video conference software to show his or her drawing while the other team members guess what it is.

Another activity that can be used to teach Foundation Phase learners is Virtual Trivia. According to Donga et al. (2020), Virtual Trivia is an exciting method that teachers can use to test learners’ knowledge on a particular topic. To use this activity in the Foundation Phase, the teacher should have a list of trivia questions and answers. The class is divided into teams that will compete to answer the most questions quickly and correctly.

Virtual Trivia can be a valuable online classroom activity to use in Foundation Phase classes because it is an exciting way to confirm the extent to which learners retain the knowledge they need.

Furthermore, virtual educational games can be helpful in enhancing sustainable learning in Foundation Phase classes in South Africa. Studies confirm that simulations and games can be helpful in teaching young children because they are highly interactive forms of e-learning (Anwar 2020; Wang et al. 2021). According to Jena (2020) and Marais (2021), when games are used in learning, they bring about a competition component in learners that allows them to challenge some life goals and sets of rules and constraints. Jena adds that if simulations and games are used during online teaching, learners may develop sustainable problem-solving skills.

From the aforementioned discussion, it appears that the use of different online activities can be highly useful for learning at any age, but they are particularly important for young learners in the Foundation Phase. Jena (2020) emphasises that online learning activities should motivate learners to want to explore more as they interact with the world. Therefore, for teachers and parents to be able to effectively use different activities, as explained here, they should possess different skills and knowledge (Koehler & Mishra 2009). It seems that online teaching has been used widely in universities and colleges in South Africa. In the 'Findings' section of this chapter, I provide suggestions on how online teaching can be supported in the Foundation Phase in South Africa to promote sustainable learning. These ways of utilising online teaching can be helpful during difficult times, such as the COVID-19 era, when brick-and-mortar classroom teaching and learning were suspended.

■ Theoretical framework

This project was underpinned by two theories, namely the asset-based approach (ABA) (Rippon & Hopkins 2015) and the technological, pedagogical and content knowledge (TPACK) theory (Mishra & Koehler 2006). The ABA is a theoretical framework that acknowledges that local people can identify their problems and provide solutions to these problems (Chidakwa 2020). The framework acknowledges that local people have capabilities within them to address issues that affect them (Myende 2014; Rippon & Hopkins 2015; Rippon & South 2017). The literature indicates that the focus of the ABA is not on identifying other people's shortfalls but on what they can do to bring about change and achieve specific goals (Chidakwa 2020; Myende 2014). The ABA presupposes that although there may be challenges, different people, institutions and communities have very useful and fundamental talents and abilities that can improve their lives (Chidakwa 2020; Myende 2014).

Assets are categorised into the following three groups: The primary tier comprises easily accessible assets that are under the control of the school, such as learners, teachers, the management, moveable assets and infrastructure. The secondary tier consists of assets that are found in the neighbourhood of a school but do not belong to or are not controlled by the school, such as churches, charity organisations, local businesses, parents and other community members. The tertiary tier is made up of all the assets that are not found within the school community but can influence teaching and learning, for example, private companies, non-governmental organisations, public companies, institutions of higher education and research organisations (Chidakwa 2020; Chikoko & Khanare 2012). This implies that in every school environment, there are people who know the use of technology, some know the content to be delivered to learners and some have the skills to deliver it; all these people should work together to enhance ESD among learners, especially in the Foundation Phase.

The TPACK theory was deemed suitable for this study, as it works as a harmonising theory because of its nature of three interacting bodies of knowledge, namely content, pedagogy and technology, which produce the type of knowledge learners need in our ever-changing world (Gudmundsdottir & Shulman 1987; Guerrero 2010; Guzey & Roehrig 2009; Harris, Mishra & Koehler 2009a; Koehler, Mishra & Cain 2013). The TPACK theory is important to technological education because it amalgamates technology, pedagogy and content knowledge, which cover the 'what' and 'how' of teaching by using tools of information technology (Koehler & Mishra 2009). Shulman (1986) and McGraw Hill Canada (2017) point out that apart from having subject knowledge and broad didactic skills, teachers should know how to teach topics by using approaches that learners can understand. Therefore, the integration of the ABA and TPACK enabled the identification of people who possess different skills that are required for online teaching in Foundation Phase classes. In this chapter, our focus is on integrating the two theories.

■ Integrating the asset-based approach and the technological, pedagogical and content knowledge theory

The interlinking of different components of TPACK offers a dynamic approach that can mitigate teachers' challenges when implementing educational technology in their classrooms (Harris, et al. 2009b). In this chapter, TPACK and the ABA are combined to show how the skills people in the community possess are used to enhance ESD in teaching Foundation Phase learners.

In this chapter, I argue that specific high-tech tools (including hardware and software applications), used appropriately, can help learners better understand the subject matter. Integrating the principles from the ABA and TPACK as a lens in this study plays a significant role in making online teaching a success because the school is built of people with different information technology expertise that can be used in the classroom. Therefore, TPACK is found the core of the theoretical frameworks of this chapter. Hence:

Technological pedagogical knowledge describes relationships and interactions between technological tools and specific pedagogical practices [(Guerrero 2010)], while pedagogical content knowledge describes the same between pedagogical practices and specific learning objectives [(Gudmundsdottir & Shulman 1987)]. Lastly, technological content knowledge describes relationships and intersections among technologies and learning objectives (Guzey & Roehrig 2009). These triangulated areas constitute TPACK, which considers the relationships among all three areas and acknowledges that educators act within this complex space [(Koehler et al. 2013)].

Thus, TPACK is the final combination of these different combinations and interests, drawing from them – and from the three larger underlying areas of pedagogy, content and technology – to establish an effective basis for teaching by using educational technology. Therefore, I hoped that the integration of these two theories would be beneficial to the effectiveness of this study, as the TPACK theory would bring in the use of technological methods in the teaching, whereas the ABA stresses the collectiveness of different people in the teaching and learning processes.

■ Methodology

The current study was conducted following a qualitative approach as the point of departure. This was important because the approach allows educational researchers to address the ‘how’ and ‘why’ research questions (Merriam & Tisdell 2016; Moon et al. 2016) while also enabling co-researchers to obtain a deeper understanding of one another’s experiences, phenomena and contexts (Worrall & Harris 2013). This implies that through the qualitative research approach, we (principal researcher and co-researchers) managed to ask questions that could not be easily quantified; hence, we learnt from one another. In this understanding, the co-researchers were guided by the critical emancipatory research paradigm (concerning emancipation, creating agency and transformation) (see Habermas 1971; Ndaba & Dube 2021), as it supports the underlying participatory action learning and action research (PALAR) approach in representing a critical and transformative research view of knowledge creation.

The study was based on the notion that co-researchers can create knowledge from their own experience through observation, reflection and ideas and by testing the implications of concepts. This collaborative action

learning research experience was made possible through the PALAR design, as suggested by Zuber-Skerritt (2018). Iterating cycles of action and reflection by teachers and parents were used to allow them to learn from one another's experiences and develop a plan for how they could better address their problem during the succeeding cycle (see Worrall & Harris 2013) to enhance sustainable learning in the Foundation Phase through online teaching. Thus, dialogue among the co-researchers enabled them to reflect and transform their meaning schemes in terms of beliefs, attitudes, opinions and emotional reactions to ensure that the educational support was appropriate for the needs and challenges experienced by teachers and parents in Foundation Phase classrooms situated in a formal setting (see Wood 2019; Zuber-Skerritt 2011).

Zuber-Skerritt (2011) and Wood (2020) describe PALAR as a practical, creative way to find solutions to problems, leading to professional development. Participatory action learning and action research functions from a relational ontology where all co-researchers are regarded as able to add value to the project (Wood 2019). In this study, the moral, social, political, cultural and economic values unique to the social settings of all co-researchers involved in the community were respected, and these actions ensured that the educational products developed were culturally and contextually relevant.

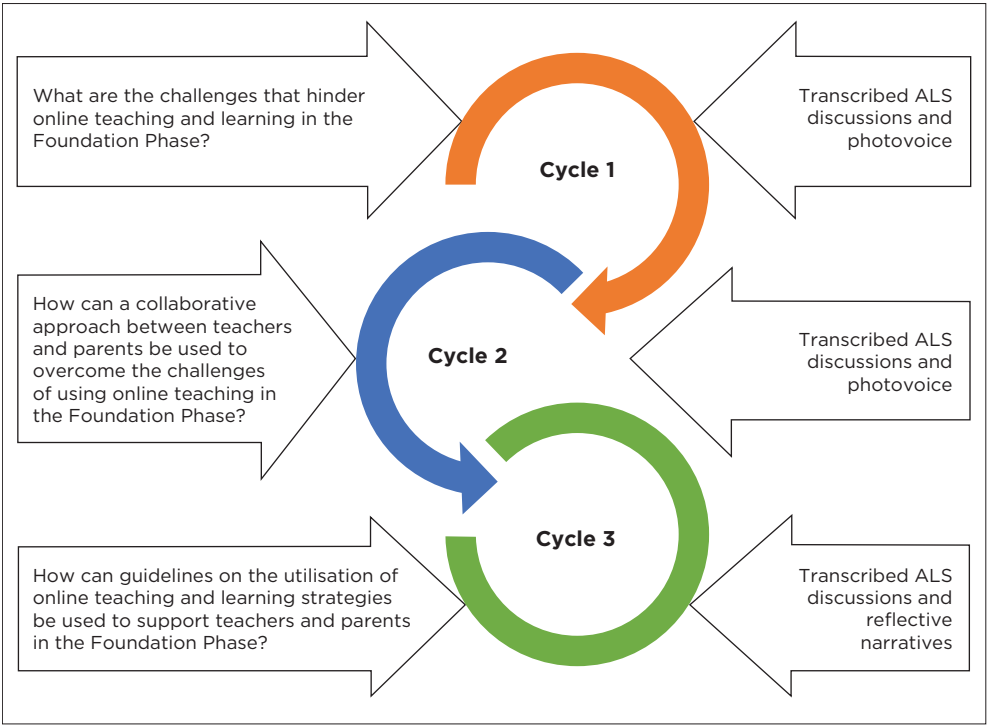
The epistemological assumptions of PALAR imply that knowledge is derived from the researcher taking on a participatory role (Wood 2020). The researcher is not merely an observer who interprets but a participator who works together with other co-researchers in the study in a creative, innovative, collaborative and self-developed way to identify problems and find solutions to these that can bring about change and development in the community (Wood & Zuber-Skerritt 2013).

Regarding the axiology or methodological consideration, the participants in PALAR form an action learning set (ALS) to achieve a collaborative relationship. Zuber-Skerritt and Wood (2019) describe ALS as a democratic, inclusive productive space where dialogue occurs. Wood (2019) adds that PALAR is a figure-eight model with two main components, namely relationship building and research, which are continuously revisited and revised. The figure-eight process was used in three cycles to ensure that the research process remained authentically participatory and aligned with agreed ethical processes, as advised by Zuber-Skerritt and Wood. During the research process, we wanted to generate robust data to fully answer the major research question - 'How can online teaching be utilised to enhance ESD in the Foundation Phase?' In doing so, we formulated three sub-research questions. Therefore, the study was conducted in three cycles, and each cycle focused on one sub-question, as shown in Figure 7.2.

Figure 7.1 highlights the process in which the research was conducted guided by specific research questions as well as the data generation methods used in each cycle. So, in Cycle 1, we formed an ALS in which we could have discussions to answer the first research question. The ALS negotiated the ethical agreement during the pre-research relationship-building phase. The three Rs (relationship, reflection and recognition) of PALAR (Zuber-Skerritt 2011) guided the interaction of the co-researchers by addressing the research aims of:

- Developing a democratic, authentic, trusting and supportive relationship among all the participants of the community of practice
- Initiating a process of frequent reflection in a collaborative learning context between all the participants in the different cycles (phases)
- Recognising the learning and knowledge generated by participants in the cycles.

After exploring the aspects noted in an ethical working agreement, we proceeded to the first research cycle. Every time we met as an ALS, we revisited the aspects of relationship building before we started discussions that focused on answering the research questions. The research process



Source: Author (2024).

FIGURE 7.1: Cyclical research process.

unfolded in a continuous, iterative cycle of observing, planning, acting and reflecting (see Zuber-Skerritt & Wood 2019).

We critically reflected on ways in which online teaching could be utilised to enhance sustainable learning in the Foundation Phase. The reflection also helped me to understand the co-researchers' attitudes to and visions for the education of Foundation Phase learners in utilising the ABA approach. As we applied the new approaches and refined our thinking, we aimed to improve our scholarship and create theory by evaluating our collective transformation because of the process in which we participated (see Carr & Kemmis 1986; Kemmis & McTaggart 2005). The first research question sought to explore the challenges that hinder online teaching and learning in the Foundation Phase.

In Cycle 2, we started with a relationship-building session to reflect on learning and to negotiate our needs. Then, we focused on addressing the second research aim, where we explored ways of utilising a collaborative approach between teachers and parents to overcome challenges they encounter in using online teaching strategies in the Foundation Phase. During this cycle, support was designed, evaluated and refined based on the data generated in Cycle 1 and piloted with a group of teachers and practitioners.

In Cycle 3, we continued with relationship building to reflect on Cycle 2, and we explored the research aim of developing guidelines on the utilisation of online teaching and learning strategies to support teachers and parents in the Foundation Phase. We explored ways to ensure the sustainability of the support and partnership and reflected on the process of working collaboratively. As an action towards developing agency among teachers and parents, all the co-researchers attended a 1-day workshop where we were introduced to an online teaching application relevant to the level of learners in the Foundation Phase called ClassDojo.

■ Research context

Purposive sampling was used to recruit participants from a private school in the Johannesburg district based on my existing relationship with the school director and some teachers. Three teachers were selected as co-researchers according to the following criteria: Foundation Phase teachers who have at least three years' experience of teaching in their respective grades. The three teachers recruited three parents to participate in the ALS as co-researchers. Thus, six participants agreed to participate in the research. The study was ethically approved by the Edu-Rec Ethics Committee of the North-West University. The school governing board of Phumelela (pseudonym) Primary School in Gauteng granted permission

TABLE 7.1: Biographical details of the co-researchers.

Pseudonyms	Gender	Age group	Language	Designation
Prio	M	35–44	Shona	Principal researcher
Marty	F	30–34	English	Grade 1 teacher
Noma	F	30–34	Ndebele	Grade 2 teacher
Thandie	F	45+	Ndebele	Grade 3 teacher
Zandie	F	35–44	Ndebele	Parent
Provie	F	45+	Luganda	Parent
Perf	F	35–44	Afrikaans	Parent

Source: Author (2024).

for the research to be conducted at the school. We constituted a community of practice in one school with seven co-researchers (see Table 7.1).

The members listed in Table 7.1 participated in data generation through ALS discussions, reflective narratives and photovoice, as detailed here.

■ Data generation

We generated data through recorded ALS discussions, reflective narratives and photovoice. Wood (2020) suggests that ALS discussions enable co-researchers to learn from one another by sharing their views, beliefs and opinions about their experiences. The discussions were recorded to allow the ALS to analyse the ideas and provide opportunities to reflect and ask new questions.

In addition, reflective journal narratives were used to enable the co-researchers to capture their experiences of, feelings about, reactions to and changes with regard to the relevant practice of the participants in the Foundation Phase in the school. According to Ndamba and Van Wyk (2019), the narrative in a reflective journal encourages people to raise critical issues concerning the studied topic. As co-researchers, we were able to reflect on not only our observations but also our emotions and understandings related to the actions throughout the research process (see Mills 2018). In this approach, reflection was implemented as a reflection in action and reflection on action (see Zuber-Skerritt 2015).

Lastly, photovoice was used to generate data to effectively produce collective knowledge to go beyond the conventional research approaches by involving community members in active participation (Margolis & Zunjarwad 2018; Wang et al. 1998). Wang (1999) and Wang and Burris (1997) describe photovoice as a community-based participatory research method that involves participants in taking photographs and giving narratives to help them convert their understanding into actionable knowledge.

Each co-researcher was requested to use his or her smartphone to take photographs in response to specific prompts in connection with online teaching in the Foundation Phase. As photovoice was used in Cycles 1 and 2, I gave the co-researchers two prompts. In Cycle 1, the prompt was:

‘As we have discussed the challenges that we face as parents and teachers regarding online teaching, use your cell phone to take a photograph of any object that reminds you of challenges that you face in helping learners to learn online. Then give a narrative to explain what is meant by your photograph.’ (Prio, Male, March 2022)

In Cycle 2, they responded to the following prompt:

‘We have discussed the importance of collaboration in promoting ESD in the Foundation Phase. Use your cell phone to take a photograph that reminds you of ways in which parents and teachers can support online teaching and learning. Then explain what the photograph reminds you of.’ (Prio, Male, July 2022).

The meaning was attached to the photographs in the form of written narratives. Photovoice allowed the co-researchers to explore how online teaching could be used to enhance ESD for learners in the Foundation Phase by means of pictures. This encouraged critical dialogue through the discussion of the photographs taken by the members of the ALS, as suggested by Margolis and Zunjarwad (2018).

■ Data analysis

Data analysis aims to make sense of data generated through different methods. We used the six steps of thematic analysis as explained by Clarke and Braun (2017) to analyse data generated from recorded ALS discussions, reflective journal narratives and photovoice. Zuber-Skerritt (2011) explains that in a PALAR study, analysis is carried out in a continuous cyclical process, where generating and analysing data are interlinked and reflection is integrated into every cycle. In this understanding, during the data analysis process, we refreshed the use of active reflection at different stages of the study to allow for the possibility of different interpretations. We collaboratively analysed the data in two folds – the practical and theoretical analysis. According to Wood (2020, p. 114), in collaborative analysis, ‘normally the action learning set members analyse data on a practical level [...] whereas the academic researcher can analyse the data through a theoretical lens for publication purposes’. After analysing the data as an ALS, I shared the transcribed data and the analysed data with all the co-researchers so that they could comment on the data. After that, we made some changes according to their comments. Furthermore, the five indicators of research quality set out by Herr and Anderson (2015) were followed to ensure integrity throughout the research process.

■ Findings

The findings identified ways in which online teaching can be utilised to enhance ESD in Foundation Phase classes. As I present the verbatim statements, I substantiate them with literature. The three emerging themes are ‘asset mapping in local communities’, ‘developing agency for hi-tech skills and knowledge’ and ‘parent-teacher collaboration in implementing online teaching’.

■ Asset mapping in local communities

The ALS understood that many valuable assets within communities can be utilised to enhance sustainable learning through online teaching. Rippon and South (2017) and Chidakwa (2020) explain that every school is located within a rich community in terms of resources that can be turned into useful teaching and learning assets. As we were trying to identify our possessions as people who stayed around the school, Noma took a photograph of a tree (Figure 7.2) and explained her opinion regarding the use of different assets to assist in online teaching:

‘In that photo, I see a lot of branches on that tree connected to the trunk, which symbolises to me different people such as teachers, parents, school leavers and other professionals who are within the community who can all provide. With that, I then thought a collaboration of different people with specific computer skills in a society to actually achieve quality teaching of young learners as a very big tree is being supported by different roots, different leaves and different branches.’ (Noma, Female, August 2022)

Provie also gave a view that emphasises the importance of each branch in the growth of a healthy tree when she said:

‘Equally important is the involvement of different people who are in the community in assisting teachers to teach through online teaching. I am also reminded of some schools that possess some computers and people who own some old cell phones, which can be of great use in implementing online teaching in schools, particularly in the Foundation Phase.’ (Provie, Female, July 2022)

This idea suggests that hi-tech gadgets and human resources in local communities should be utilised to amplify children’s learning in the Foundation Phase through online teaching methods. Thereafter, Prio added a photograph (Figure 7.3) of an old building on a farm to attract her point regarding different assets found within their locality.

One of the co-researchers commented as follows:

‘When I look at the building from a distance, it looks like everything is okay, but when I take a close look, I realise that certain aspects like windowpanes, doors, and roof are missing and that this place (both the outside and inside of the building) is not taken care of. Grass and trees are just growing everywhere, so



Source: Noma, Female, August 2022.

FIGURE 7.2: Skills around the school community.

it's lacking nurturing. This is what happened during COVID-19 [*sic*] where online teaching was introduced; children were just left without proper structuring from both the parents and the teachers or even from any other individual within different communities. [...] [*W*]hat happens is that the child has all these different pieces, and they fail to connect them to make a beautiful structure.' (Perf, Female, May 2022)

While the explanation emphasises the importance of the missing parts of the building for the functionality of the building, Provie (Female, April 2022) argued as follows:

'When I saw that building, I thought of a big and beautiful classroom that was once of good and proper use, but now it looks neglected. No one is taking care of it. Some parts are even collapsing as a result. This reminds me of children at home maybe who expected to learn through online teaching. The painful thing is that some parents don't help their kids. To make matters worse, some parents have access to Wi-Fi and [*a*] smartphone, which can be used for educational purposes while children are at home, but they are not being utilised. So, the



Source: Prio, Male, March 2022.

FIGURE 7.3: Using community assets.

collapsing of some sections of the building shows me that the cognitive development of learners is being destroyed by [their] not utilising what they already have.'

This statement confirms that some of the locally available assets are misused by parents; hence, online teaching and learning processes in the Foundation Phase are negatively affected. From this perspective, teachers and parents need to work collaboratively in identifying the assets available within their communities so that they can be fully used in implementing online teaching and learning in the Foundation Phase:

In this chapter, I argue that using the ABA can greatly assist in enhancing ESD in the Foundation Phase through meaningful online teaching. This can be accomplished by making sure that there is a partnership between different educational stakeholders with the aim of achieving sustainable development as explained in the 17th SDG (partnerships for the goals) (UNESCO 2017). Scott et al. (2020) and Ramatea and Khanare (2021) justify that the focus of ABA is on identifying the strengths that different individuals can bring into the teaching and learning processes. It is important to acknowledge that using an ABA in teaching and learning directly redresses the deficits in the education models (Myende 2017) and promotes resilience and independence among learners. When assets for use in online teaching and learning have been identified, both parents and teachers need to be trained on how they can effectively use these to enhance sustainability in the classroom. Guerrero (2010), Gudmundsdottir

and Shulman (1987) and Guzey and Roehrig (2009) all stress that technology-focused teaching and learning require people to have different skills to allow them to cope with the educational dynamics in the world.

The next theme focuses on developing agency in teachers and parents regarding knowledge of and skills in using technology to teach learners.

■ Developing agency for hi-tech skills and knowledge

With regard to asset mobilisation, as discussed in the previous theme, findings also point to the importance of training and retaining different people in the use of information and communication technology equipment in teaching and learning processes. Different ALS members gave their opinions on this, which are used as evidence that there is a need to develop agency among learners, teachers and parents to collectively enhance sustainable learning through online teaching.

In reaction to Figure 7.4, Zandie explained the need to educate everyone to implement online teaching as follows:

'In this photo of a seesaw, I see the steel pole as the resources, one red board as a child, and the other as the teacher. The pivot and the pole symbolise the environment, which is conducive to learning, which is the starting point for everything to move. So, both boards need the steel pole to do their function. I am saying success in online learning and teaching requires sustainable knowledge of the use of resources. For a long time, technological tools have been overlooked by the education system, but the world is evolving, and things don't work the same as they used to. So, I strongly feel that if, as parents and teachers, we can get some training on how we can use technology to teach our children first, that can help us to have adequate knowledge before teaching is done. I think that can make us capable of helping children in this transition to online learning.' (Female, May 2022)

The aforementioned extract from Zandie's description emphasises the significance of having parents and teachers who have current information and communication technology skills. She emphasised that 'success in online learning and teaching requires sustainable knowledge on the use of resources'. This statement suggests that both teachers and parents should be given access to training in computer skills so that they can be in a better position to help children through online teaching and enhance ESD in Foundation Phase classes. Furthermore, a parent (Perf, Female, June 2022) added the following:

'I can tell you that this project is so important to us all, but mostly to us parents. I never thought that we had something to do to help our learners more using our phones more. I am now prepared to learn to use my phone to teach my child, even at home. I think [*it would be good*] if there can be a small course that we can do so that we know what to do with our children.'



Source: Zandie, Female, May 2023.

FIGURE 7.4: Retraining for information technology skills.

Parents need to realise the importance of being involved in educational research because it allows them to learn and contribute to the cognitive development of their children. One of the teacher co-researchers, Thandie, concurred with the views shown here and added that teachers lacked technological knowledge, and hence, there was a need for their agency to be developed. She said:

'I agree that in as far as a teacher, we were trained to teach using different methods in the classroom, but we lack knowledge and skills in computers as far as parents do, and it is not easy for us to just switch to online teaching. Maybe we must have some workshops on teaching using computers so that it becomes easy for us to teach learners as [*sic*] they are at home.' (Thandie, Female, July 2022)

Shivangi (2020) emphasises that online activities should be stimulative so that learners can have the motivation to continue learning. However, Noma, one of the teachers, also emphasised that online learning might be

problematic for young learners, as their attention could be easily diverted to something else, such as social media. Therefore, it is argued in this chapter that parents and teachers should have the necessary skills to monitor children while they are learning online. Moreover, it is important for parents and teachers to be aware of particular activities that they can use to enhance sustainable learning in different subject areas. For example, one of the teachers (Marty, Female, May 2022) gave the following explanation of how language skills could be taught online:

‘I just want to talk about some of the activities that our learners should do online so as to develop certain skills; particularly I will focus on language because I am an Afrikaans teacher, and our children struggle with it. So, for us [teachers and parents] to be helpful to our learners we must be educated in computer skills. Then we can assist learners to have some competitions where they could play spelling games, make presentations and so on. This can help them develop both their speaking and writing skills in any language.’

Drawing from the explanations given by the co-researchers, it can be emphasised that helping teachers and parents acquire the skills needed to support online teaching and learning is essential in the enhancement of sustainable learning in Foundation Phase classes. Notably, the verbatim extracts presented in this chapter provide evidence for the idea that if agency for computer skills and knowledge can be developed among parents, teachers and learners, online teaching can go a long way in enhancing sustainable learning for all learners, especially those in the Foundation Phase in South Africa. For example, Marty used the phrase ‘for us to be helpful ... we must be educated in computer skills’. These words imply that once teachers, parents and learners have the required skills in information and communication technology, some challenges associated with remote learning can easily be mitigated and sustainable learning be promoted. Vincent-Lancrin (2020) highlights that a remote education system needs to be delivered by individuals who are trained well in pedagogical practices and supported by digital resources to promote teaching that is adaptable to prevailing circumstances. This idea resonates with the theory of TPACK (Mishra & Koehler 2006) as it is used in this study to emphasise the importance of different types of knowledge when teaching through online methods. For sustainable learning to be enhanced, parents and teachers should work together. Next, I set out how parent-teacher collaboration can be utilised in implementing online teaching.

■ **Parent-teacher collaboration in implementing online teaching**

According to Burns (2020), continuous communication between schools and parents is associated with children’s achievement of their learning

goals because it boosts their parents' confidence in them. This idea corresponds with the opinions of the co-researchers, who stressed that online teaching required a combined effort from different stakeholders for it to be a success, as seen in the following response:

'Since we have realised that many people around our school have lots of skills that, as teachers, we do not have, I think it is important to have everyone on board so that those skills are used to teach our learners rather than working in isolation. This project is really an eye-opener to me.' (Marty, Female, May 2022)

The extract shows that the participating teachers realised that every individual within the community should be recognised and their knowledge is crucial for enhancing sustainable learning. Marty used the phrase 'everyone should be on board' to emphasise that collaboration was necessary for online teaching to be helpful to learners. Zandie added the following:

'I just discovered that, as a parent, I also neglect my children's education, thinking that it is the responsibility of the teacher, but with what has been said here, online teaching is like a funeral. It is for everyone, not only for the bereaved. So, what I can say is that we need to give ourselves time as parents to work with teachers to make sure that our children get the best education through online teaching from as early as Grade R.'

Notably, Zandie's perception rebukes the notion that teaching is a teacher's responsibility only. According to her, emphasis is given to the importance of every asset in the community for the accomplishment of sustainable learning through online teaching. Interestingly, Noma (Female, June 2022) referred to a photograph of a tree (see Figure 7.2) and said:

'When I took the picture of a big tree and what I saw was the animal that was roaming around alone and I thought of someone who is not mingling with others and who is losing focus in life, as he is desperate. He doesn't even know what to do. This reminds me of a situation where we do not collaborate with others in the community as well as with the teachers. We cannot achieve quality education for our learners.'

Collaboration among parents, teachers and other individuals who possess particular skills and knowledge within the community was placed at the centre of the discussion. This led to our desire to explore different activities to make sure that there was a collaboration among all human assets to assist Foundation Phase learners through online teaching. In response to that, one teacher mentioned:

'Parents can help to make sure that their kids at home do every activity that is given by teachers, and where a child is failing, a parent should assist them. Parents can also be part of the adventure like, let's say it's a virtual trip, parents can also be invited. You can schedule a time when the parents are free, so they can also take part. I think that will make it more fun for the kids, and it will help them to learn a lot because when a teacher is explaining, a parent can also be assisting.' (Thandie, Female, June 2022)

The extract highlights that parents should be committed to monitoring their children's learning to prevent them from diverting their attention from their schoolwork. Excursions have been mentioned as a useful activity where a parent can be involved. It is argued in this chapter that online trips have the potential to motivate learners to concentrate on their education. In addition, Zandie argued that parents should collaborate with teachers to enhance sustainable learning through online teaching as a response to Figure 7.5:

'This photo reminds me of a situation where there is drought and the mother is working hard to provide for [sic] her children with food. Knowledge is like food, and many children are not getting adequate content from their teachers because of circumstances such as COVID-19. Food, in this case, symbolises different gadgets that parents can give to children. I see a dish of food as the assistance that a parent can give to her child. So, parents need to support online learning to be a success.' (Zandie, Female, April 2022)

From this excerpt, something else that parents can do to make sure that there is a collective effort between them and teachers is to support schools



Source: Zandie, Female, April 2022.

FIGURE 7.5: Parental support.

by providing information technology devices that learners can use when they are taught online, especially during difficult times such as the COVID-19 pandemic. Fulton (2021) explains that working together to support online teaching is the only way to hasten and enhance contemporary and future e-learning activities.

■ Discussion

Distance learning is commonly associated with higher education institutions, and research proves that it has yielded good results (Gray & DiLoreto 2016; Hsu et al. 2019). However, in 2020, the COVID-19 pandemic forced the Department of Basic Education in South Africa to switch to online teaching for learners in primary and secondary schools. This move resulted in many challenges, including a lack of resources and knowledge among parents, teachers and learners. The findings presented in this chapter demonstrate that having success in online teaching requires the collaborative engagement of people with different skills. Therefore, this study was successful in enhancing ESD in the foundation phase because it helped parents and teachers to work in partnership in using online teaching. This resonates with the demands of SDG 17 (partnerships for the goals) which stresses reinforcing global partnership for sustainable development in different aspects of human lives (UNESCO 2017). While using the ABA in this study allowed us to identify different types of knowledge that can enhance remote teaching and learning, the TPACK theory afforded a clear understanding of how to amalgamate technology into the classroom effectively. Three major types of knowledge (technological, content and pedagogical knowledge) are explained in the TPACK framework and are important to create the basis for effective technological integration learning (Harris et al. 2009a; Koehler et al. 2013). Furthermore, technological integration allows smooth and meaningful communication, which supports rich learning and teaching experiences (Mishra & Koehler 2006). For example, it was highlighted in the discussion of the third theme of this chapter that collaboration in online teaching possibly allows teachers and parents to give each other feedback on the learning process of the learners.

According to Chikoko and Khanare (2012), considering different locally available assets is a very important strategy that can be implemented to enhance sustainable learning in schools. Myende (2014, 2015) and Chidakwa (2020) agree that every community is filled with material and human resources that can be utilised to accomplish educational goals. In this regard, the co-researchers in my study highlighted that computers, smartphones and knowledgeable people were underutilised in school communities. It is argued in this chapter that schools should identify assets (such as information technology experts and non-governmental

organisations that can support the use of computers) in their areas and utilise them wisely, for example, by inviting knowledgeable people to be resources for enhancing sustainable learning in the Foundation Phase. The verbatim extracts presented in the discussion of the first theme in this chapter stress the significance of identifying assets in local communities.

Furthermore, it was found that parents, teachers and learners lack skills in using digital tools to facilitate teaching and learning; hence they need to get some training to aid them in implementing online teaching. This is supported by the literature emphasising that teachers and learners must be well-versed in computer skills before opting for online teaching and learning (Basilaia & Kvavadze 2020). This is important because it can ease the transition from traditional teaching and learning to online teaching and learning during times like the COVID-19 outbreak. Thus, it can be argued that the use of online teaching in this study has contributed to access to quality education (SDG 4) as well as to the reduction of inequalities (SDG 10) among learners living in marginalised and developed communities regardless of their gender (SDG 5) (UNESCO 2017). As an ABA was adopted to advance online teaching in the Foundation Phase, collaboration between parents and teachers is called for. This idea corresponds with the methodology used in this study – PALAR – which focuses on transformation and democracy in education where members of the community work together to bring about social change (Wood 2020). Mills (2018) points out that when teachers, parents and learners work as a team, they bring a valuable learning experience to the classroom, rather than concentrating on what they need to work on or lack as individuals. The findings and the literature show that if online learning can be planned well and be fully utilised in the Foundation Phase, ESD and the SDGs can be enhanced regardless of any unforeseen circumstances such as COVID-19 when a lot of learning time was lost because of the closure of schools (Reimers 2022).

As a way of combating such a challenge in the future, the co-researchers emphasised that online teaching and learning should be an ongoing process that should be practised alongside traditional face-to-face teaching. Implementing such a practice means that in times of trouble (such as the COVID-19 era), the transition can be easy; hence sustainable learning can be achieved in the Foundation Phase. This is true despite some researchers arguing that online teaching does not help developing young children to be socially and emotionally ready for school, and therefore, they should not be exposed to it (Jena 2020). This means that it is indispensable for teachers to practise an ABA with their peers, parents and other community members to support learners by working hard and demonstrating their efficacy in learning remotely.

■ Conclusion

In this chapter, it is explained how online teaching can be utilised to enhance ESD in the Foundation Phase in South Africa. It is argued that the success of implementing online teaching depends on using an ABA in conjunction with TPACK, as explained by Mishra and Koehler (2006). The conclusions derived from the findings highlight that education systems should aim to have a strong engagement with the community to get appropriate information regarding the availability of assets. This also includes getting guidance from parents on effective practices that may help support their children's learning through remote teaching. Furthermore, locally available assets remain a strong tool for enhancing SDGs through online platforms. Thus, it is encouraged that schools should make sure that parents, teachers and other stakeholders work collectively and collaboratively to identify different resources within the locality. Furthermore, the implementation of online teaching and learning in the Foundation Phase needs to be supported by making sure that everyone has the required skills. This can be performed by making efforts to train and equip parents and teachers with information and communication technology skills.

Most importantly, a workshop on online teaching and learning helped the participating parents and teachers understand how they can collaborate in using online teaching to enhance the SDGs in the Foundation Phase. Therefore, if online teaching is utilised properly, sustainable learning can be enhanced for all learners, especially in the Foundation Phase, in South Africa and beyond.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-01010-21-A2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Fostering inclusive early childhood through the pedagogy of play for quality education

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■ Abstract

This chapter presents the findings of a collaborative study among early childhood care and education (ECCE) practitioners to foster early childhood inclusion within development programmes. The study leveraged the pedagogy of play and integrated the African Reggio Emilia Approach to cultivate values of acceptance, empathy and respect in young children. This endeavour is in alignment with the United Nations (UN) sustainable development goal (SDG) 4 (quality education) underscoring the importance of offering inclusive, equitable education and lifelong learning opportunities to all, thereby contributing to the cultivation of a more inclusive society and working towards SDG 10 (reducing inequalities).

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In the context of the research, both the ECCE lecturer and practitioners actively participated as co-researchers within a community of practice. This collaborative engagement was situated within an established participatory action learning and action research project. This study emerged from the recognition of a collective need when the practitioners expressed their awareness of lacking comprehensive guidance and practical knowledge regarding the seamless integration of the pedagogy of play in early childhood education in ECCE centres while ensuring it enables meeting the SDGs. Through this collaborative effort, the study aimed to address these gaps and provide actionable insights for creating an inclusive and sustainable educational environment for children.

■ Introduction

The goal of the chapter is to report on how an early childhood care and education (ECCE) lecturer and ECCE practitioners working in a community of practice (CoP) (Lave & Wenger 1991) collaborate in developing strategies based on Target 4.2 of SDG 4 (quality education), to foster inclusive early childhood education through play-based pedagogy in their centres. Early childhood care and education provides a strong foundation for lifelong learning and development as it lays the groundwork for the cognitive, social, emotional and physical well-being of a child. Investing in ECCE ensures that children have the skills, attitudes and knowledge needed for continued learning and success throughout their lives.

Early Childhood Care and Education in South Africa includes children from birth to 5 years of age (Department of Basic Education [DBE] 2015). Because inclusion confirms equal access to learning for all children, irrespective of their diverse cultures or backgrounds, inclusion in ECCE sets the groundwork for SDG 10 (reduced inequalities), the National Development Plan of 2030 and the National Integrated Early Childhood Development Policy (NIECD) (Republic of South Africa 2015). Sustainable development goal 4 (quality education) is one of the 17 global goals set by the UN (UNESCO 2016) in their 2030 Agenda for Sustainable Development. Each goal has specific targets and indicators to measure progress towards their achievement. The goals are interconnected and aim to promote a holistic and sustainable approach to development that balances social, economic and environmental dimensions. Sustainable development goal 4 predominantly aims to empower individuals with knowledge, skills and opportunities to lead fulfilling and productive lives. Target 4.2 falls under SDG 4, focusing on ensuring all children have access to quality early childhood development, care and pre-primary education to be ready for primary education. The target highlights the importance of providing

children with a solid foundation during their early years through proper care and education, which can significantly impact their overall development and future success in formal schooling. Thus, Target 4.2 reflects the global commitment to improving education systems and opportunities for young children, to achieve inclusive and equitable quality education for all.

■ Fostering inclusive early childhood education

Quality education in a nurturing and stimulating environment supports the child's holistic development. Holistic development includes not only cognitive, emotional, social and physical aspects of a child's development but also a safe environment, stimulation in general, responsive and supportive caregivers, age-appropriate activities and materials and a language-rich environment in which play-based learning (Bennett, Wood & Rogers 1997) can take place, curiosity can be promoted and critical thinking, creativity and problem-solving skills can be developed (Fesseha & Pyle 2016). Engelbrecht (2020) states that Equity and Inclusion acknowledge that children may start with different advantages or disadvantages because of their families' income, educational levels, geographic location, race, ethnicity, gender, disabilities or language abilities. Therefore, it aims to provide targeted interventions and resources to support children who are marginalised or at risk of experiencing educational inequalities (SDG 10). This may include providing appropriate accommodation and individualised support for children with special needs, addressing language barriers for children from linguistically diverse backgrounds, creating inclusive curricula and learning materials that reflect the diversity of children's backgrounds, and actively involving families and communities in the educational process. By prioritising equity in ECCE, societies aim to reduce the achievement gap, ensure social justice, and create opportunities for all children to succeed and contribute to society (Molla & Nolan 2018). Investing in lifelong learning in ECCE enables children to develop a positive attitude towards learning and a curiosity to explore new ideas and concepts. This will provide the children with a strong educational foundation to process information, regulate behaviour and construct new knowledge (National Scientific Council on the Developing Child 2007).

With that in consideration, it is evident that SDG 4 is crucial in the context of ECCE as it emphasises the importance of inclusive and quality education for children. By prioritising access, quality, equity and lifelong learning opportunities in ECCE, we can ensure that the children in the centres receive a strong foundation for their educational journey, fostering their development and contributing to education for sustainable

development (ESD) and equitable societies. The need of ESD for young children is becoming more widely acknowledged (Edwards & Cutter-Mackenzie-Knowles 2013; Samuelsson 2011).

For the scope of this study, the co-researchers within the CoP collectively agreed that SDG Target 4.2 which pertains to ensuring access to quality early childhood development, care and pre-primary education for all children in preparation for primary education, can be effectively addressed by focusing specifically on immediate day-to-day challenges. This approach aims to address the fundamental questions:

‘What are the prevailing knowledge gaps among ECCE practitioners, and how can these gaps be effectively addressed to facilitate the advancement of inclusive early childhood education within the educational centres?’

Following this deliberation, the subsequent content delves into three distinct SDG 4 objectives that hold substantial significance in the overall achievement of SDG Target 4.2. This target is focused on the promotion of inclusive childhood education, employing the principles of pedagogy of play.

In the search for fostering inclusive early childhood education through the pedagogy of play, it became important to underline the relevance of SDG Target 4.2. Therefore, the co-researchers thought it important to prompt a comprehensive assessment of the existing ECCE lesson plans and instructional resources within the ECCE centres. The evaluative process was geared towards not only adapting but also integrating components that facilitate holistic development and underscore principles of ESD. Central to this integration is the strategic utilisation of the pedagogy of play, as discussed by Bennett et al. (1997). Furthermore, a key component of this endeavour involves the incorporation of the African Reggio Emilia Approach (AREA), a concept advocated by Browne and Hugo (2018). The essence of this integration lies in its capacity to nurture core values such as acceptance, empathy and respect among young children directly within the curriculum. Crucially, the AREA philosophy emphasises a child-driven learning process, wherein the child assumes an active role in the construction of knowledge through play. This approach empowers the child to influence the path of the curriculum, thereby granting them a sense of control over their educational journey. By applying this principle when crafting curricula and designing lesson plans, a play-based pedagogy encourages the development of critical skills such as self-expression, problem-solving, effective communication and teamwork. This paradigm shift in education not only fosters individual growth but also serves as a transformative force with far-reaching societal implications. This points to humanising pedagogies and establishing a relationship of trust and dialogue between the practitioner and the child. The approaches are all praxis-based, which

involves both reflection and action. By aligning educational strategies with such principles, education becomes a catalyst for both personal and collective advancement, positioning young learners on a path of holistic development and preparing them to contribute positively to their communities and the broader world. The AREA compliments ESD because a component of ECCE is linked to the optimal ways to integrate the conceptual underpinnings of ESD with existing play-based pedagogies (Edwards & Cutter-Mackenzie-Knowles 2013).

One can pose the question, how can children in an ECCE centre reflect? The foundation for reflection needs to be that of a solid trusting relationship between the practitioner and the child where they actively engage in critical thinking and dialogue. By fostering dialogue and discussing challenges, the traditional role of 'the practitioner of the children' and 'the children of the practitioner' (Pascal, 1993, p. 69) will dissolve and give way to a new dynamic where the practitioner and the child will learn from one another and discover collaboratively. The AREA pedagogy (Browne & Hugo 2018) takes it further, stating that the physical environment needs to be considered as the 'third teacher', where learning is motivated by the natural environment. Again, a question can be posed, how do we as practitioners facilitate all this? We need to observe the environment, listen to, and engage with children, provide guidance and scaffolding, and extend learning opportunities based on the children's interests and abilities. Freire (2017), an influencer of AREA, states that the pedagogy needs to be planned according to themes that relate to all children's everyday reality in which the parent plays a significant role. Thus, the curriculum needs to be developed through collaboration between practitioners, children and parents, leveraging the child's interests and abilities to the greatest extent possible. Bruner's socio-constructive learning (1996) emphasises the significance of interaction with others as the foundation for our learning process. Bruner refers to this as a sub-community of mutual learners (Bruner 1996, p. 27), with the teacher (practitioner) orchestrating the proceedings.

Learning becomes a co-constructed approach rather than a one-way transmission model and it is easy to include and accommodate children from diverse backgrounds and challenges in learning. When the sub-community of mutual learners (Bruner 1996, p. 27) is involved in the learning activity, children can understand ESD issues such as elementary environmental science, ecology, renewable energy, waste management, sustainable agriculture, climate change, mathematics, language and social justice. Through this integration, the children can interact and collaborate with their peers, parents and practitioners. They can also learn to think critically, make informed age-related decisions and take responsible actions in their personal

lives, communities and future careers. This means that learning becomes child-centred and inclusive, regarding the interests, choices and individuality of the child. As play fosters child development, the pedagogy of play can accommodate and include all children, even children with developmental barriers, because the learning environment becomes less restrictive. The World Organisation for Early Childhood Education (OMEP)-UNESCO (2021) reports that one aim of ESD in ECCE's plan to shape sustainable learning for African young children is to empower stakeholders to provide quality teaching and support for children's sustainable development as change agents. To achieve the latter objective, the strategy employed is to train practitioners working in ECCE services in themes related to early childhood, pedagogy, play and sustainability.

The second objective is to offer practitioner training and professional development opportunities, including aspects such as child-centred teaching methodologies and inclusive education practices such as the ability to identify and address children's developmental delays. The challenge in South Africa is that most practitioners do not have adequate training in ECCE and therefore lack knowledge and skills in developmentally appropriate activities to support and include all children in learning (Ebrahim, Martin & Excell 2021). This means that although children might have access to forms of ECCE, they are not necessarily guaranteed inclusion or quality education (Faustino et al. 2017). The children may be enrolled in certain centres, expecting a proper level of achievement, but this can, in many instances, only be surface-led accommodation (Petriwskyi 2010). Brain development and stimulation during the child's earlier years form the basis for learning success, and without training in this area, a practitioner is not generally aware of this fact.

The identification of at-risk developmental delays and support thereof is directly linked to school readiness and may improve school progress if the delay can be identified and addressed in the early years (Department of Social Development [DoSD] 2015). Access and equity to ensure quality in every planned lesson need to be focal points. The training of practitioners and professional development is, therefore, a valuable step in improving the quality of education (Biersteker et al. 2013). The training programmes in general need to focus on a holistic approach that considers the unique challenges of each child as well as the central context (Biersteker et al. 2013).

To include pedagogy of play in the classroom to foster inclusion can be a challenge for practitioners with limited qualifications, knowledge and skills of ECCE. Manwaring (2011) and Pyle, Poliszczuk and Danniels (2018) point out that ECCE practitioners have expressed uncertainty about the facilitation of play learning in a diverse classroom. Researchers such as

Ghafouri and Wien (2005) state that direct practitioner involvement can disrupt or discourage the positive influence of play. On the other side, researchers such as Weisberg, Hirsh-Pasek and Golinkoff (2013) believe that children learn through play and state that through play, practitioners can pose questions to children regarding their play activities that can enhance their logical thinking, social skills and language. Theodorou and Nind (2010) affirm that through play, children with and without disabilities are all included therefore the practitioner can facilitate meaningful social play experiences between all children and support both academically and socially, the forming of positive peer relations and acceptance.

The third and last objective is parent and community engagement. This raises awareness of the importance of early childhood education and involves parents in decision-making. When parents form part of the sub-community of mutual learners (Bruner 1996, p. 27), meaningful relationships can be built between the practitioners and the parents who will be practically involved in their children's learning.

Imposing Epstein's (1995) six types of parent involvement within the context of this objective can add to fostering a sub-community of mutual learners. The six types comprise *parenting*, where the parent provides a supportive and nurturing home environment, with *communication* pointing to transparent communication between the practitioner and the parent regarding the child's academic progress and well-being. Through *volunteering*, parents are actively involved in school-related projects and assisting in the classroom. *Learning at home* sees the parent being actively involved in the learning activities outside of the school. Examples would be engaging them in the learning theme of the two weeks, providing educational resources that align with the themes, or reading with their children at home, where possible. *Decision-making* aims to promote collaboration and shared decision-making between the parents and the centre staff. They can be engaged as advisors during the planning or adjusting of a context-related curriculum. This can create an opportunity for engagement. The last type of parent involvement is *collaborating with the community*, which seeks partnership among community members in the centre to emphasise the importance of early childhood development and education as well as to give the centre a voice in the community. Collaborating with the community and parents is not always easy. Hornby and Lafaele (2011) contend that engagement on both sides (parents and practitioners) can be difficult. The practitioners often lack experience and skills in initiating and sustaining parental participation. Parents, on the other hand, are unclear about what is expected from them when asked to partake in centre-related activities. The socio-economic status and educational level of the parent can hinder their self-confidence to get

involved, or as Güzeltyurt, Birge and Ökten (2019) report, heavy working hours or tight schedules might also affect their involvement. Marin and Bocoş (2017) confirm that both parents and practitioners lack constructive interaction and effective communication skills to create a friendly centre atmosphere, which makes parents hesitant to get involved in centre activities. The researchers elaborate saying that practitioners can be dominant in their turf and might be reluctant to accept parental leadership or partnership.

■ Theoretical framework

Wood posits that the pedagogy of play (2010) in ECCE unifies play and education and this view has been supported by various scholars over time, such as Froebel (Tovey 2013) states that play is a fundamental aspect of ECCE; Vygotsky (1966) feels that play provides opportunities for children to engage in challenging activities under the guidance and support of, for example, the practitioner; Piaget (1962) states that through play, children construct knowledge and make sense of the world using hands-on experiences and exploration, and Montessori (Lillard 2013) indicates that children have a natural inclination to learn through active engagement. The AREA (Browne & Hugo 2018), based on the Reggio Emilia Approach that originated in Italy, tailored for the African context supports the pedagogy when stating that play is a central component of a child's learning and thus, combined with expressive languages, has an active role in the construction of knowledge that encourages exploration, creativity and collaboration, subsequently promoting the holistic development of the child. The pedagogy of play places the child at the centre of the learning process. For this reason, AREA pedagogy supports the pedagogy of play theory because one of our aims in the study is to adjust the curriculum and instructional resources, train the practitioners and involve the parent and child to create an environment that fosters inclusive early childhood education through play. This aligns with Bruner (1996, p. 27) when he refers to the sub-community of mutual learners where learning becomes a co-constructed approach rather than a one-way transmission model. The AREA pedagogy (Browne & Hugo 2018) advocates that play is a crucial avenue for children to make sense of the world, express themselves and critically engage in social interactions. Rather than relying solely on traditional didactic methods, the approaches encourage a holistic and child-centred method of education. The pedagogy thus refers to an instructional approach to teaching where the practitioner facilitates meaningful, authentic and enjoyable learning experiences.

Play-based activities and strategies are integrated into the learning process to enhance engagement, motivation and overall educational outcomes that can benefit all children. Thus, through play, cognitive, social, emotional and physical development is promoted. The AREA, like the pedagogy of play, views children as active participants in their learning process, wherein they are encouraged to explore and interact with their environment. African Reggio Emilia Approach principles concur with Freire's idea (1972) that the pedagogy needs to be planned according to themes that relate to the child's everyday reality, and learning experiences need to be designed accordingly. This learning experience serves multiple purposes, including making children's learning visible, reflecting on teaching practices and involving parents in the learning process. The approach points to the great value of collaboration and social interaction, where children are encouraged to work together, share ideas and learn from one another (Pascal & Bertram 2012).

The authors posit that a praxeology worldview (2018) in the context of early childhood encompasses the theory and study of praxis as defined by Freire (2017), as the reflective aspect of understanding human action and the role of education in individual and social progress. It acknowledges the importance of considering the social, cultural and political contexts in which education takes place, and so highlights the need for education in context: to address power dynamics, promote social justice and contribute to collective efforts for a more equitable and inclusive society. According to their perspective, praxis, which involves both reflection and action, lies at the core of human activity. It includes the process of critical reflection upon one's actions and experiences and subsequently taking meaningful and transformative measures (Pascal & Bertram 2012). In the context of ECCE, praxeology recognises the reciprocal relationship between learning and action. It views education as a dynamic process beyond the mere transmission of knowledge; rather, education develops advocacy in the different role players, such as the practitioners, children and parents, supporting them to engage critically with the world and transform for the better.

Pascal and Bertram go further contending that education is not solely focused on individual development but plays a crucial role in societal progress that aligns with SDG Target 4.2. They argue that education in ECCE should go beyond traditional models of instruction and rather encourage learners to actively participate in their learning, engage in dialogue with others and contribute to their communities. This approach fosters the development of critical thinking, social responsibility and active citizenship (2018). The AREA greatly values parent involvement and encourages parent-teacher communication and involvement as an essential part of child development. The AREA further strives to ensure equal access

to education for all children with opportunities to learn and thrive and recognises the importance of holistic development that goes beyond academic knowledge but prepares children for lifelong learning and active participation in society. To accomplish this, teacher professional development is important. This will enable them to create a rich learning experience in the classroom and encourage a positive relationship between children and their parents (Biersteker et al. 2013; Ginja & Chen 2021; Harrison 2020). Hence, AREA and SDG Target 4.2 both aim to contribute to the overall improvement of the education system and the well-being of the child.

■ Research design and methodology

Zuber-Skerritt (2018) defines participatory action learning and action research (PALAR) as ‘a special kind of action research that integrates various concepts and processes, including lifelong learning, collaborative action learning, participatory action, and action leadership’ (p. 3). The PALAR research design reflected in this chapter falls under the umbrella of Action Research (AR) in which the focal point is on a group of people. In the present research project, the co-researchers, including the lecturer and the practitioners in the CoP, address a mutual problem (Wood 2020). As the CoP has functioned since 2018, the practitioners understand the fundamentals of qualitative data generation and the identification of themes. The participatory paradigm applicable in this research includes *dialectic epistemology*, suggesting how knowledge is created through collaborative democratic dialogue. This implies that the voices and opinions of the co-researchers were respected and reflected upon. *Relational ontology* signifies how we collaboratively generated relevant knowledge drawn from practical experiences in the authentic ECCE centre from the co-researchers with different world views. Applying the notion of *axiology* we sought a democratic process of achieving social change (Wood 2020).

By adhering to the 7Cs as PALAR principles (Wood 2020), we as co-researchers considered and respected each other’s diverse values, morals and contributions. The 7Cs in PALAR comprise communication, commitment, competence, compromise, critical self-reflection, collaboration and coaching. By adhering to the 7Cs, we could ensure sustainable systemic change in the ECCE centres. We based our meetings on the 3Rs as PALAR principles (Wood 2020), where we built solid *relationships* between the co-researchers. Because this research forms part of a well-established, ethically approved research project, we already had a reputable relationship with the co-researchers. We *reflected* critically on all data generated and throughout the research *recognised* one another for our contributions.

■ Research site and recruitment

The research site is two under-resourced privately owned ECCE centres situated in an informal settlement in the Kenneth Kaunda district in the Potchefstroom area in South Africa. Although the space is limited, the premises are well-kept and clean, and the centres accommodate 189 and 215 children, respectively, aged from six months to six years. One centre is registered with the DBE and therefore receives a subsidy of ZAR17 per child per day. The other centre is not registered; therefore, the centre is responsible for all expenses. For this reason, resources to support children's holistic development are limited. The five practitioners from the two centres were purposively selected and recruited at the beginning of the project by an independent person working for the non-profit organisation (NPO) under which the centres resort. The co-researchers, referred to as C1, C2, C3, C4 and C5, included me, a lecturer from an HEI; the two centre managers, each with a Level 5 ECCE qualification; and three practitioners with, respectively, Level 4 qualifications and no formal ECCE qualification (Table 8.1).

■ Data generation

As the research facilitator, I gave a general overview of sustainable development (UNESCO 2016), SDG 4, and then narrowed the discussion down to SDG Target 4.2 and the purpose thereof for education in South Africa. I asked the co-researchers to identify current knowledge gaps, with a focus on ensuring that all children gain access to quality early childhood development, care and pre-primary education, to be ready for primary education.

We used these objectives as themes for discussion in our CoP to answer the research question:

'What are the prevailing knowledge gaps among ECCE practitioners, and how can these gaps be effectively addressed to facilitate the advancement of inclusive early childhood education within the educational centres?'

TABLE 8.1: Biographical details of participants.

Participant	Gender	Referred to as	Position	Qualification
1	Female	C1	Practitioner	Level 4 qualification
2	Female	C2	Practitioner	No formal ECCE qualifications
3	Female	C3	Centre manager	Level 5 ECCE qualification and enrolled for the Gr R diploma
4	Female	C4	Practitioner	Level 4 qualification
5	Female	C5	Centre manager	Level 5 ECCE qualification and enrolled for the Gr R diploma

Source: Compiled by co-researchers for this research project (2023).

The accentuated SDG Target 4.2 focused on (1) adjustments to the ECCE curriculum and instructional resources, (2) practitioner training and professional development and (3) parent and community engagement. As the research facilitator, I audio-recorded and transcribed the verbatim discussions. During the follow-up meeting, we collaboratively identified themes under the thematic analysis. We used these objectives as themes for discussion in our CoP to answer the research question.

■ Data analysis and ethics

As co-researchers, we approached the data analysis process deductively according to the six-phase steps of Braun and Clarke (2013). Collaboratively we read through the transcribed discussions to identify codes under the three themes and substantiated the findings with verbatim quotations from the co-researchers. I drew from Herr and Anderson's (2005) five quality indicators, namely, outcome validity, process validity, democratic validity, catalytic validity and dialogue validity, to ensure credibility. The Ethics Committee of the North-West University granted ethical clearance and permission to conduct the low-risk-level research project. When data are generated by participation, co-researchers need to be well-informed and committed and feel engaged. For this reason, they cannot be anonymous, but confidentiality and privacy were ensured by adhering to the 7Cs as PALAR principles (Wood 2020). The co-researchers signed a letter of consent before participation, stating that their participation was voluntary and that they could withdraw from the research at any time, should they no longer want to participate. The data are stored electronically, using password-protected documents on Google Docs and are to be destroyed within the timeframe indicated by the North-West University record system.

■ Findings and discussion

In the following, the three themes will be discussed.

■ Theme 1: Adjustments to the early childhood care and education lesson plans and instructional resources

At first, we drew from Bennett et al. (1997) to share ideas on our understanding of the pedagogy of play and how important play is in learning to accommodate all learners, including those with developmental barriers. We underlined the relationship between the pedagogy of play, AREA and inclusive early childhood education to ensure that we all knew that it includes and supports the child holistically. We underlined that the

notion 'holistically' includes not only the cognitive, emotional, social and physical aspects of a child's development but also a safe environment, stimulation in general, responsive, supportive, caregivers, age-appropriate activities and materials, and a language-rich environment in which play-based learning can occur, curiosity can be promoted and critical thinking, creativity and problem-solving skills can be developed. Critical thinking competencies and integrated problem-solving competencies are two of UNESCO's eight key competencies that will enhance sustainable development (UNESCO 2021). C3 and C5, who have level 5 ECCE qualifications, suggested that we evaluate the centres' lesson plans (curriculum) and instructional resources and ensure our teaching integrates the pedagogies of AREA and play and that we make sure to include all children in our teaching. After the assessment, we agreed that play is not integrated into our teaching but stands apart as a specific activity that mostly happens outside of the classroom. This points to a gap in our lesson plans and instructional resources. Following views expressed by Brewer (2014) and Fesseha and Pyle (2016), C5 explained the difference between play-based learning and outside play, where play-based learning focuses on opportunities for children during our lessons, to explore, experiment, solve problems and develop various skills through play. The lesson and resources are planned to intentionally foster holistic development. On the other hand, outside play refers to unstructured play, which happens most of the time outdoors, like on the playground.

Outside play is not guided by the curriculum, nor does it have specific learning objectives; it includes exploring the outdoors, engaging in physical activities, imaginative play with peers and developing gross motor skills. C1 pointed out that play-based learning must be age-appropriate. This concurs with Burgemeester (2019), and Solis et al. (2019), who underline that effectiveness is maximised when play-based learning is age-appropriate. Therefore, children's developmental milestones and ability to socially interact with peers through play must be considered. C4 said, 'Keep the overall growth and well-being of the child in mind, and the local context' (C4, Female, July 2023). After C3 explained to some of the practitioners how play-based learning can be integrated into the classroom, we agreed that we would keep the structured lessons as a guideline and add more play to our teaching. After a lengthy discussion on applying the pedagogy of play in our teaching and learning, we agreed that there is no right or wrong way to play. We need to aim to achieve the preferred outcomes in a skilful, playful manner. C5 advised that the play activities need to be well structured. Although the children will experience learning as play, as practitioners we need to guide the play to the benefit of the learning experience.

All children need to be actively involved and motivated (Piaget 1962) in the play activity, but we need to be careful not to set rules and want to

control the games. C1 suggested that ‘children must lead us with their fantasy world, and we must look [observe] how they solve problems and express themselves’ (C1, Female, July 2023). This is in line with the AREA pedagogy that as practitioners we need to engage with the child and observe them in their learning environment to enable us to scaffold and extend the learning opportunities based on the child’s interests and abilities. Because C2 does not have any theoretical knowledge or training in ECCE, she was not happy when most of the CoP co-researchers agreed to ‘get away from the structured lessons and adjust more to play-based learning’ (C1, C4 and C5, Females, July 2023). She revealed that ‘the only way I can teach is when C3 (centre manager of the one centre) writes out my two-week lesson plan and discusses it with me’ (C2, Female, July 2023). C4 hinted that we all should come up with at least three to five practical ideas to integrate play-based learning in our lessons for the next CoP meeting.

The following is a template lesson plan, compiled by the co-researchers, as a working document with basic ideas for integrating play-based learning also.

TABLE 8.2: Practical ideas to integrate play into lessons.

Ideas	Discussions
Create a play-friendly school and class environment by re-arranging the classroom in such a manner that it encourages active exploration and play, like different play areas, such as a reading corner or pretend play corner	Space in both schools is limited, therefore we decided to only focus on the two corners. When doing art, instead of sitting at desks, we rather move either outside or onto the carpet in the middle of the floor. C4 stated that during our art activities, we must not only think of paint, colour pencils and clay but ‘bring the outside indoors’ (C4, Female, July 2023), meaning that we must use mud, water, plants and outside games, which are also a form of art. This idea matches the ‘third teacher’, of the AREA pedagogy (Browne & Hugo 2018).
Integrate the Six Bricks® Duplo Blocks (Six Bricks®) Care for Education 2020) as often as possible in the lessons. Use these when reading stories, in problem-solving activities, with social interaction, etc.	Both schools underwent the Six Bricks® training and received training materials and boxes of blocks to engage play in learning
Introduce open-ended activities without a specific outcome or answer when building blocks or dramatising a story	C3 explained to C1 that this activity is ‘like free play’ and will help the children explore and express their creativity. C3 commented that this is an ideal opportunity to observe the children and see what interests them, and C2 remarked that we can discuss their interests. C5 added that this could be the ideal opportunity to observe the children, make notes and take photographs or videos on our cell phones to identify developmental barriers, interests and strengths. This aligns with AREA pedagogy (Browne & Hugo 2018), which states that we need to observe the environment, listen to, and engage with children, providing guidance, scaffolding and extending learning opportunities based on the children’s interests and abilities.

Table 8.2 continues on the next page→

TABLE 8.2 (Continues...): Practical ideas to integrate play into lessons.

Ideas	Discussions
Plan the pedagogy according to themes that relate to the child's everyday reality (Freire 2017) and promote ESD	The idea was a challenge for all members of the CoP as the impression was that the children dictated the themes even though the themes were already structured in the lesson plans. We agreed that as part of the structured themes, we need to identify what captures the children's interest, and based on that we then engage the children in related imaginative play, role-playing and creating stories together. This implies that the children need to think independently, express themselves, communicate to share their ideas and plan play-based activities. C4 opined that '[t]his will promote social skills and language development' (C4, Female, July 2023).
Sub-community of mutual learners (Bruner 1996; Pascal & Bertram 2012), including the practitioners, parents and children This aligns with the fourth theme <i>parent and community engagement</i>	The idea was a challenge to the CoP members. We had lengthy discussions around this topic. We agreed that the parents need to trust us, therefore we need to reach out; C2 posed that we 'open the school gates'. C5 said, 'We need to try to understand the community's values and challenges' (C5, Female, July 2023). C3 remarked that 'during our parents' meetings we need to listen and be responsive to their needs and concerns. They must know that we respect and appreciate them' (C3, Female, July 2023). C5 suggested that we share our observations [photos, notes, videos] with the parents and ask them to inform us whether the children's interests or behaviour are the same at home. C3 added that she already displays the themes of the weeks at the entrance of the centre, but she will involve the parents by inviting them to participate in brainstorming ideas on the topic. C1 reminded us that 'parents are the first teacher(s) of the child; we need to encourage them to take the themes home and engage them in the household' (C1, Female, July 2023). C2 remarked that where possible, 'parents can be invited during the school [centre] time to share knowledge on their culture, jobs [professions] or hobbies' (C2, Female, July 2023), relating to the theme of the current two weeks. C5 added to the latter, saying that during the year-end prize giving, parents who actively partnered with the centre can get some recognition by highlighting their involvement and the positive impact on the learning environment. C3 indicated that this partnership will motivate parents, in general, to get involved. C4 said, 'We must plan the [parent] involvement very well so that this good initiative does not become a competition between parents' (C4, Female, July 2023).

Source: Compiled by co-researchers for this research project (2023).

The following is a template lesson plan, compiled by the co-researchers, as a working document with basic ideas for integrating play-based learning.

TABLE 8.3: Lesson plan draft.

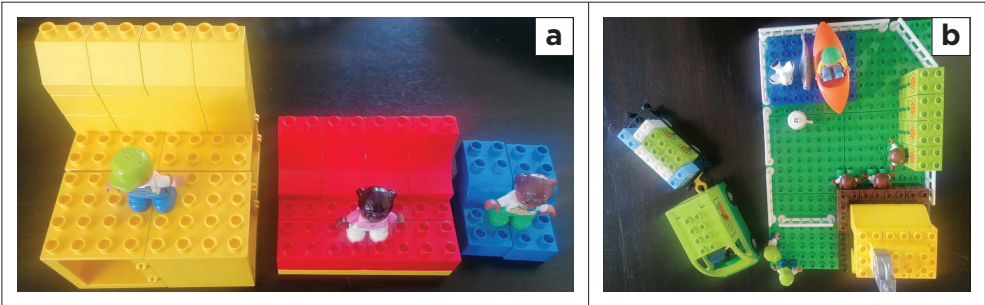
Theme: The farm		
Objective: To introduce children to the concept of a farm, farm animals and farm-related activities through play-based learning to promote ESD		
Duration: Depending on the age of the children		
Material needed:		
• Picture books about farms and farm animals • Farm animal toys • Farm-related props (e.g. toy tractors, buckets, artificial or real fruits or real vegetables) • Art supplies (e.g. crayons, markers, coloured pens and glue) • Sensory material (e.g. dry beans, hay and grass) • Farm animal flashcards or poster(s) • Six Bricks®		
Lesson plan:		
1. Introduction (5 min)	2. Farm animal exploration (10 min)	3. Farm experience (15 min)
Gather the children on the mat and introduce the theme 'The farm'	Set up a farm animal play area with different toy farm animals Encourage children to explore the animals, make sounds, and colours, touch the animals and speak about their shapes	Create a sensory farm area using materials like dry beans, hay and grass Allow children to touch and explore the material, pretending to plant seeds, feed animals or harvest crops
4. Art activity: Farm animal collage (15 min)	5. Farm animal sounds and movements (10 min)	6. Farm-related pretend play (5 min)
Provide art supplies and coloured pens Ask children to choose a farm animal they like and help them to create a farm animal collage using paper, crayons and glue Encourage them to use their creativity to decorate the animals and talk about the characteristics of the chosen animal	Show flashcards or posters of different farm animals and their names Engage the children in a game where they mimic the sound and movement of the animal shown	Set up a farm play area with props and Six Bricks® like toys tractors, buckets and imaginary or real fruit and vegetables Encourage children to engage in pretend play, taking roles such as farmers, animal caretakers or gardeners
7. Group work to act out animals on the farm (15 min)	8. Recap and closure (10 min)	9. Invite a parent or community member to share information with the children or plan a field trip
Divide the children into groups and give them 3-5 min to plan a mini-concert	Gather the children in a circle and recap what they have learned about farms and animals Ask open-ended questions to encourage discussions and reinforce their understanding of the theme Sing a farm-related song or rhyme together to conclude the lesson	In advance, contact volunteers to talk about the farm

Table 8.3 continues on the next page→

TABLE 8.3 (Continues...): Lesson plan draft.

Theme: The farm		
10. Learner support		
Visual perception: • Struggle to follow and remember objects Poor eyesight: • Rubbing eyes or constantly touching eyes • Eyes are misaligned (strabismus) • Sensitive to light • Tilts or turns head when looking at objects • Squints eyes • Closes an eye when looking at an object	Auditory perception: • Turns head to the side of the sound/does not turn head to the side of the sound • Speaks at a high volume • Asks the practitioner to repeat • Difficulty distinguishing sounds • Behaviour challenges • Looks closely at the practitioner's lips	Speech lapses: • Child struggles to pronounce words correctly – may stutter, stammer or drag tongue Language delay: • Difficulty putting words correctly together • Difficulty following a story • Struggles to organise thoughts Fine motor delays: • Uncomfortable pencil grip • Difficulty drawing/colouring pictures • Performs activities very slowly because struggling with the formation of pictures/letters/colouring

Source: Compiled by co-researchers for this research project (2023).



Source: Compiled by co-researchers for this research project (2023).

FIGURE 8.1: Examples of integrating Six Bricks® into lessons. (a) Illustrates the three different chairs of *Goldilocks and the Three Bears*. (b) Illustrates the Farm theme. Photographs taken by co-researchers on the research site (2023).

Here are examples of integrating Six Bricks® into play-based learning, compiled by the co-researchers (Figure 8.1).

Figure 8.1 shows examples of integrating Six Bricks® into lessons. The practitioner reads the story of *Goldilocks and the Three Bears*. After this, each child takes three different sizes of blocks (from the resource basket) that represent the three sizes of bears. Each child gets the opportunity to show and tell their blocks. Depending on the age of the children, they can elaborate on the colour of the block and the size. Hereafter each child gets the opportunity to select figure blocks from the resource basket and place them on the 'chairs'. Depending on the age, the children can re-tell the

original *Goldilocks and the Three Bears*, or the older children can contextualise the story relating to their family members. Depending on the age of the children, the practitioner can give more exact instructions for the child to remember and apply during the visual display of the story. The practitioner can also let the children build houses or build a patterned pathway leading to the front door. Some of the Six Bricks® bears can have a conversation. Some of the children can act out or make up a song based on parts of the story. The practitioner is not restricted to using the Six Bricks® only, extra material can also be added, like hand puppets or leaves and grass.

Theme 1 emphasises the need to adjust the ECCE lesson plans and instructional resources to foster inclusive early childhood education through the pedagogy of play. The co-researchers recognised the significance of the pedagogy of play and AREA in accommodating all children, including those with developmental barriers (Theodorou & Nind 2010). We discussed the importance of integrating play-based learning into the curriculum and lesson plans, rather than treating it as a separate activity. We agreed and highlighted that the play activities should be age-appropriate and should consider the developmental milestones and social interaction abilities of children, which is in line with Burgemeester (2019) and Solis et al. (2019). The co-researchers acknowledged the need to move away from structured lessons and embrace the pedagogy of play in their teaching while ensuring that the play activities are well-structured and guided by the desired learning outcomes. The proposed lesson plan draft (Table 8.3) offers a comprehensive and engaging approach to introducing children to farms and farm-related concepts, fostering their learning through play activities and exploration. The lesson plan provides learner support strategies that address various areas of development. These strategies aim to address individual needs and ensure that all children can actively participate and benefit from the lessons (Engelbrecht 2020). Finally, the plan suggests inviting parents or community members to share information about farms or planning field trips to provide a real-life experience related to the theme (Hoover-Dempsey & Sandler 1995, 1997).

■ Theme 2: Practitioner training and professional development

As mentioned, this project forms part of a bigger research project in which the co-researchers are engaged, and therefore their exposure to the NELDS (DBE 2009) and the NCF (DBE 2015) provide basic guidelines on the development aspect of children in ECCE. In conversation, C2 opined that:

'You all know that I have experience [*in early childhood development*] but no papers [*qualifications*], so I need help in compiling lessons based on play-based learning and supporting children with develop[mental] delays, I cannot do it on my own.' (C2, Female, July 2023)

C4 posed:

'I do have a qualification, but I do not know how to support a child with barriers [developmental delays]. I am honest, I am scared when I see there is a child with a barrier in my class. I do not know how to plan my lessons to differentiate or adjust my lessons. I also do not understand the documents [NELDS and NCF]. Luckily [*the lecturer*] trained me, but I still struggle to apply it on my own.' (C4, Female, July 2023)

We all agreed that this is a huge knowledge gap that needs serious attention, but that we need to approach the problem with due regard for the time needed for all our other activities. We decided to evaluate one lesson plan and integrate different aspects of the pedagogy of play that enable children to develop a positive attitude towards learning and a curiosity to explore new ideas and concepts (Pascal & Bertram 2012). We are in the process of adjusting the lessons and activities following the 'participatory recipe' (Wood 2020), which involves: (1) the *plan*, that is, the lesson with objectives and outcomes; (2) acting, that is, include various play-based activities needed to reach the outcomes; (3) *evaluate*, that is, make sure the activities planned are age and context related; (4) *reflect and apply*, that is, critically reflect on the practicality thereof. Hereafter, we ask the following questions:

'Did I accommodate all learners on their ability levels and in their learning styles? Did I integrate play into the learning? And how can I involve the parents in my lesson?'

Fatima (2014, 2016) states that the handling of concrete material is essential to the young child's concept development and therefore we do need time to explore a variety of tools and activities that will help them develop their senses. Engaging with the mentioned, we at one point reflected on how we can integrate the Six Bricks® activities into our lessons and storytelling. During our one session, C2 read *Goldilocks and the Three Bears* and we 'built the story' with the Six Bricks® to evaluate how it would work in practice (Table 8.3). Pascal and Bertram (2012) posit that children are naturally curious and motivated to learn, so it is up to us, as practitioners, to provide them with tools for learning in a safe and happy environment. They added that children learn best by doing. The play is the 'doing' or the work. When children are actively engaged in play and are moving around in the class, it does not mean there is no discipline in the class. On the contrary, it means that children are applying or demonstrating their knowledge in practical play.

C3 opined that ‘when we feel comfortable with the lessons and play-based activities, we can share them with neighbouring ECCE centres in the community’ (C3, Female, July 2023). The co-researchers agreed that the training material must be simple and practically implementable. C1 indicated that ‘every centre has specific challenges and requirements’ (C1, Female, July 2023), and C3 added that we need to keep the existing skill levels, resources and potential barriers to training in mind. C4 replied:

‘[W]e are lucky to have you [me as the research facilitator] with us. You taught us a lot, the other [*practitioners*] are not so lucky, therefore we need to share our knowledge.’ (C4, Female, July 2023)

We agreed that after our lesson plans are well-adjusted and practically applicable for a rural ECCE, we can select and train skilled volunteers with the ability to code-switch between English and Tswana, who can effectively deliver the programme to ECCE centres in the area. The CoP will provide them with comprehensive training materials, pedagogical techniques and ongoing support to ensure they can effectively impart knowledge to the practitioners. C5 suggested that we can engage parents with ECCE knowledge from the school community to support in this regard. She mentioned that there are three parents that she knows of with ECCE qualifications who are not currently active practitioners whom we can approach in this regard. This echoes Adu (2014) and Agarwal et al. (2010), who underline that to effect change in a community, the teachers from neighbouring schools (ECCE centres) need to collaborate and learn from one another, to adapt and differentiate the curriculum, and share lesson plans to enhance practicality within the context of learning.

Theme 2 focused on *practitioner training and professional development*. The co-researchers acknowledged the knowledge gap among practitioners in terms of integrating play-based learning and supporting children with developmental delays (Biersteker et al. 2013; Engelbrecht 2020; Ginja & Chen 2021; Harrison 2020). We recognised the need for training and practical guidance in these areas. The co-researchers discussed the importance of evaluating and adjusting lesson plans to incorporate play in learning and the use of concrete materials. We emphasised the need to involve parents and community members with ECCE knowledge in supporting the training efforts. Gerdes et al. (2020) underline this when stating that collaboration ensures a conducive learning and support environment. We intended to create practical and implementable training materials that consider the existing skill level, available resources and potential barriers to training. The involvement of skilled volunteers and parents was seen to expand the reach of the training and support practitioners in various ECCE centres. C4 asked ‘[...] and what about our parents?’ (C4, Female, July 2023). This brings us to the third theme of parents and community engagement.

We agreed on the importance of engaging the parents and the community in the centre. I suggested we draw from Epstein's six types of involvement to structure our conversation:

1. *Parenting* refers to the role that the parent plays in supporting the child at home. C3 suggested that we have a 5-min talk on a specific topic during parent evenings or put up some posters that we change often at the entrance of the centre, touching on topics like ADHD or discipline.
2. *Communication* between the centre and the parents happens weekly through WhatsApp messages. C5 suggested that parents prefer communication via WhatsApp rather than face-to-face and that the communication flow is primarily one-way from the centre to the parent. C4 said that the theme of the week is communicated, along with any other information that is needed. She felt that communication with parents in general is effective. She mentioned that some of the parents are not at all interested in getting involved in centre activities and said, 'I learned to live with that' (C4, Female, July 2023). C5 added that:

'Young mothers born after 2000 have no respect for education or practitioners and we struggle to communicate with them. They feel that they are right and do not see reason. I have an agreement with my staff that we report every incident. We each have an *At-Handbook* in our classes in which we write up all incidents so that we can be prepared; we cannot afford to lose children because of parents that do not know how to behave.' (C5, Female, July 2023)

Marin and Bocos (2017) point out that both parents and practitioners lack constructive interaction and effective communication skills to create a friendly centre atmosphere.

3. *Volunteering* refers to parents actively taking part in centre activities. The CoP members all agree that the parents are willing to participate, but the 'background and the literacy level and the working hours' of the parents hinder their involvement (Güzeltürk et al. 2019). C5 pointed out that the area in which the centre is situated is very poor on all levels (financially, services, education and safety) and 'it is only by the grace of God that we flourish in this centre' (C5, Female, July 2023). This aligns with Güzeltürk et al. (2019) that these variables influence parental engagement.
4. *Learning at home* in some households is a challenge because of the socio-economic situation. C2 reminded us that:

'[A] lot of our parents have low literacy levels and do not have access to storybooks; therefore, we encourage parents to involve the children in household chores, but not only to tell the children to take out the rubbish; talk to them about rubbish, hygiene, recycling etc. We share some ideas over WhatsApp.' (C2, Female, July 2023)

5. *Decision-making* to include parents in school-related aspects might be a challenge according to C4 because of the socio-economic challenges. C1 added that 'we need to plan it very well so that parents, and I am referring to the young ones, don't take over and create chaos' (C1, Female, July 2023). This supports the statement by Marin and Bocos (2017) that parents and practitioners lack knowledge of constructive communication, which can hinder partnerships.
6. *Collaborating with the community* to emphasise the importance of parents, practitioners and the community to take hands to support children's education. C1 said, 'Currently, we do not engage with the community' (C1, Female, July 2023). C3 remarked, 'What about asking parents or community members to [come and] tell traditional stories to the children? They can code-switch, or we can translate, show some dances, tell the kids about different traditional food' (C3, Female, July 2023). The CoP members suggested that workshops or training sessions specifically designed for parents and community engagement in ECCEs that cover various topics such as collaboration skills, early literacy, positive discipline or creating a supportive learning environment at home, can be presented. Enhancing parents' knowledge and skills, and those of the community will enable all parents to play an active role in their child's education. In the process, the practitioner will get the opportunity to become aware of the parents' goals, aspirations and concerns for their children's education. This will result in developing individual activities, and help provide support, where the parents can feel valued in knowing that their perspectives are considered. By embracing these strategies, the ECCE centre will create a collaborative and supportive environment that nurtures parental engagement in their child's early education. This forms part of understanding human action and behaviour and the importance of social interaction, all embedded in the praxeological worldview in early childhood (Pascal & Bertram 2012).

The third theme highlights the importance of parent and community engagement in ECCE centres (Adu 2014) that talks to SDG 17 (partnerships for the goals) because multi-stakeholder partnerships can promote quality education. The co-researchers acknowledged the challenges and limitations faced in engaging parents, especially those from disadvantaged backgrounds. We discussed various approaches, such as targeted communication through platforms such as WhatsApp, sharing information on specific topics during parent evenings and involving parents in centre activities to the greatest extent possible. As co-researchers, we recognised the need to address barriers to parental involvement, including low literacy

levels and socio-economic challenges. In line with Agarwal et al. (2010), we also discussed the potential for collaborating with the community to enhance parental engagement, such as inviting community members to share stories, dances or traditional knowledge with children to not only promote indigenous knowledge but also promote ESD. We also suggested workshops or training sessions specifically designed to improve parents' knowledge and skills, fostering collaboration among parents, practitioners and community members SDG 17 (partnerships for the goals).

■ Conclusion

This chapter reports on how an ECCE lecturer and ECCE practitioners working in a CoP collaborate in developing strategies based on Target 4.2 of SDG 4 (Quality Education) to foster inclusive early childhood education through the pedagogy of play in their centres. Sustainable development goal Target 4.2 focuses on ensuring all girls and boys have access to quality early childhood development, care and pre-primary education to be ready for primary education. The target highlights the importance of providing children with a solid foundation during their early years through proper care and education, which can significantly impact their overall development and future success in formal schooling. The findings of this research emphasise the need for adjustments in the ECCE lesson plans and instructional resources to promote ESD. The importance of practitioner training and professional development in this regard was highlighted. Additionally, the findings underscored the significance of parent and community engagement in creating a collaborative, sustainable and supportive environment for children's education (SDG 17). By addressing these knowledge gaps and implementing the suggested strategies, ECCE centres can enhance their practices and foster inclusive early childhood education through the pedagogy of play. In the process, we will support the holistic development of children, including those with barriers, and promote meaningful engagement with parents and the community.

Although the data were generated in under-resourced ECCE centres in the Kenneth Kaunda district, the findings are not limited to the specific context. Research on inclusion in ECCE is scarce and needs to be shared with the bigger ecology of knowledge that is a valued contribution to the community and one of the requirements of PALAR. This line of thought coincides with the PALAR paradigm that aims to bring about change and encourage participants to become lifelong learners who learn, unlearn and relearn in a changing society.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-0161519-A2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Challenges experienced in early childhood care and education centres to promote quality education: The view of practitioners as co-researchers for sustainable development¹²

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■ Abstract

Quality early childhood education is a complex challenge that requires practitioners to be knowledgeable about the development of young children and to be able to provide a supportive learning environment that

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meets the needs of diverse learners enrolled at early childhood care and education (ECCE) centres. Motor development lays the foundation for holistic development. Therefore, identifying the intrinsic and extrinsic challenges faced by practitioners in practice while trying to promote the motor development of young children is crucial to ensure quality education (sustainable development goal [SDG] 4).

A qualitative research approach was adopted, following a participatory action learning and action research design in Cycle 2 of the research project reported on in this chapter. An action learning group (ALG) was formed that explored the challenges experienced by practitioners in ECCE centres in South Africa with regard to promoting motor development. This action would enable them to identify and overcome the challenges hindering sustainable development in ECCE centres. The data generation strategies included online questionnaires, collaboration and dialogue through informative discussions in the ALG. Investigating these challenges led the ALG to understand the context better and to collaboratively improve practice in ECCE centres for sustainable development through education.

■ Introduction

Quality education in early childhood care and education (ECCE) refers to a comprehensive approach to education that includes young children's social, emotional, cognitive and physical development – referred to as holistic development – as well as motor development. As children are regarded as holistic beings in current educational systems globally, the culture and context (environment) in which children live and play form a crucial part of their development. Since the adoption of the United Nations sustainable development goals (SDGs) (United Nations 2015), there has been increasing recognition of the fact that quality education (SDG 4) for sustainable development is an important means of addressing the ongoing process of challenges that may hinder the holistic development of children in the early years. Furthermore, children who receive education for sustainable development (ESD) are better equipped to be global citizens (Collins & Garrity 2023).

Quality education in the early years aims to provide young children with a sound foundation to ensure lifelong learning and support children in reaching their full potential while becoming contributing citizens of an inclusive society (United Nations Educational, Scientific and Cultural Organization [UNESCO]). Factors such as the culture and the context of a child influence what the child is exposed to and have a positive or negative impact on the development of the child (Bakken, Brown & Downing 2017; Woolfolk & Perry 2012).

Children are born eager to learn; therefore, the adult in the child's micro-environment, in this research referred to as the practitioner, plays a critical role in offering opportunities for learning to take place. A child will thrive in a positive learning environment where opportunities are created to stimulate development, but lasting developmental delays can become a reality in a negative learning environment that does not offer opportunities for stimulating development (Harrison 2020; Somerville & Williams 2015).

Somerville and Williams (2015) refer to a research report compiled in a deprived socio-economic environment which found that children in these learning environments struggled to reach age-appropriate developmental milestones. Furthermore, the findings of this report indicate that, in general, practitioner and parental knowledge and training are lacking in deprived socio-economic contexts where the importance of creating a stimulating learning environment and holistically stimulating children – both crucial in quality education – is neither recognised nor understood (Harrison 2020).

To strengthen the quality of ECCE, parents and the community must be involved in ECCE centres, especially because ECCE centres offer a foundation for the long-term cultivation of sustainable and pro-environmental attitudes (Ärlemalm-Hagsér 2013). Joint involvement (partnerships) may ensure a safe and nurturing environment that promotes optimal learning and development to provide opportunities for positive long-term outcomes and socio-economic benefits for society, even though challenges are faced daily (Mahadew & Hlalele 2022). The challenges faced by practitioners in ECCE centres while trying to stimulate young children should be understood in context to ensure that quality stimulation takes place and to be able to find ways to overcome these challenges so that development in the early years is not hindered.

Overcoming the challenges resonates with Target 4.2 which is focused on quality education and lifelong learning (United Nations South Africa 2022). The 2030 National Development Plan indicates the importance of access to early learning for all children in South Africa. The South African Department of Social Development (2006) refers to ECCE centres as any non-residential facility, including a building, home or school, where children aged nought to six years are taken care of and are supposed to receive education through a stimulating programme for optimal development when parents need a safe space for their children to be taken care of when they are at work.

The concept of quality ECCE in South Africa further entails that not only should all children have access to an ECCE centre but also that such an

ECCE centre should be close to the family home. Furthermore, the ECCE centre should offer programmes based on a developmentally appropriate curriculum offered by qualified or trained practitioners with access to sufficient resources and information to ensure quality stimulation (Mncube & Harmsen 2017).

This research is primarily concerned with understanding the challenges experienced by practitioners while they try to provide sustainable and quality education (stimulation) in the early years, specifically, while promoting motor development. The challenges identified by the practitioners who served as co-researchers were limited to three under-resourced ECCE centres in an informal settlement and, therefore, may differ in another context.

■ Background of the study

In the South African context, specifically in informal settlements, practitioners experience various challenges that influence the stimulation and development of young children attending ECCE centres daily. A general crisis in the ECCE sector highlights that the practitioners who work in ECCE centres in informal settlements are often unqualified or untrained and, therefore, only keep children safe and fed, without exposing them to stimulating activities (Harrison 2020).

Informal settlements are found all over South Africa and are mostly poverty-stricken areas where poor-quality housing or shacks are home to many people. They are normally built on municipal grounds and are often far from quality education facilities (Satterthwaite et al. 2020). Statistics South Africa (2017) found that 33% of South African children below the age of four attend ECCE centres in informal settlements, where formal ECCE training for practitioners is not necessarily required. In 2019, the *South African Early Childhood Review* indicated that over a million young children did not have access to early learning programmes and emphasised the importance of stimulating development early in a child's life (Ilifa Labantwana 2019).

Dawes, Biersteker and Hendricks (2012) found that children entering schools with previous ECCE offered by trained practitioners outperformed those without quality ECCE. In ECCE centres in informal settlements, children are often restricted to a small space with limited movement opportunities and may even be strapped to a caregiver's or practitioner's back for long periods. These restrictions are seen as challenges because children learn through movement. Consequently, being limited in space or movement prevents young children from developing optimally, resulting in them not reaching their milestones (Institute of Medicine and National

Research Council 2015). This suggests there is a need to educate and train the ECCE workforce and provide quality, affordable care and stimulation (education) for young children attending ECCE centres to ensure sustainable development.

Learning about the importance of stimulating young children to develop optimally and gaining knowledge about young children learning best through movement (Haywood & Getchell 2020; Hestbaek, Andersen & Skovgaard 2017) guided me in a collaborative research journey of the importance of motor development for sustainable development through quality education. Children's gross motor development is delayed when they are confined to small spaces. Children in green outdoor environments have better motor development, engage in more physical activity and are absent less because of sickness (Mårtensson et al. 2009). To ensure that quality motor development is promoted, practitioners need to identify challenges that hinder stimulating motor development and find ways to overcome these.

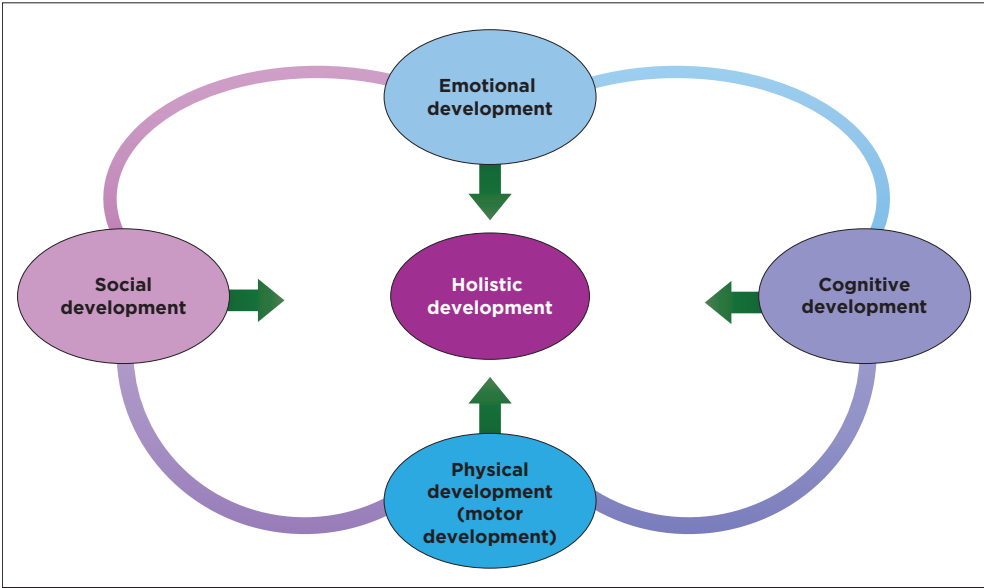
This research journey unfolded as a relationship developed between three ECCE practitioners, as co-researchers, and me. The co-researchers worked as both practitioners and centre managers at three different ECCE centres in an informal settlement. The research journey started with an investigation of the practitioners' current knowledge of the importance of motor development from as young as possible. Another factor that was investigated was how practitioners could be supported to promote the motor development of young children in under-resourced ECCE centres. In Cycle 3 of this research, the co-researchers and I collaboratively developed an educational intervention, consisting of stimulating motor development activities to support practitioners in under-resourced ECCE centres. These activities were created so that practitioners at ECCE centres can use them to stimulate the motor development of young children. The activities can also be adapted to stimulate the holistic development of children. In this way, practitioners are also supported to overcome intrinsic and extrinsic challenges that can hinder young children from developing optimally. Thereby, the intervention contributes to quality early education and learning and the sustainable development of young children in ECCE centres.

■ Understanding motor development as a component of holistic development in the early years: Theoretical perspective

De Jager (2017), Gordon and Browne (2016) and Voko, Duci and Tahsini (2014) all agree that there are different domains of growth and development

and that these areas cannot operate independently or be separated when one looks at human growth and development. To better understand the challenges faced by practitioners when they try to promote motor development, it is important to know that motor development is a component of physical development that lays the foundation for all other areas of development, including young children’s social, emotional and cognitive development, which together are referred to as holistic development (Clark & Metcalfe 2002; Goodway, Ozmun & Gallahue 2021), as depicted in Figure 9.1.

Research has found that social development starts when a baby is born and is a lifelong process (Malik & Marwaha 2021). The foundation for attitudes, values and behaviour is laid from day one and eventually includes skills such as sharing, talking and waiting for one’s turn, which are learnt while learning takes place through movement (Essa 2014). These are basic skills to be learnt to function in society. Bandura’s (1977) social learning theory states that children learn by observing others’ behaviour and imitating the behaviour they are seeing. Forming good relationships with the people around them is fundamental to the social development of children. This notion is supported by Bronfenbrenner’s (1974) social-ecological theory, which suggests that children’s development is influenced by various systems and social circles, with the child seen as the centre point.



Source: Author (2023).

FIGURE 9.1: Developmental components contributing to holistic development.

Children learn to communicate through emotions long before language is developed (Brodie 2018; Malik & Marwaha 2021). Stimulating, interactive activities are important to guide children to develop emotionally and express what they are feeling. Children have a set of emotional responses from a very young age that are influenced by the feelings children have within themselves caused by other people, things or events in their environment. Emotional behaviour is also part of cognitive processes, and practitioners should be aware of the different experiences of young children and act accordingly when faced with different emotional reactions and behaviours of children while stimulating activities are promoted in the ECCE centre (Charlesworth 2017). Therefore, it is of the utmost importance that the practitioner also builds a relationship with the parents to ensure that they are prepared for whatever reactions their young children may have because of experiences in their environment that affect their emotional reactions and behaviour at the ECCE centre.

Cognitive development is a holistic process of acquiring, organising and applying knowledge gained in the active learning process, drawing on all areas of learning and development from individual experiences (Brodie 2018; Essa 2014; Malik & Marwaha 2022). Piaget's theory of cognitive development marks the idea that children construct knowledge and form their own beliefs from their own first-hand experiences, specifically while learning through movement (Brodie 2018; Paul & Singh 2020). Children are born curious and are competent learners from the day they are born (Cherry 2020).

Piaget (in Charlesworth et al. 2020) describes the stage between birth and 2 years of age as the sensorimotor period in which children learn about the world around them. His description is supported by Bandura's (1977) social learning theory, which highlights that children learn from people and the environment around them, as well as through imitation of what they see and do. Piaget's theory underpins the fact that young children use all their sensory skills to learn, including touch, taste, sight, hearing, smell and using their muscles. Using muscles when one learns entails the stimulation of young children's motor skills (Charlesworth et al. 2020). Children learn through play, which is a movement process that uses motor skills to stimulate cognitive development; in turn, the social and emotional developmental areas are also promoted. Therefore, children need opportunities to use their sensory and motor abilities to learn basic skills and concepts.

Physical development refers to health and fitness benefits, brain development and learning in young children (Clark 2007). One of the components of physical development is physical growth, which, in the early years, includes a rapid change in size, weight and body

proportion (Brains 2015). In addition, physical development includes developing motor skills and entails components such as mobility and developing control over the body, specifically control over muscles and physical coordination. These components are referred to as motor development, which is a second component of physical development and forms the basis for all other developmental areas contributing to holistic development, as mentioned earlier and illustrated in Figure 9.1 (Brodie 2018; Cooper & Harlow 2018; Essa 2014; Excell & Linington 2020; Goodway et al. 2021).

Furthermore, for a young child to optimally develop holistically, he or she needs a safe environment that includes parents, caregivers or practitioners who make the child feel loved, safe and cared for. These adults are responsible, as practitioners, for caring for children who attend ECCE centres daily to optimally stimulate and develop all children holistically while overcoming challenges (Brodie 2018). A well-trained workforce positively contributes to the development of young children, even in environments with limited resources (Biersteker et al. 2016). Furthermore, the workforce who form partnerships for change (SDG 17) are enabled to overcome challenges faced during the stimulation of motor development – which is crucial to the young child’s development – to ensure quality ECCE.

■ Methodology

The research sites in this study were three under-resourced ECCE centres in an informal settlement in South Africa that accommodate babies, toddlers and young children between birth and six-years-old. The participants (co-researchers) were recruited by a gatekeeper from an independent non-profit organisation that supports the centres that participated in the study through donations.

The co-researchers were recruited based on specific criteria. They had to be practitioners who could speak, write and read Setswana or English, who would be available for the duration of the study, who had at least two years of work experience in an ECCE setting and who were enthusiastic and showed interest in being involved in the study. The co-researchers were not only ECCE practitioners but also the centre managers of the three identified centres.

■ Biographical details of participants

The co-researchers are referred to as P1, P2 and P3 as indicated in Table 9.1. All three participants are females and completed the EDTP-SETA (Education, Training and Development Practices Sector Education and Training Authority), ECD (early childhood development) and NQF (National Qualification Framework) Levels 4 and 5 certificates, at the

TABLE 9.1: Pseudonyms of co-researchers.

Pseudonym	Participant
P1	Manager at Centre 1 (C1)
P2	Manager at Centre 2 (C2)
P3	Manager at Centre 3 (C3)

Source: Author (2023).

time of the research. Furthermore, all three participants can speak English and Setswana, and P1 are also fluent in Afrikaans. P1 was a 41-year-old female with seven years of experience in ECCE. P2 was a 53-year-old female with eight years of experience and P3 was a 60-year-old female with 16 years of experience.

Together we formed an action learning group (ALG). We discussed and identified various challenges experienced by ECCE practitioners that influence the quality of education and quality stimulation (education) in the aforementioned ECCE centres. The aim of the study was explained to all the co-researchers, who signed informed consent forms before the data generation commenced.

This study is based on research conducted for my doctoral study, which took place in three cycles. This chapter focuses on Cycle 2, which unfolded in continuous, iterative cycles of planning, acting, reflecting and identifying to address the second secondary research question: *What are the challenges practitioners are confronted with in promoting the motor development of children in under-resourced ECCE centres in informal settlements?*

The real-life, day-to-day challenges faced by the participating ECCE practitioners were collaboratively identified by the ALG. These challenges were investigated to better understand the context and to collaboratively overcome them in an attempt to support practitioners who work in ECCE centres in informal settlements and strive to stimulate young children in their care. The solution to the challenges unfolded in Cycle 3 of the bigger study when the educational intervention was developed. (I only mention the educational intervention to help the reader understand the entire project better and how sustainable development is ensured).

A qualitative approach was employed to identify the challenges that were experienced by the practitioners, and which had an effect on the quality of stimulation and development of young children in these ECCE centres. A participatory action learning and action research (PALAR) design was followed, which is defined by Zuber-Skerritt (2018, p. 13) as ‘a special kind of action research that integrates various concepts and processes, including lifelong learning, collaborative action learning, participatory action, and action leadership’. I obtained ethical clearance from the Faculty of Education and followed the guidelines set out by the committee.

The North West Department of Education also granted permission to conduct research. To protect the rights and privacy of the co-researchers, they signed informed consent forms after they had been informed what the study would be about and what would be expected of them.

As co-researchers in this study, our behaviour, strategies and methods and our ability to improve practice were influenced by living experiences evolving from acting and reflecting through action research (see Zuber-Skerritt 2018). We shared our experiences, learnt from one another and broadened our way of dealing with challenges experienced in caring for developing babies, toddlers and young children (nought to four-years-old).

Finding solutions to the research problem took place in a safe space through collaborative, informative discussions in the ALG and was followed up with an online questionnaire to support the research question. I came to realise that individuals in the context of my co-researchers constructed multiple realities. Relationships were formed, and informative discussions led us to successfully identify the challenges these practitioners experienced in attempting to stimulate motor development. These discussions also made us realise that the challenges identified were not limited to motor development but were experienced in overall development within ECCE centres.

Each cycle commenced with building relationships among the co-researchers within the ALG, following the PALAR principles referred to as the seven Cs and three Rs (Wood 2019). The seven Cs are communication, commitment, competence, compromise, critical self-reflection, collaboration and coaching; the three Rs are relationship building, reflection and recognition. Together, the seven Cs and three Rs support and promote knowledge creation and practical, social and educational improvements in the specific research context. We adhered to these principles, as we built relationships, had mutual respect in the ALG and encouraged and allowed for constant change and transformation within the group. We empathised with one another's circumstances and respected one another's feelings and time.

The co-researchers in this study were actively involved in the data generation methods and, through active participation, gained a deeper understanding of the dynamics of the research problem (see Nieuwenhuis 2019). To answer the specific research question, we used online questionnaires, informative discussions in the ALG and transcriptions of recorded sessions of the ALG meetings as data generation methods. These methods worked well, and our relationships became stronger as we collaboratively shared the challenges experienced.

Different interpretations of data are possible when different data generation methods are used during the various stages of a research process (Creswell & Creswell 2018). Therefore, we followed specific steps to analyse the data, namely:

- Organising and preparing the data for analysis through coding
- Coding the data by analysing the connections between them
- Generating a description and themes (this will follow in pattern coding, where patterns are identified, themes are written down and one sees how patterns develop)
- Presenting the description and themes and simultaneously coding multiple codes of the same concepts.

In this research, pattern coding was used effectively, as we all sat together and divided the data into themes according to the secondary research questions. The second secondary research question was coded as the second theme, which was about the challenges the practitioners were confronted with in promoting motor development in ECCE centres. At this stage, I came to realise that the data were relevant to not only the challenges faced in promoting motor development but also those experienced in promoting the holistic development of young children.

■ Guiding theory

The challenges experienced by practitioners in stimulating motor development include constraining factors in the environment in which babies, toddlers and young children learn and develop, which are linked to the environmental influences as classified by Bronfenbrenner's ecological systems theory, which focuses on human development (Brodie 2018; Essa 2014). Both Bronfenbrenner's (1974) theory and Gesell's (1925) theory highlight how the sustainability of holistic development of young children is influenced by constraining factors in the environment, which include culture and the background of the family that the child is born into, health circumstances and parenting style, which also resonates with Engeström's (2001) cultural-historical activity theory. Furthermore, events such as natural disasters, wars, the economy and social unrest in children's environment will influence their development and should be considered when we look at holistic development, specifically motor development (Kuther 2018).

Intervention should be seen as part of the layers referred to in Bronfenbrenner's theory, which have an influence on children's development and are necessary to be able to guide the optimal development of young children in ECCE centres and assist practitioners in practice to overcome

challenges hindering motor development (Essa 2014; Rala & Salami 2019). Practitioners need to be aware of the continuous change in the development of the children in their care and assess and adapt from day to day to ensure that the children's needs are met. The progression of a dependent baby to an independent young child relies on the stimulation and support of his or her cognitive, social, emotional and physical – thus holistic – development from the ecological system (Brodie 2018; Paul & Singh 2020).

Educational interventions are developed for practitioners in ECCE centres to overcome challenges faced and to contribute to the motor development, as well as the holistic development, of children because the practitioners become aware of stimulating activities to overcome challenges faced and learn about age-appropriate motor skills that should be gained by and developed in young children (Esterhuizen & Grosser 2014). Practitioners do not always promote motor development because of various challenges experienced and not having the knowledge and skills to overcome these challenges (Essa 2014; Excell & Linington 2020). Therefore, as co-researchers, we developed an educational intervention to support practitioners in under-resourced ECCE centres in informal settlements. So, in this research, we focused on the challenges experienced by the practitioners in the motor development of babies, toddlers and young children in ECCE centres.

According to Bronfenbrenner (1974), environmental influences are classified as a microsystem, mesosystem, ecosystem, macrosystem and chronosystem. The *microsystem* refers to the people who are closest to and have the biggest and most direct influence on the child's development, such as the parents, family, other children who attend ECCE centres and, specifically, the practitioners taking care of the child daily. In some cases, children spend more hours with these practitioners in a day than they spend with their parents. The predominant part of this study took place in the microsystem, namely the ECCE centre, where the development of the children is the practitioner's responsibility.

The *mesosystem* refers to the connections children make between the immediate environment, such as relationships in the child's world and between the home and the ECCE centre. The practitioners at the ECCE centre must relate to one another and form positive relationships to work together towards the optimal development of the babies, toddlers and young children in their care (Essa 2014).

The *ecosystem* refers to the external settings in the child's environment that influence his or her development indirectly. In other words, the environment in which the child is not directly involved still influences his or her development. An example of an ecosystem is the parents' workplace,

with parents having to work long hours and leaving young children to stay with grandparents or the practitioners at the ECCE centre, and the influence that family, friends, neighbours and legal services have on the child (Essa 2014; Rala & Salami 2019). The child may long for his or her mother, and this emotional struggle can influence the child's development.

The *macrosystem* refers to the wider cultural context and beliefs of the family and the community (Nel et al. 2016). In South Africa, many diverse families with different backgrounds send young children to the same ECCE centres, specifically in informal settlements. The macrosystem further includes the influence on children's development because of economic and political influences. The lack of quality services, including a lack of decent centre facilities and transport to and from centres, and a lack of opportunities for training practitioners that, in turn, leads to a lack of trained practitioners in the ECD workforce, are part of the macrosystem that influences the young child's development.

The *chronosystem* refers to continuous changes in the child's life, which are not static but take place over time and include social structures, culture and history within a specific environment and context that shape people (Rala & Salami 2019). From an ecological perspective, the child is seen as part of various systems, each layer influencing the development of babies, toddlers and young children (Essa 2014). My study drew from Bronfenbrenner's (1979) ecological system theory to identify the challenges experienced by practitioners trying to stimulate the children in their care at ECCE centres. Because practitioners must understand the development of young children in the specific cultural and socio-economical context in which they work in order to improve their practice, it is worth mentioning that the challenges experienced are also underpinned by Engeström's (2001) cultural-historical activity theory.

To ensure quality care and quality education in ECCE centres in informal settlements, practitioners must gain contextual knowledge of the environmental challenges that influence children's development (Fahey, Insel & Roth 2006; Gallahue & Donnelly 2003; Marotz 2020).

■ Findings and discussion

This research aimed to investigate the challenges influencing the motor development of young children in under-resourced ECCE centres in South Africa. To reach our objective, it was important for the ALG to first investigate the real challenges and the influence of interaction among changing constraints that ECCE practitioners face in ECCE centres for us to understand the context better and be able to collaboratively improve the practice for sustainability.

In Cycle 2, the iterative cycles of planning, acting, reflecting and identifying the challenges experienced guided the ALG in identifying and categorising the intrinsic and extrinsic challenges that the practitioners were confronted with in promoting motor development in ECCE centres. Finger and Houguet (2009) describe intrinsic challenges as challenges that practitioners may face on a personal level, such as a lack of professional knowledge and understanding of the intended curriculum, which can lead to a lack of professional attitude and teaching approaches. Extrinsic challenges are related to environmental factors, such as a lack of resources, that may hinder development processes (Finger & Houguet 2009).

The process of identifying intrinsic and extrinsic challenges unfolded with informative discussions in the ALG and an online questionnaire to support the second secondary research question. All the codes emerged, and I clustered these under relevant themes that relate to the type of challenge identified. Table 9.2 shows the intrinsic and extrinsic challenges identified as themes relevant to this cycle.

TABLE 9.2: Themes identified.

Challenges	Themes	Codes
Intrinsic challenges	Lack of professional knowledge	Lack of knowledge of how to use the guidelines available to stimulate motor development
		Lack of knowledge of how to promote motor development in ECCE centres in informal settlement
	Lack of professional attitude	Lack of motivation – practitioners lack the motivation to promote stimulating motor activities because of a lack of professional knowledge and understanding of the importance of motor development
		Lack of commitment to promoting stimulating activities in ECCE centres because of limited knowledge and low remuneration
		Lack of loyalty among practitioners, low remuneration and motivation; practitioners are not loyal and leave the centre, which influences the motor development of children in ECCE centres
	Lack of development approaches	Lack of creativity , because of a lack of knowledge, motivation and commitment, influences motor development in ECCE centres
Extrinsic challenges (socio-economic challenges)		Lack of language proficiency – the language of learning and teaching is English, that is the second or third language of practitioners
	Environmental factors	Informal settlement – impoverished communities influence the motor development of children in ECCE centres
		Little space for motor development
		No or limited resources for practitioners to use to stimulate motor development
		Natural disaster – the COVID-19 pandemic negatively influenced motor development in ECCE centres

Table 9.2 continues on the next page→

TABLE 9.2 (Continues...): Themes identified.

Challenges	Themes	Codes
Lack of professional training		Limited opportunity for training for the workforce working with 0–4-year-olds leads to a lack of professional knowledge and attitude
		Unqualified practitioners lead to a lack of professional knowledge and a lack of professional attitude to promoting motor development
		Low remuneration because of an unqualified, untrained workforce leads to a lack of professional attitude
		Turnover of staff because of a lack of professional attitude to promote motor development
Lack of parental support		Lack of parental involvement in promoting motor development collaboratively
		Lack of parental commitment to pay school fees
		Turnover of children because of non-payment of school fees, with babies, toddlers and young children being moved to other centres

Source: Adapted from author's thesis – Taylor (2023).

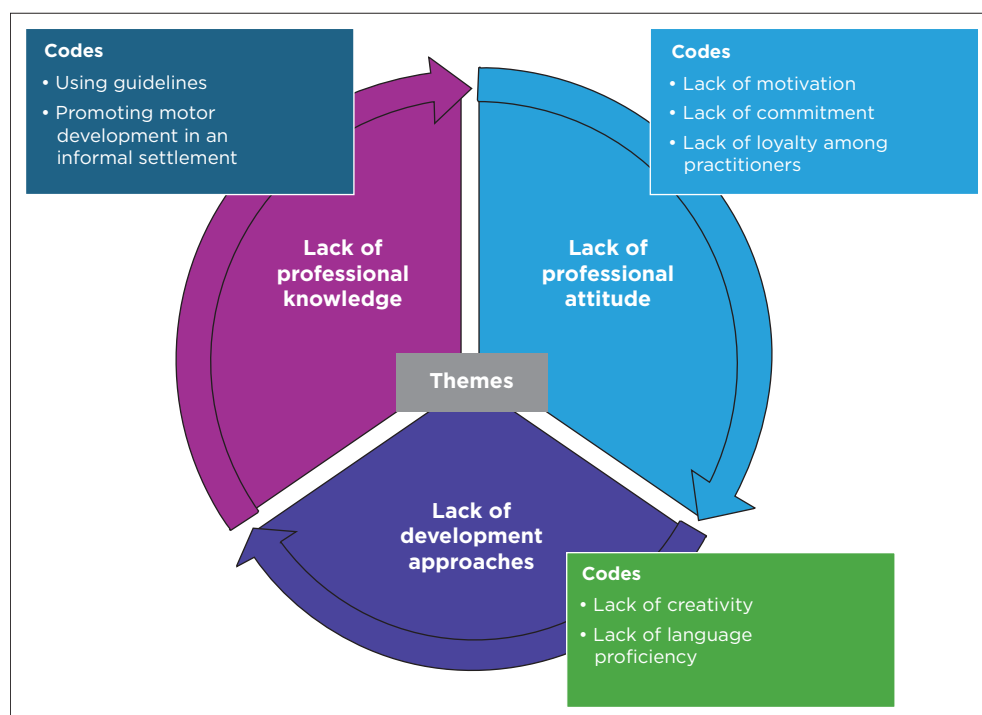
Through the ALG reflections, I found that the challenges identified are not limited to motor development but affect all developmental areas of young children. As motor development lays the foundation for future learning (Biersteker et al. 2016), it is crucial to identify and overcome challenges to ensure sustainable and quality ECD through education.

Keeping this in mind and through informative discussions and reflections in the ALG, as well as the online questionnaire completed by the ALG, I realised that ECCE practitioners who work with children in ECCE centres confront various challenges, which directly and indirectly influence all developmental areas of the children in their care. In this research journey, the practitioners and I, as co-researchers, collaboratively identified the intrinsic and extrinsic challenges that the ECCE practitioners were facing while trying to stimulate and develop young children in their care. I came to realise how these challenges influence practitioners' task of stimulating the motor development of babies, toddlers and young children in their care.

While listening to the collaborative discussions of the intrinsic and extrinsic challenges experienced by the co-researchers, I realised that these challenges have an interrelated influence on one another, as seen in Table 9.2. The identified intrinsic challenges are discussed next.

■ Intrinsic challenges

The themes identified as intrinsic challenges are illustrated in Figure 9.2. The themes are *a lack of professional knowledge*, *a lack of professional attitude* and *a lack of development approaches*. The codes identified are *a*



Source: Adapted from author's thesis – Taylor (2023).

FIGURE 9.2: Themes and codes identified under 'intrinsic challenges'.

lack of professional knowledge of guidelines and stimulating motor development in ECCE centres and a lack of practitioner motivation, commitment, loyalty, creativity and language proficiency. The themes are discussed here.

The intrinsic challenges as factors that influence development in an ECCE centre can be described as challenges that practitioners who work with young children face personally and professionally, including a *lack of professional knowledge* and understanding of the intended curriculum (or guidelines), which, in turn, will lead to a *lack of professional attitude* and a *lack of development approaches* (Finger & Houguet 2009). Professional attitude refers to the practitioner's motivation and commitment to stimulating development. Development approaches refer to how the practitioner develops young children, including the language used in the playroom to teach them.

A *lack of professional knowledge* was identified as a challenge while investigating the current knowledge and skills of practitioners in promoting motor development in ECCE centres. The lack of professional knowledge was clear when I found that the practitioners were not aware of the two guideline documents – the *National Early Learning and Development*

Standards (DBE 2009) and the *National Curriculum Framework* (DBE 2015) – set out by the government to support practitioners in stimulating young children in ECCE centres. Their lack of knowledge was because of environmental factors, such as practitioners having limited or no access to training. While observing what the practitioners did to stimulate the motor development of children in ECCE centres, I found that, most often, ECCE practitioners do not know how to stimulate the motor development of young children. Because of their lack of knowledge, the practitioners are not aware of national guidelines that could assist them in developing young children in their care, and therefore, they most often only keep children safe and fed.

A lack of professional attitude is a crucial challenge within the ECCE workforce. The co-researchers experienced that practitioners are not motivated to stimulate young children in their care, possibly because of a lack of professional knowledge. *A lack of professional attitude* is an intrinsic constraint identified, which includes practitioners lacking the motivation to stimulate motor development because of a lack of professional knowledge in this regard, which also leads to a lack of commitment, not only because of a lack of professional knowledge but also because of a low salary, which is an extrinsic constraint. As centre managers, the co-researchers felt that they were committed and motivated to stimulate the development of the children in their centres but thought that they needed to be the steering force to be able to get the practitioners to do their part in the playroom. The following are snippets from informal conversations between the co-researchers:

‘Because of salaries, they look for other jobs.’ (Participant 01, Female, 27 July 2022)

‘They are not motivated.’ (Participant 02, Female, 27 July 2022)

‘Practitioners are not motivated.’ (Participant 03, Female, 16 March 2022)

A lack of development approaches, also known as teaching approaches, was also identified and referred to the practitioners not knowing what to do and needing in-house training on approaches to stimulate young children. *A lack of language proficiency* was also identified as a lack of development approaches because some ECCE practitioners cannot speak and read fluently in the language of teaching and learning. The reason is that there are 11 official languages in South Africa, and children who attend ECCE centres in informal settlements come from diverse households. The practitioners could also have received education in a language other than their home language or the language of teaching and learning. Therefore, practitioners sometimes struggle to understand instructions in English, especially if they receive instructions in English that they must read. This may hinder practitioners in stimulating the development of children aged 0–4 years if the instructions are not in their home language.

Because of a *lack of knowledge, motivation and commitment*, the practitioners also experience a *lack of creativity*, which is also influenced by a *lack of language proficiency*. The co-researchers believed that the practitioners did not take initiative and responsibility for the teaching and learning process in their playrooms; instead, they would wait for the centre manager to tell them what to do daily. In-house training is then offered by the centre managers, who also have a lot of other responsibilities at the centres. This relates to the finding of Zulu, Aina and Bipath (2022) that ECCE practitioners need short in-house interventions to ensure that quality learning takes place in centres. In this regard, the following was said:

‘[T]hey need to be committed. I mean, they also need to be creative.’ (Participant 01, Female, 26 February 2021)

‘The problem, neh, is that it sound[s] different in the languages.’ (Participant 02, Female, 26 February 2021)

‘The problem, remember, is that they can’t read English proper[ly]. At least, I have to explain to them [practitioners working with babies] what “what what,” yes. So, if we would have [it] maybe even in Setswana at least.’ (Participant 03, Female, 27 July 2022)

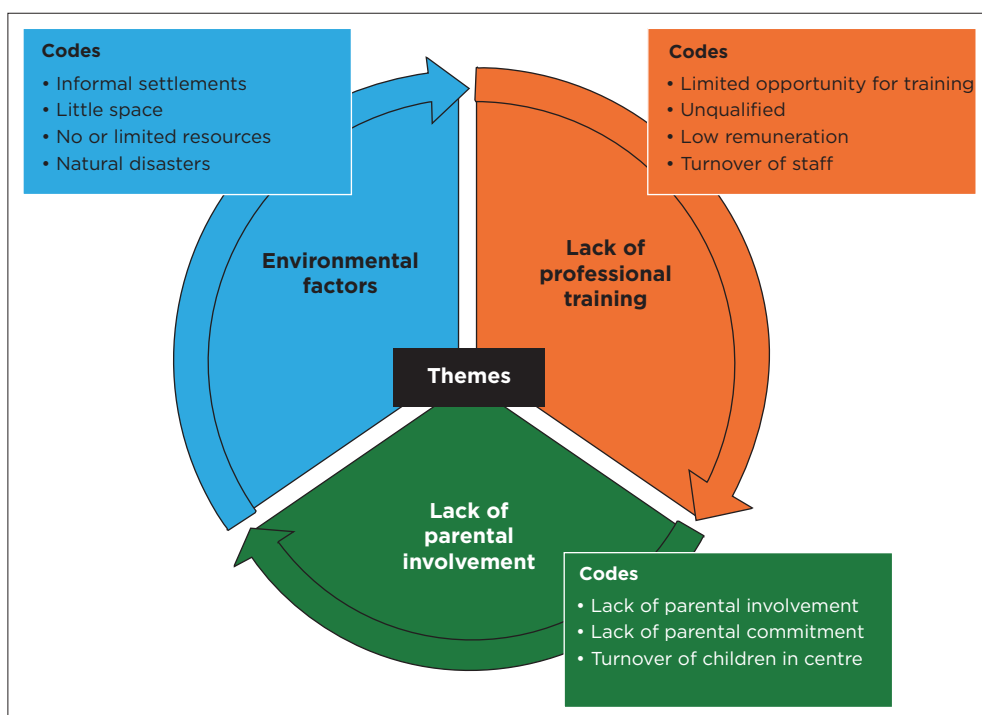
Extrinsic challenges that hinder practitioners in stimulating motor development are discussed next.

■ Extrinsic challenges

The themes identified as extrinsic challenges that influence sustainable development in ECCE centres are described as challenges those practitioners face externally, including *environmental challenges*, a *lack of professional training* and a *lack of parental involvement*. The themes and codes that were identified as extrinsic challenges are illustrated in Figure 9.3. The codes identified include *informal settlements*, *little space*, *no or limited resources*, *natural disasters*, *limited opportunity for practitioner training*, *unqualified practitioners*, *low remuneration*, *turnover of staff*, *turnover of children* and a *lack of parental involvement and commitment*.

Finger and Houghuet (2009) explain extrinsic challenges as challenges that are brought about by environmental factors; for example, a lack of resources may hinder the developmental processes of the children in ECCE centres, which is in line with Bronfenbrenner’s ecological theory.

In South Africa, informal settlements are home to a large number of the population and are established because of economic vulnerability, low-paid jobs, population growth and affordable housing (Avis 2016). These environmental factors play a role in the functioning of ECCE centres in informal settlements and lead to challenges that affect the development of children raised in informal settlement communities.



Source: Adapted from author's thesis – Taylor (2023).

FIGURE 9.3: Themes identified as extrinsic challenges.

The ECCE centres in informal settlements struggle financially, as parents pay very little school fees, if at all. Major financial strain is put on these centres when parents do not pay school fees because the school fees are mostly used to pay the practitioners' salaries. In centres that do not receive government subsidies, the school fees are also used to feed the children twice a day at the centre. Therefore, because of their small income, these centres try to accept the maximum number of children to optimise the income of the centre. Accepting the maximum number of children leads to overcrowded playrooms and leaves the children with little space to move around. Because young children learn through movement, limited space is an extrinsic constraint that has a major effect on the motor development of young children because of the limited space to move around in while they learn. Overcrowded playrooms with very little space to move around in are found in informal settlement ECCE centres.

The following are responses about this issue from the co-researchers:

'[...] we were speaking about space. Johh, it's a serious issue, and I wanted to whisper about this one – I'm thinking my baby class, it is 3.8 x 3.8, and I'm housing 18 babies in that classroom.' (Participant 01, Female, 27 July 2022)

'Yes, space is a challenge. You saw my office is here, and the next room is the babies. Sometimes when it is not so cold, we take them outside to run.'
(Participant 02, Female, 27 July 2022)

The financial constraint of limited income at these centres also leads to the centres being under-resourced. The centres cannot afford to buy the resources they need to be able to implement activities to stimulate the motor development of the children. This led me to explore making resources from recycled materials to be able to overcome this challenge that directly influences young children's motor development.

The intrinsic constraint identified as a lack of professional knowledge could be because of the extrinsic challenges related to a lack of professional training. The ECCE practitioners believe there are very few training opportunities for them, especially in their areas. To receive specific training, one needs to be under a certain age, as stipulated by the organisations offering the training. This leads to older practitioners being excluded from certain training opportunities. Because of the low salaries received by the ECCE workforce, the motor development of children is indirectly influenced because the practitioners cannot afford to pay to attend training or enrol for a qualification to learn to promote motor development and holistic development. Furthermore, the low school fees paid by parents together with the low income of the centres affects the salaries of practitioners, and because of their lack of professional training, the ECCE practitioners receive small salaries. Responses from the co-researchers in this regard are as follows:

'So that's the problem, qualification is a problem, training [...] my baby class teacher is really not professional because of the qualification and training that she doesn't have.' (Participant 01, Female, 27 July 2022)

'Yes, the challenge is [...] the training, resources, qualifications.' (Participant 02, Female, 27 July 2022)

The co-researchers, as centre managers, feel that they train practitioners with the knowledge they have, which takes approximately three months for practitioners to gain basic knowledge and skills to stimulate the babies, toddlers and young children in their care. By the time they have gained insight into stimulating the children in their care, they may be interested in earning bigger salaries, and so they leave the centre. This leaves the co-researchers at the beginning again, to find someone competent, willing to learn and committed to stimulating and developing the children at the centre. An extra workload is put on the centre managers to ensure that practitioners receive in-house training every time a new practitioner is appointed after another one has resigned because of finding another job with a better salary. In line with this, McNair et al. (2022) have also found that trained practitioners leave centres because of better opportunities, a factor the ALG concluded adds to the workload of centre managers.

Apart from doing in-house training, centre managers also ensure the safety of the staff and children, as well as that salaries are paid, parents' needs are met, the centre complies with policies and regulations and shopping is carried out for food to feed all the children daily, to mention only a few. Moreover, they take responsibility for the resources that are available at the centres to promote the development of all children at the centre. One of the participants had the following to say on this account:

'We are doing in-house training, but sometimes we ["we uhna"], I am talking about ... I am the centre manager, and I am also being trained. I am a student now, so I cannot. I will be training this person to see to it that this person is doing what she is trained to [do]. It is a problem because sometimes I have other stuff to do for the school and must supervise the person.' (Participant 01, Female, 27 July 2022)

Moreover, in the period that we, as the ALG, explored these challenges, we were faced with another extrinsic constraint: the global natural disaster of the COVID-19 pandemic. This pandemic severely influenced the operations of ECCE centres from 2020 to 2022, as strict protocols were enforced, such as people having to stay indoors for lengthy periods, which led to children not being able to play outside or go to ECCE centres. Even when children returned to ECCE centres, they faced many challenges, such as social distancing. In the participating ECCE centres, this challenge was managed by providing each child with a hula hoop in which he or she could sit and stand in the playroom, which further limited their movement in the centres. The extra administration regarding protocols and safety in ECCE centres and extra training were other challenges because the practitioners were too busy with administration and protocols to be able to prepare activities to stimulate the motor development of children:

'The COVID-19 file, it is, uh, really a challenge because there are so many things that they want there – we must print out policies and print out the, the uh, training, especially the COVID-19 training, and they also want, uh, staff, uhm, precaution protocols and everything.' (Participant 01, Female, 15 June 2021)

The lack of parental involvement can be regarded as an extrinsic and intrinsic challenge for practitioners to develop young children. In terms of intrinsic challenges, the practitioners were frustrated with parents not supporting them in developing their young children optimally. Extrinsic challenges refer to parents, for example, dropping sick children, who need a lot of individual attention, off at the ECCE centre, not thinking about all the other children that also need attention and stimulating activities to ensure that development takes place. The practitioners' experience is that parents shift their responsibility towards the practitioners to care for their children. The parents believe that it is the practitioner's job to take care of all children, whether sick or healthy. This situation can lead to practitioners not being able to do stimulating activities with the children in the playroom.

As part of the ALG, the co-researchers agreed that parents in informal settlements are not committed to being involved and do not see the importance of supporting the practitioners to ensure that their young children receive quality stimulation at the centre daily. This could also be because of parents not understanding the importance of stimulating their children between the ages of nought to four years specifically, thinking they should just be fed, changed and kept safe.

The high turnaround of children at the centres was also identified as an extrinsic challenge because of a lack of parental involvement, as parents in informal communities are not always committed to paying school fees, which results in their simply moving their children to another ECCE centre when they are queried on unpaid school fees. This is most likely because of parents not earning an income or child-headed households where a sibling is trying to provide for the family. Another challenge identified was the relocation of families and parents who did not want to pay transport fees for children to travel to school and then moved them to centres close to their new home, as explained here:

'They pay R450, and we cannot charge more than that because we are in an informal settlement, because the economy there, it is not the same as maybe at the suburb. [...] The other reason, most of the time, it is money; most of the time they are not satisfied, or they relocate to another place, or the parents doesn't [s/c] work anymore. Too many reasons. It can be from the school's side. It can be from the parents' side. And then that's when you ask us, "How many babies do you have?" [...] I've got three of three months, but as time went on, the ones of three months are no longer there. [...] that's one of the challenges.'

(Participant 01, Female, 27 July 2022)

'That child will end up for the whole year not paying school fund. [...] The children are rotating the creches, hey. She will be in my creche three months, not pay; if she has to pay, she leaves to go to P2, and then three months there, if she has to pay, she leaves and go[es] to P1.'

(Participant 03, Female, 27 July 2022)

In Cycle 2, the ALG identified many intrinsic and extrinsic challenges that hinder the motor development of babies, toddlers and young children (0–4 years) in ECCE centres.

In Cycle 1 of my research project, we collaboratively identified the current knowledge and skills of the practitioners. Then, in Cycle 3, we collaboratively developed an educational intervention to support practitioners in ECCE centres in informal settlements in an attempt to overcome the intrinsic and extrinsic challenges experienced that have a direct or indirect effect on the motor development of children in ECCE centres. While investigating the challenges that influence motor development, it became clear that practitioners working in ECCE centres in informal settlements in South Africa have limited access to training, which is a concern in the effort to ensure quality early learning and development,

as well as ESD. It has also become clear that ECCE centres should give children access to high-quality ECD, as well as information and abilities necessary to advance sustainable development.

Furthermore, I found that stimulating programmes are not always offered or promoted at ECCE centres in informal settlements because of various challenges experienced by the practitioners. Therefore, ECCE practitioners need to have knowledge of and skills in creating a safe and stimulating environment for babies, toddlers and young children to move around and develop optimally to ensure that the foundation of lifelong learning is laid while challenges that can hinder the development of young children in their care are overcome.

Collaboratively, we, as an ALG, took hands to identify the challenges experienced. We again realised how important the knowledge, skills and motivation of practitioners are to successfully promote the motor development of children in under-resourced ECCE centres in informal settlements.

■ Conclusion

Access to quality education in the ECCE field is a key outcome for the South African government. The target of SDG 4.2 is ECD, and universal pre-primary education can be reached if we start by equipping all practitioners working in the ECCE workforce with the necessary knowledge and skills to ensure quality early learning and development for all babies, toddlers and young children. Even though many internal and external challenges hinder the participating practitioners from promoting quality education, the ALG had to think creatively and make plans to overcome these challenges. Using knowledge gained in a collaborative approach of identifying and reflecting, it was possible within the ALG to motivate and encourage the practitioners to think out of the box, be creative and generate transformative thinking. To be able to do this, we need to understand the context and the challenges experienced by ECCE practitioners that influence sustainable development in ECCE centres in informal settlements.

This research focused on identifying challenges that influence the motor development of young children in under-resourced South African ECCE centres for sustainable development through education. The proposed solution is to equip practitioners and parents through informal training and collaborative learning in practice on how to overcome the challenges that influence ECCE and under-resourced ECCE centres while contributing to a sustainable environment in the South African context. Providing equitable and high-quality ECD services in ECCE centres would help South Africa

achieve SDGs, such as decreasing inequality and providing high-quality education.

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■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-01615-19-A2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

Learner-centredness, partnerships and participatory action learning and research: A triad of transitioning in a special needs education context for sustainable development¹³

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■ Abstract

Despite growing global awareness of and advocacy for disability rights, it is difficult to sustain meaningful transition goals for young adolescents with severe intellectual disabilities, especially regarding employment opportunities. Existing evidence from research in the field of education for sustainable development points to the benefit of involving multiple stakeholders in the transition plans of young people, in this case with severe intellectual disabilities, in order to move towards sustainable development through education. This chapter reports on research undertaken to address the question ‘How can family–school–community partnerships better meet the support needs of adolescents living with severe intellectual disabilities, before and during the transition?’ Guided by the quality-of-life theory, we provide empirical evidence from a participatory action learning and action research project that a combination of three essential features underpins a transition process that promotes development that is sustainable. We call these three features the ‘transition triad’, comprising (1) a learner-centred mindset, (2) guiding the creation of working partnerships between the school, community and parents and (3) implemented within a participatory action learning and action research framework. The study shows how collective action and continuous learning could advance sustainable development goals, particularly in the context of promoting inclusion for adolescents with disabilities through education. It is argued that a framework for the development of sustainable transition plans for learners with any level of intellectual disability holds the potential to improve the lives of not only these young people but also their family members.

■ Introduction

The term ‘transition’ refers to the process of moving from the protected life of a child to the autonomous and independent life of an adult (Foley et al. 2012). Transition is particularly challenging for adolescents with a severe intellectual disability (SID), as these individuals experience barriers to employment, as well as economic, social and daily living challenges well into adulthood (Trainor et al. 2019). There is a clear intersection between these barriers, education for sustainable development (ESD) and the sustainable development goals (SDGs), particularly in the context of supporting young adolescents with severe intellectual disabilities in transitioning to employment opportunities. The international attempt to accomplish the 17 SDGs is greatly facilitated by ESD (UNESCO 2020). This research aimed to enhance transition outcomes for young adolescents with SID by adopting a learner-centred approach (SDG 4 - Quality Education),

fostering partnerships (SDG 17 – partnerships for the goals) and collaborating to drive meaningful change and learning (SDG 4), thus contributing to the broader goals of sustainable development as outlined in the Brundtland Report (1987). The Brundtland Report (1987) introduced the concept of sustainable development and laid the foundation for the notion of ESD by highlighting that it includes much more than environmental education. Education for sustainable development facilitates activities that result in a more sustainable society because it develops the ability of learners to envisage solutions through decision-making, find connections between systems and be encouraged to adopt sustainable behaviour (Tilbury & Wortman 2004). In order to be effective, ESD must incorporate and transcend established education systems in order to develop curricula and learning opportunities that will interest learners from all backgrounds, including those in the adult workforce (UNESCO 2020). The United Nations adopted the 2030 Agenda for Sustainable Development which included 17 SDGs aimed at addressing various challenges including environmental degradation, social justice, poverty and inequality. This research involved multiple stakeholders (schools, communities and parents) in the transition plans, which ensured a more inclusive, equal and quality education for all, as advocated by SDG 4 (United Nations [UN] 2015). Addressing the transition needs of adolescents with SID improved access to meaningful employment opportunities, thereby contributing to economic growth and reducing inequalities as outlined in SDG 8 (UN 2015). This study also emphasises the importance of partnerships between schools, communities and parents, aligning with SDG 17 which focuses on strengthening partnerships for sustainable development (UN 2015).

The number of young people with different levels of intellectual disability who manage to find paid employment is very low worldwide, ranging from 9% to 40% (Khayatzadeh-Mahani et al. 2020). Despite growing human rights advocacy for deinstitutionalisation and inclusion, people with SID are still more likely to end up in segregated workplaces (Khayatzadeh-Mahani et al. 2020). If they do find employment, individuals with intellectual disabilities usually work in entry-level positions, earn lower wages and work fewer hours than their peers without disabilities (Petner-Arrey, Howell-Moneta & Lysaght 2016).

Although there is a substantial body of research on the transition of adolescents with SID into adulthood in various countries (see e.g. Jacobs, MacMahon & Quayle 2018; Talapatra, Miller & Schumacher-Martinez 2018; Wilt & Morningstar 2018), there remain many practical barriers to satisfactory transition into adulthood, especially when adolescents with SID live in contexts of poverty and social disadvantage (Kett, Cole & Turner 2020). The challenges are often compounded by biased attitudes in communities

towards people with disabilities (Harris 2019). Transition is enhanced by family involvement, but again, parent participation and collaboration with the school can be hampered by cultural, linguistic and economic barriers in low-income communities (Wilt & Morningstar 2018). Similarly, community involvement is necessary to enhance the sustainability of transition and offer ongoing support (Budowle, Krszjzaniek & Taylor 2021) but all too often, transition planning lacks interagency collaboration, such as collaboration between the school and community stakeholders such as employers and non-profit organisations (Abdullah, Yasin & Abdullah 2015).

To address the factors that influence the transition of learners with intellectual disabilities, there is a need for institutional and individual lines of communication across the boundaries of school, home and community (Epstein 2018). Shared responsibilities and overlapping influence mean that parents do not need to bear the entire burden of figuring out what direction to take after their child with SID has completed his or her schooling. Instead, teachers, parents and members of communities should combine efforts to create a coherent programme to help learners succeed (Epstein 2018).

The transition of adolescents with SID from school to adult life is thus a multi-layered challenge. If not addressed successfully, manifold problems develop that have a negative ripple effect on the individual's wellness and quality of life, the family's psychological, social and economic well-being and the social and economic well-being of communities (Parola et al. 2022). Having a well-researched transition programme helps schools improve these learners' individual education plans to become more transition-focused and practical (Beamish et al. 2020). Based on the first author's experience as a teacher in the field and a parent of two children with intellectual disabilities, the problem in South African schools is that transition programmes for learners with intellectual impairment, if they exist, are of limited scope. If they are implemented, the concept of fostering strong family-school-community partnerships for transition is not usual practice. Consequently, schools that experience initial success with their transition programmes find that these are not sustainable because of a lack of carry-over by parents and a strong bias in community organisations and businesses against providing opportunities for people with intellectual disabilities. We argue that if parents, school and community stakeholders collaborate to devise, implement and monitor a transition plan for a specific learner in a specific context, it is likely to be more sustainable. Through involvement in the transition planning, parents will not only learn how to communicate and negotiate with both the school and future employers but also be more aware of the strengths of the child, rather than focusing on the disability.

Consequently, to address this gap, we investigated how school-family-community partnerships could be fostered to make transition planning more relevant and sustainable. The 2030 Agenda, referring to the SDGs,

emphasises multi-stakeholder involvement, with special reference to SDG 17 (Partnerships for the goals), implies that in order to address the issues of sustainable development, all facets of society must stop operating in isolation and instead collaborate (UNESCO 2020). By fostering partnerships and adopting learner-centred approaches, there is potential to improve the quality of life for adolescents and their families, which will lead to sustainable development. We begin with an explanation of the theories guiding this study linking it to SDGs and ESD, before presenting an overview of the methodology. Lastly, we discuss the findings and how they contributed to the development of the transition triad.

■ Guiding theories

In this section, we discuss the two main guiding theories of the study: the quality-of-life (QOL) theory (Ventegodt, Merrick & Andersen 2003) and Bronfenbrenner's (1986) ecological systems theory. Both theories align with the goal of promoting sustainable development that encompasses improving the quality of life for current and future generations. Ventegodt et al. (2003; p. 1031) conceptualised quality of life as a 'good life'. The QOL theory refers to the conceptual framework used to understand wellbeing of individuals and societies and is often used to evaluate the impact of interventions on people's lives, aiming to enhance overall life satisfaction and happiness. By incorporating the following principles into educational practices, the adolescents could understand the interconnectedness between well-being and the well-being of society and the planet (UNESCO 2020). The QOL theory distinguished between an *existential* quality of life (how good life is at a deeper level, including spiritual and religious aspects), an *objective* quality of life (how one's life is perceived by the outside world) and a *subjective* quality of life (how the individual feels about his or her quality of life). Researchers in the field of intellectual disability have been exploring ways to use quality of life as a conceptual framework to plan and assess the outcomes of support programmes (such as transition programmes) for individuals with intellectual disabilities (Verdugo et al. 2005). Verdugo et al. (2005) identified 10 QOL domains. A later study by the same authors (Schalock et al. 2010) reduced the different QOL domains to eight, as listed in Column 1 of Table 10.1 to craft a conceptual and measurement framework.

Table 10.1 shows the importance of participatory approaches which is also a key principle of ESD. This theoretical framework of QOL was utilised throughout the research as a holistic guideline for transition planning, especially in the first and third cycles where the challenges and support needs of young adolescents with SID were investigated and the findings put into practice. By engaging the participants in critical thinking and

TABLE 10.1: Quality-of-life conceptual and measurement framework.

Domain	Literature-based indicators
Personal development	Education, performance and personal competence
Self-determination	Autonomy, personal control, goals and personal values and choices
Interpersonal relations	Interactions, relationships and support
Social inclusion	Community integration and participation, community roles and social support
Rights	Human rights (respect, dignity and equality) and legal rights (citizenship, access and due process)
Emotional well-being	Contentment, self-concept and a lack of stress
Physical well-being	Health and health care, activities of daily living and leisure
Material well-being	Financial status, employment and housing

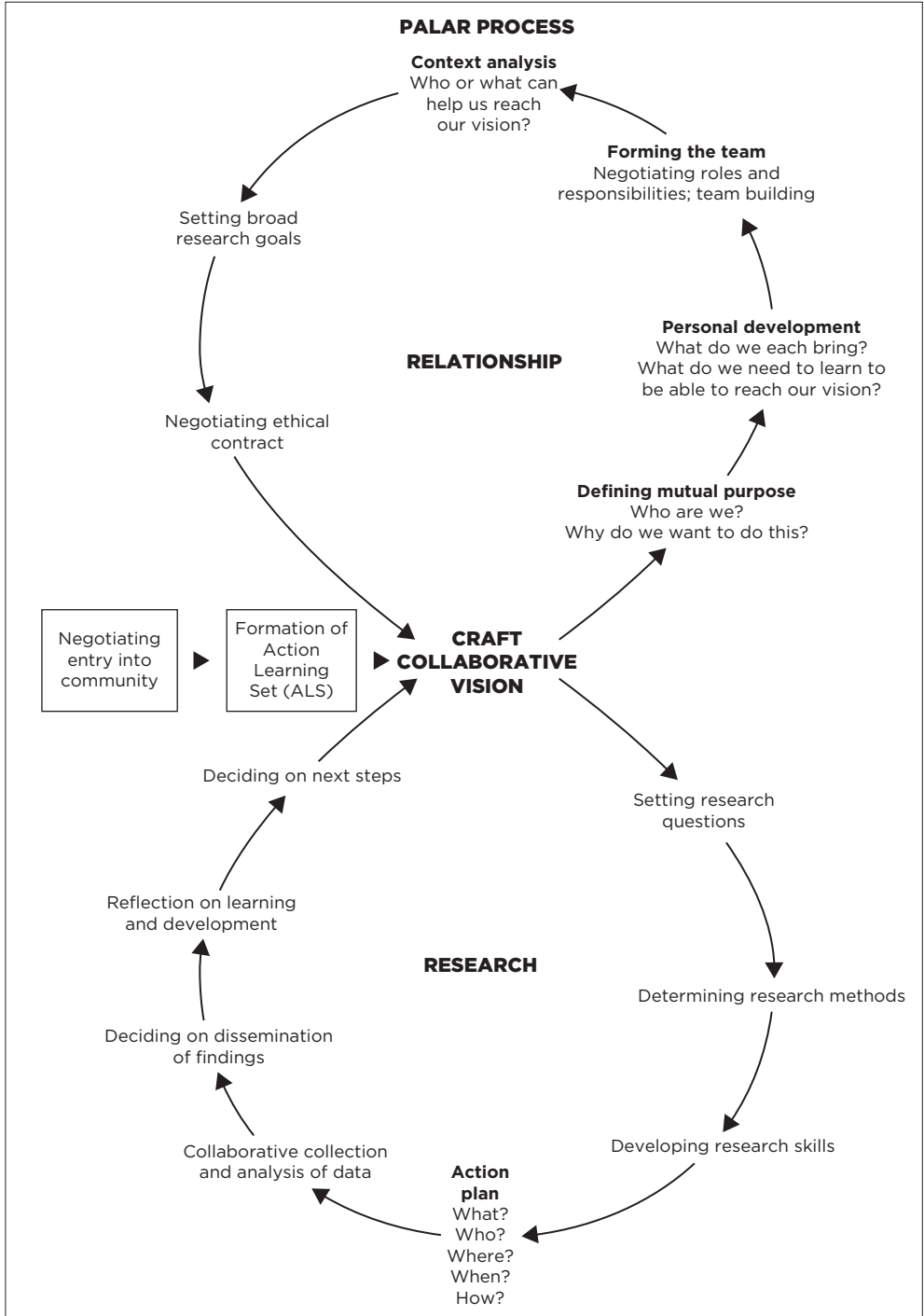
Source: Schalock et al. (2010, p. 19).

action-oriented experiences it aims to support them to contribute to a more sustainable and equitable world, thereby enhancing their quality of life.

The theory that guided the second cycle of the study, where the role of family–school–community partnerships was under investigation, was the ecological systems theory of Bronfenbrenner (1986), more specifically the process–person–context–time model, as described by Xia (2020). An important focus of our study was to determine how the different systems in the life of an individual with an intellectual disability may serve as support as he or she transitions into adult life. Therefore, it was important not only to rely on support within the ecology of the young adults with SID but also to create partnerships, where the partners became a support net for these adolescents. In this venture, two *microsystems* – the family and the school – need to interact to partner and become a strong *mesosystem*. The influence of the *macrosystem* and the cultural and current socio-political setting (especially regarding disability legislation and policy) in South Africa is a force that cannot be ignored. By incorporating Bronfenbrenner’s ecological (1986) systems theory, it recognises the interconnectedness of social, economic and environmental factors highlighting the long-term consequences of individual and collective actions which are essential for promoting sustainable development at local, national and global levels.

■ Methodology

The research site was a special needs school for learners with SID. The study utilised participatory action learning and research (PALAR) – a collaborative research design that combines the genres of action learning and participatory action research. Wood (2020) explains that PALAR is not only a design but also a paradigm grounded in life-enhancing values such as democracy, participation, mutual respect and care for fellow humans and the planet. The PALAR process is typically depicted by the figure-eight model (Zuber-Skerritt 2011), adapted by Wood (see Figure 10.1).



Source: Wood (2020, p. 106).

FIGURE 10.1: The participatory action learning and research process.

Wood suggests that the figure-eight represents the continuous nature of action learning and research. Forming strong research relationships is vital for the process to be educative and emancipatory so that participants learn to collaborate to improve their circumstances. For that reason, the upper component of the PALAR process focuses on building relationships, and this focus continues throughout the empirical research. In other words, the participants' capacity to sustain change is increased. Figure 10.1 provides an overview of the PALAR process.

One of the working principles of PALAR is the generation of knowledge through the collaborative actions and reflective learning of an action learning group, called the action learning set (ALS), that leads the project (Wood 2020). The members of the ALS, as the primary participants of this study, were purposively selected to include a range of capabilities and viewpoints. The first author – a teacher in the school used as the research site – negotiated with the school management to be allowed to conduct the research. She then recruited the members of the ALS, as depicted in Table 10.2.

TABLE 10.2: Biographical information of primary participants.

ALS member	Code	Field of expertise	Gender
Principal	P1	Management Involvement in a transition programme at a previous school	Male
Vice-principal	P2	Management Discipline management Sports coaching	Female
Head of department, Senior Phase	P3	Skills teacher – cooking Autism experience at previous school Involvement in a transition programme at a previous school	Female
Head of department, phase for learners with profound intellectual disability	P4	Management Autism experience Experience with young adults with moderate to severe disabilities entering adulthood	Female
Therapist, Senior Phase	P5	Occupational therapist tasked with school exit programme Tasked with the emotional support of learners Assessment expert knows learners Daily living skills expert	Female
Setswana teacher, Senior Phase	P6	Skills teacher – gardening Insight into African culture Knows African languages Insight into rural life (lives in a rural village himself)	Male
Parent 1 (male)	P7	Former member of school governing body Interested in disability policy reform Research experience Passionate about parental involvement	Male
Parent 2 (female)	P8	Research experience Chairperson of school governing body Passionate about disability rights Conscious of family dynamics in a family with a child living with SID (own experience)	Female

Source: Malan (2022).

The ALS collected data from two sets of secondary participants via interviews, as depicted in Table 10.3.

Data were gathered from the secondary participants on an ongoing basis. The themes that emerged from these interviews served as discussion starters for the ALS meetings.

Five learners were purposively selected to represent a variety of physical and cognitive challenges, and their parents were invited to participate in the research. Semi-structured interviews with these parents were conducted by ALS members, not only to determine what challenges and support needs the learners faced but also to establish a trusting relationship with and encourage the parent participants and learners (Table 10.4).

TABLE 10.3: Interviewees (secondary participants).

Interviewee	Pseudonym	Background	Gender
Post-school facility managers	FM1	Manager of a studio for youths with SID doing job placements	Female
	FM2	Manager of an adult facility for youths with Down syndrome focused on pre-transition and employment skills	Female
	FM3	Manager of a coffee shop employing young adults with SID	Female
	FM4	Manager of a protected workshop focused on crafts	Female
	FM5	Manager of a care centre focused more on care than employment	Female
Staff members from other schools for learners with SID	S1	Deputy principal of another school for learners living with SID running an employment placement programme	Female
	S2	Craft teacher at a school for learners living with SID	Female
	S3	Occupational therapist employed at another school for learners living with SID, involved with its employment placement programme	Female
An employee of the Department of Basic Education	D1	Former teacher and award winner in transition programming	Female
Parent of a child with special needs	F6	A parent of a young adult with SID with past employment experience	Male
A private occupational therapist	T1	A therapist with an adult family member with SID, interested in transition programming	Female

Source: Malan (2022).

TABLE 10.4: Parent participants and learners.

Parent code	Background	Gender
M1	Mother of L1, a learner who is non-verbal and uses a wheelchair	Female
M2	Mother of L2, a learner who has cerebral palsy (diplegia)	Female
M3	Mother of L3, a learner who has spina bifida	Female
F4	Father of L4, a learner who is on the autism spectrum	Male
F5	Father of L5, a learner who lives with SID but has good functional skills	Male

Source: Malan (2022).

The therapist in the ALS assisted with the evaluation of the five learners. They were requested to respond to a picture-based career interest questionnaire, which led to their transition plans being drawn up and transition-related actions being undertaken. The ALS members were continuously updated about the progress to inform discussions about the way forward for the different learners. As the study progressed, the learners were exposed to workplaces and community settings. At the same time, ALS discussions about these ventures took place, during which challenges were identified and possible solutions proposed.

The data generation took place in three cycles. The ultimate goal was to answer the main research question, 'How can family-school-community partnerships be promoted to foster learner-centred transition to adult life for youth with SID?' The ALS aimed to answer the following sub-questions during the various cycles (see Figure 10.2):

- *Cycle 1*: What are the challenges and resulting support needs of adolescents with an SID regarding the transition to adult life?
- *Cycle 2*: How can family-school-community partnerships better meet the support needs of adolescents with an SID before and during the transition?
- *Cycle 3*: How can the knowledge created by this team enhance sustainable learner-centred transition planning for learners with SID?

Cycle 1 was guided by the principle of learner-centredness, Cycle 2 was centred on the issue of partnerships and Cycle 3 was about the real-life actions undertaken with the five learners who had been selected.

The data analysis of the first two cycles was thematic. As the study yielded a mountain of data that had to be coded and organised into themes (see Braun & Clarke 2020), as an academic researcher, I (first author) immersed myself in the data, coded the data and organised the codes into themes. After the data analysis in each cycle, we returned to the ALS to discuss the findings and logically structure and proceed with conceptualisation by using the visual representations. The ALS decided how the themes related to one another and how these findings needed to feed into the strategic planning that lay ahead. In the final cycle of the study, a critical realist framework (see Bygstad & Munkvold 2011) for the data analysis was instrumental in the discovery of causal mechanisms or reasons for the results of the practical work.

The trustworthiness of the study was guided by the five quality indicators for action research suggested by Herr and Anderson (2005), namely outcome validity (was the original problem solved?), process validity (was ongoing learning promoted?), democratic validity (was the research collaborative?), catalytic validity (did the transformation take place?) and dialogic validity (was the work peer-reviewed?).

Regarding ethics, the approval granted by the Ethics Committee of the North-West University (NWU-00537-19-S2) and the Gauteng Department of Education attests that the study adhered to the principles of autonomy (informed consent), non-maleficence (to not harm) and beneficence (that the research should benefit the participants or society at large). The study aimed to improve the quality of life of young adolescents with SID; therefore, it was conducted in such a manner that the participants, especially the vulnerable young adolescents with SID, were protected from harm and would benefit directly from their participation.

■ Discussion of findings of Cycle 1

Three main themes regarding the challenges and support needs of young adolescents with SID emerged in Cycle 1, namely the need for:

- dignity
- empowerment
- inclusion.

These themes are closely related to ESD as they reflect foundational principles of sustainable development and equity. Regarding the dignity theme, Participants M1, M2, P5, F5 and D1 recounted how young people with intellectual disabilities were stigmatised, victimised and bullied. M2 shared that her mother thought that having a child with a disability was the result of a curse and insisted on subjecting the boy to cleansing rituals. When M2 objected, she was rejected by her family, became homeless and had to put her son in a shelter. She secretly slept in the locker room of her workplace for 6 months before she was able to save enough money to rent a room. P5 shared that learners were ashamed of being associated with a school for learners with intellectual disabilities and were mercilessly teased in taxis. The same participant (P5) also recounted how learners who were able to read well enough to use social media became victims of cyberbullying. F5 and D1 shared how young people with intellectual disabilities were robbed of their earnings in workplaces or exploited and subjected to sexual harassment. Moreover, M1 attested to the fact that she had witnessed young adults with severe cognitive and physical challenges being subjected to neglect in a sub-standard facility close to her home.

Respect for human dignity is a core value in sustainable development and is widely viewed as a basic human right in the South African Constitution, which states that ‘everyone has inherent dignity and the right to have their dignity respected and protected’ (South Africa 1996, p. 6). South Africa is a signatory to the *United Nations Convention on the Rights of Persons with Disabilities* of 2006. Section 11(b) of this convention aims ‘to combat stereotypes, prejudices and harmful practices relating to persons with disabilities, including those based on sex and age, in all

areas of life' (United Nations Enable 2006). The ALS concluded that the need to treat individuals with intellectual disability with dignity, not only in care centres but also in places of employment and schools, is non-negotiable. The human dignity of people with SID should be an existential and philosophical cornerstone for any kind of transition programme (Wertz 2023). In the context of ESD dignity encompasses recognising and valuing the inherent worth and rights of every individual including young adolescents with SID. It is therefore argued that family members and educators of people with disabilities should combat prejudice and harmful conduct such as bullying.

The second theme was empowerment, a concept that goes beyond rights – it provides the structure, resources and support for individuals to realise these rights, demonstrate their abilities and exercise control over their lives (Moran, Gibbs & Mernin 2017). The most important disempowering attitude that emerged in the study was that of infantilisation. According to Capri and Swartz (2018), the infantilisation of people with intellectual disabilities is a form of overprotection, which becomes an endless cycle of disempowerment perpetuated in care facilities and other social circles. This results in the development of an infantile personality in the disempowered individual. Capri and Swartz found that in South Africa, caregivers of young people with SID used infantilising communication, debasing nicknames, patronising reprimands and childlike décor. The participants in the ALS believed passionately that one needs to move away from infantilisation and misplaced pity towards empowerment. In this regard, FM1 said:

'My greater vision for the world would be working against the bleeding-heart mentality, but towards moving them ahead, towards their greatness. Just like we want to move towards our greatness.' (Participant FM 1, Female, April 2020)

D1 stated that she believed that the first step of a transition programme should be to facilitate an attitude change in young adolescent learners. She made her classroom a microcosm of the world of work and established a work-like routine with work-like rules and responsibilities like those an adult would adhere to in the real world: signing in a register, beginning on time and displaying self-discipline. She also made the learners 'look the part' by having them dress differently than the rest of the school. FM1 stressed the need to give 'just right' challenges to create an attitude of 'I can' and to enhance motivation. Empowerment is central to the goals of ESD as it involves equipping individuals with the knowledge, skills and confidence to participate meaningfully in decision-making processes and to take action for positive change (UNESCO 2014). The ALS concluded that instead of overprotecting adolescents with SID, the school and parents should join hands to ensure that these learners

can acquire basic self-care (such as fastening buttons or shoes), home living skills (such as making a bed and preparing a basic meal) and community living skills (such as going to the grocery store and handling money). These actions could provide them with opportunities to develop self-advocacy skills, express their needs and preferences and actively engage in their own learning and transition planning processes (UNESCO 2014).

The third theme – inclusion – refers to:

[7]he practice or policy of providing equal access to opportunities and resources for people who might otherwise be excluded or marginalised, such as those having physical or mental disabilities or belonging to other minority groups. (Hamilton 2021, p. 46)

We found that the first barrier to social inclusion was having to live with physical and other concomitant disabilities. Of the five learners, the two who had the most profound physical and medical challenges lived the most isolated lives. L1, a 16-year-old girl with SID and cerebral palsy, rarely left the house, except to go to school. She had outgrown her previous wheelchair, and the family had not yet been able to replace it. Because of cultural bias, the family also believed that it was not proper to take a person with such disabilities out in public. L3 had spina bifida and was overweight, with chronic kidney failure. The family tended to leave the girl at home in the care of her grandmother when they ran errands, and they seldom took her out to visit, except for occasional family gatherings.

The second barrier was the fact that young adolescents with SID invariably have complex communication needs, which may affect their ability to express their needs, develop social relationships and exchange information with others which is in agreement with Blackstone, Williams and Wilkins (2007). P5 and T1, both therapists and M2, a mother, described communication challenges such as a lack of conversational skills, difficulty in expressing emotions and interpreting abstract language or figures of speech and auditory memory challenges (such as the inability to remember instructions).

The third social inclusion barrier was social skills. Because of a lack of social judgement and an inability to display emotional regulation, young individuals with SID are often subjected to rejection by their peer group. As a result, these young people have a strong need to be included. One of the facility managers put it as follows:

‘They wanted to be included [...] they wanted to wear bling, they wanted funky wheelchairs, you know. They needed space to live out who they were and what they wanted. They wanted to go out to the shops, to do window shopping, like a girl’s day out, to be pampered, have their nails painted and, you know, girly type of stuff.’ (Participant FM1, Female, April 2020)

One of the young adolescents tried to hide the fact that she was attending a special school and could not read and write very well out of fear of rejection. She said:

‘I was, like, lying about me, saying that I was in this grade, and then I’m not, cause I was afraid that I would go out, that they would leave me alone, just like that.’ (Participant L5, Female, October 2020)

The need to be included could make young adolescents with SID vulnerable to exploitation by unscrupulous people who might introduce them to drugs or crime or who might exploit them sexually. One of the participants gave the following explanation:

‘Our learners often experience emotional rejection; so, often they have a great need for acceptance and then become part of a peer group for ulterior reasons – without them realising what those reasons are. For instance, an intellectually disabled adolescent may be used as a drug mule, or a girl may be sexually attractive and get exploited in that respect. So, peers may seemingly accept them into a group, but for dubious reasons.’ (Participant P5, Female, November 2020)

Ethical behaviour in workplaces does not come naturally. Therefore, employability skills such as punctuality, self-discipline, task completion, honesty and integrity need to be specifically taught. One of the participants pointed out:

‘Our other challenge was that some of them would pinch things in the workplace from time to time; very few learners did this. We then immediately contacted the workplace – mostly they contacted us first. The occupational therapist apologised on behalf of the school and immediately offered to pay for the stolen item.’ (Participant S1, Female, April 2020)

On the positive side, one of the most gratifying experiences we had with our L1 participant with cerebral palsy was the social acceptance that she experienced at the grocery store near her home when we persuaded her mother to take her shopping with newly earned money (by selling keyholders at school). Her awestruck face and enjoyment when she did her own shopping for the first time in her 16-year existence were unforgettable. The staff greeted her friendly and was patient while she packed her selected goods on the counter for payment.

Inclusion is a critical principle of sustainable development as it highlights the importance of equal access to opportunities, resources and participation for all individuals. Based on the data, we took action to address this principle and facilitate these learners’ transition into adulthood by devising support strategies to make their social inclusion easier. These strategies included the following:

- Alternative and augmentative communication (a communication aid for our L1 non-verbal learner)

- A visual schedule for our learner working in a pre-school, who found it difficult to remember instructions
- Social and employability skills coaching in the workplace (e.g. coaching regarding appropriate dress, greeting employers and clients and respectful treatment of co-workers).

Young individuals and their challenges and support needs were at the centre of the research during Cycle 1. The aforementioned discussion confirms that addressing dignity, empowerment and inclusion in the context of adolescents with SID could contribute to ESD by building more equitable, inclusive and sustainable societies. The starting point in planning the future of young adults living with intellectual disabilities is to determine how they wish to live their lives and what is needed to make that possible (McCausland et al. 2022). Fostering self-determination and self-advocacy skills in learners with intellectual disabilities may prevent a situation where learners leave school without the skills to make meaningful choices and without a vision for the future.

■ Discussion of findings of Cycle 2: Family-school-community partnerships as a support measure

Education for sustainable development emphasises the importance of collaboration or partnerships. Holmes (2022, p. 46) defines partnerships as:

[M]utually supportive interactions between families and professionals, focused on meeting the needs of children and families and characterised by a sense of competence, commitment, equality, positive communication, respect and trust.

By fostering partnerships, the research aligns with SDG17 *Partnerships for the Goals*. Based on the findings of Cycle 1, ALS shifted the focus from the individual with an intellectual disability towards those who surround him or her, more specifically the family, school and community. Small, Raghavan and Pawson (2013) warn that person-centred transition planning for youth with intellectual disabilities, although crucially important when conducted in isolation, may transpose an individualist idea to a group of people whose needs might be served better by acknowledging the importance of interdependence between the young adult and those who need to support him or her in the journey towards adulthood. Therefore, an ecological approach, involving family-school-community partnerships, is widely advocated (Epstein 2019).

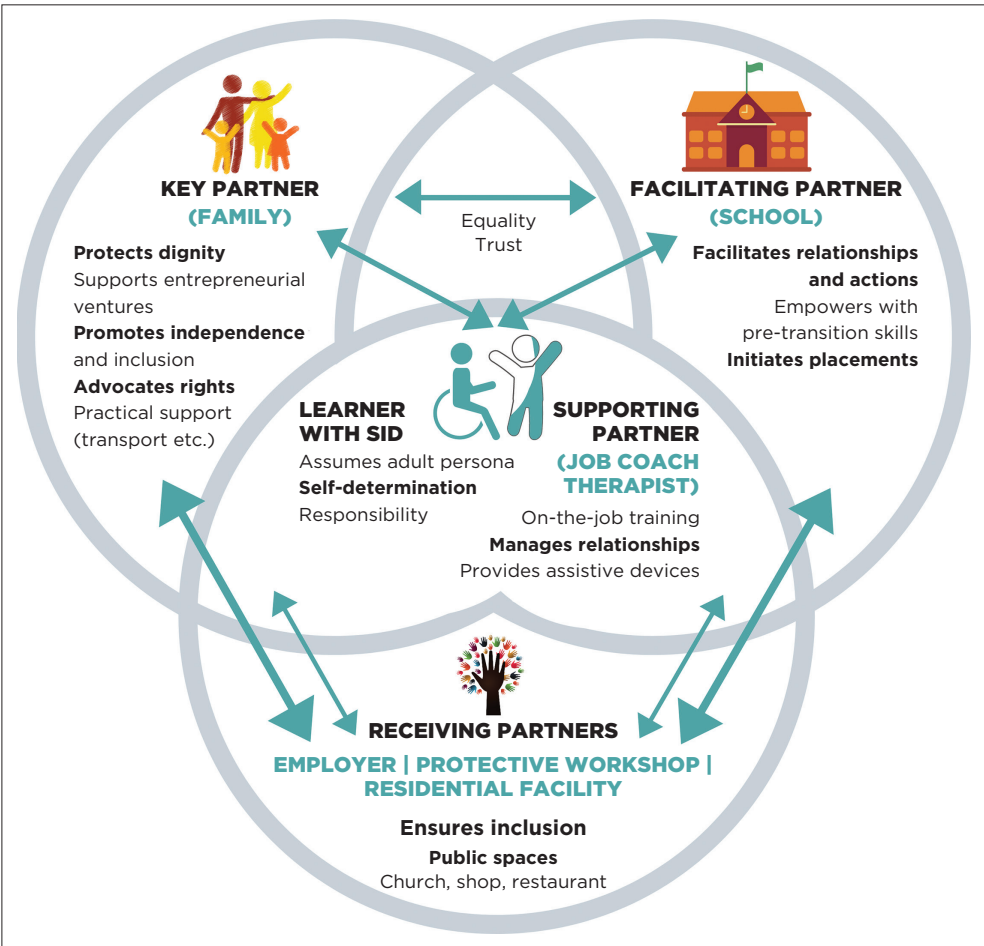
The first theme of Cycle 2 regarding partnerships was the complicated, challenging and fragmented nature of the parent-school partnership in the special needs education context, even more so in a developing country such as South Africa. One of the participants, a Tswana-speaking

teacher (P6), gave a riveting account of the unique challenges of a parent raising a child with a disability in disadvantaged communities in the South African context. The school-based ALS members (P1, P2, P3 and P5) revealed their experiences of parental non-involvement in school matters and non-attendance of meetings – a challenge that usually proves to be a major barrier in the establishment of a family-school partnership during transition planning. During the ALS discussions, the group learnt that the apparent non-involvement of parents, and the resulting breakdown of the family-school partnership, had multiple causes, rather than being because of individual deficits. Some of these factors are single parenthood, poverty, long travel times home with public transport, a lack of basic resources and service delivery at home and societal challenges, such as substance abuse and religious and cultural bias. These challenges are compounded by the care burden of a child with a disability and the grief cycle these parents need to work through, which is a major cause of depression. Another challenge is the language barrier, which causes a lack of understanding of school communication, especially as learners are often taken care of by grandparents who do not speak English well. Despite all these barriers, parent empowerment was deemed to be of crucial importance. A parent member of the ALS, P7, passionately insisted that the school needs to go the extra mile to involve and empower parents to take the lead in facilitating the transition process of their children into adulthood. By bringing together resources and different perspectives, it helped the ALS to address the post-school support gap.

The second theme was the existence of a post-school support gap, especially regarding employment. Wehman et al. (2012, p. 139) define supported employment as ‘competitive employment in an integrated setting with ongoing support services for individuals with the most severe disabilities’. The school-based ALS members pointed out that school staff members were already buckling under their workload, attending to the day-to-day educational needs of the learners in the school. They would not have the time and resources to coach young adolescents in their workplaces. The data gathered from the participating parents indicated that they too would not have the capacity or time and a parent’s presence in a young adult’s workplace would, at any rate, be inappropriate. The data provided by employers indicated that they tended to feel unsure and were not equipped to deal with the challenges of young adults with SID. The consensus reached by the ALS was that job coaches with experience with young people with SID are needed. These job coaches could render support to learners with SID and, at the same time, serve as a link between the different stakeholders. The job coach should preferably *not* be a school staff member, because of the time constraints that prevent staff members from coaching learners in workplaces for an extended period.

Based on the data analysis from Cycles 1 and 2, the ALS developed a visual representation (see Figure 10.2) that takes into consideration the different roles of the people in the social ecology of the young person with SID.

From their analysis of the data, the ALS concluded that the school is the facilitating partner. In the case descriptions, the school-based partners (the transition manager, the class teacher and the therapists) should reach out to other relevant partners (parents, employers and service providers) and facilitate the needed action. The facilitating partner initiates the action. Without the action of the facilitating partner, the transition process cannot even start. By working together partners helped bridge the post-school gap and ensure that adolescents have the opportunity to fulfil their potential and contribute to sustainable development.



Source: Malan (2022).

FIGURE 10.2: Supportive partnership roles in the different ecologies of the learner with severe intellectual disability during the transition.

The findings revealed that the parent or parents (family) are the key partners. They know their child best, so they can give key information regarding their child's dreams, wishes and abilities. As guardians of vulnerable individuals, they make key decisions, and they need to grow into informed and empowered drivers of their child's future when the school withdraws. Parents, as key partners, are best positioned to advocate for their children's rights and to ensure that they are treated with dignity.

Sponsors, therapists and other service providers are supportive partners. Of these, the job coach, depicted in the illustration as placed right next to the learner in the centre, renders crucial support, linking the parent, the employer, the school and the learner in a continuous supportive cycle until employment success is achieved.

The employer or the care centre is the receiving partner. Therefore, important questions that need to be asked before placing a learner with SID in a particular environment would be: 'How will this employer and this environment receive this particular person with these unique challenges and abilities? Is this a good fit?'

The findings of the first two cycles informed the action in Cycle 3.

■ Discussion of findings of Cycle 3

Cycle 3 consisted of the practical application of the results of Cycles 1 and 2. Firstly, we drew up individual transition plans (ITPs) for the learners, based on the different challenges and support needs of each. Furthermore, based on what we had learnt in Cycle 2, instead of communicating with parents from a position of power, we not only involved them but also empowered them by having them take ownership of the actions taken with the learners (e.g. they were introduced to employers and could make final decisions regarding placement). Moreover, we appointed a job coach for each learner placed in employment to ensure that the learner had the required support. In addition, the respective stakeholders were prepared for their supportive roles in the ecology of the learner; for example, employers were prepared to receive young adolescents with SID by informing them of their strong points and challenges.

We present one case as an example of the action taken with learners based on the findings from Cycles 1 and 2. This is the case of L5, who was placed in employment at a pre-school facility. Table 10.5 shows how we used the findings to create a transition plan and which QOL outcome we aimed to reach.

Based on the data, the ALS designed a process model that can be utilised as a guideline when embarking on a transition programme for adolescents with SID. The process consists of a pre-transition stage, a transition stage

TABLE 10.5: Actions taken in Cycle 3 to support the adolescent's employment.

Description of the learner	Challenges experienced and reasons for challenges	Core supportive actions (guided by learner-centred ITP)	Collaboration to provide support (partnership)	QOL outcomes
L5: Female learner, the appearance of a normal adolescent, fully mobile and verbal, but experiences visual memory and literacy challenges	Exclusion: No exposure to job-related opportunities	Intervention: Employment placement at a pre-school as a cleaner	Collaboration between researcher, job coach, parent and employer	Material well-being: Opportunity to earn money
	Disempowerment: A lack of employability skills	Skills development: Coaching in cleaning skills	Collaboration between job coach and parents	Personal development: Mastering cleaning tasks
	Exclusion: Auditory memory challenge, inability to remember tasks	Use of a visual schedule to bridge challenges and include her in the work environment	Collaboration between employer, job coach and P5	Personal development: Remembering daily tasks
	Disempowerment: Limited time concept	Prioritise independence skill: Reading a picture- and photograph-based calendar	Collaboration between parent, P5 and school secretary	Personal development: Time concept, ability to plan week
	Disempowerment: Unable to read recipes to prepare own meals or bake for leisure	Prioritise independence skill: Utilising a picture-based recipe book	P5 and P3 (Consumer Skills teacher and department head of the Senior Phase) collaborate to make a recipe book	Personal development: Competence in home living skill

Source: Malan (2022).

and a post-transition stage. The pre-transition stage is needed to prepare young adolescents with SID for transition into adulthood, with a focus on self-care, home living skills, community living skills and communication skills. This stage needs to start between 14 and 16 years of age to give learners time to acquire these skills. Parents, as the key partners, need to be empowered to take the lead during this stage. During the transition stage, the focus shifts to after-school placement and, where possible, employment. This stage starts with a learner-centred holistic assessment and an ITP. Parents are fully involved throughout. Job placements for job experience are conducted after pre-visits to the places of employment and with the support of a job coach. In the case of learners with complex and multiple support needs, parents are accompanied by school staff members during visits to different service providers, such as protected workshops or care centres, to support them emotionally and practically. For sustained placement and quality of life, the post-transition phase ensures that school staff members keep contact with parents and learners after the learner has left school. The school continues to provide support where needed to ensure that these young people are settled and happy. Table 10.6 explains the process.

TABLE 10.6: The transition process model.

Pre-transition stage (ages 14–16)		
Activities	Role players	Envisaged outcomes
Parent group meetings or workshops	School-based multidisciplinary team	Parental empowerment: Inform parents of the transition programme Have group discussions Identify leader parents
Learner activities: Role play – appropriate social interaction	Life Skills or class teachers and support staff involved in outings	Empowerment: Improved social skills Improved independence skills Improved community living skills
Home living skills: Make own bed, make own meals, wash and fold own laundry, and so forth	Parents	Dignity: Age-appropriate image
Community living skills: Budgeting, shopping, how to use a bank card, wayfinding and using public transport Real-life experiences by means of outings		Inclusion: Exposure to public spaces Building awareness in public spaces
Communication: Augmentative and alternative communication measures appropriate for after-school use, cell phone use, phone etiquette, safety measures in public spaces and handling emergencies		Communication support: Improved ability to keep safe and handle emergencies
Transition stage (ages 17–18)		
Activities	Role players	Envisaged outcomes
Parent group meetings or workshops	School-based multidisciplinary team	Parental empowerment: Inform parents of the aims and activities of the transition phase Have group discussions Identify leader parents
Learners in the last school year wear different attire	School management team Parents	Dignity: Paradigm shift – learners need to adopt an adult persona
Workplace simulation sites within the school environment		
Assessment (can be conducted at the end of the previous year)	Therapist Learners	Learner empowerment: Learners' preferences and strengths are identified
Career interest questionnaire		Learners with multiple disabilities: QOL improvement needs to be identified
Learners are divided into groups according to competence	Therapist	Learners with similar competencies or ITP aims are grouped to simplify planning
Individual parent interview (to be followed up as needed with telephonic conversations or more interviews)	Relevant stakeholders at school, for example, class teacher and therapist	Parental empowerment: Share and confirm findings of assessments Fill in gaps needed for ITP Ensure that parents understand the aims and envisaged activities Build good rapport with and gain the trust of parents Recognise parents as experts

Table 10.6 continues on the next page→

TABLE 10.6 (Continues...): The transition process model.

Pre-transition stage (ages 14–16)		
Activities	Role players	Envisaged outcomes
Set up ITP for learners	Multidisciplinary team, including class teacher and therapist	Holistic plan with attainable aims for learner's transition
Provide ITP to parents and discuss it with parents		
Initiate actions needed for the execution of learners' transition plans: Identify and visit job placement sites, make choices according to criteria set by the therapist	School staff member tasked with job placements	Put support in place for identified needs
Manage logistics of job placements (e.g. transport)		Adjustments to ITP where needed
Facilitate the making or acquisition of aids for ITPs		Continuous communication with all relevant stakeholders
Facilitate the linking of parents to post-school public services (e.g. application for social grant)		
Recruit and train job coaches		
Job task analyses of learners' jobs	Therapist	Provision of job-related guide for job coach's instruction
Employer interviews	Therapist or appointed staff member	Provision of guidance to the employer Enquiry into requirements of the job
Job placements	Staff member tasked with job placements	Practise employability skills in real-life situations Job hardening (becoming work-fit)
On-the-job training	Job coach	Empowerment: Supports learner, acts as intermediary stakeholder between employer, parents and school, and resolves potential challenges on the spot
Off-site skills training (at school)	School staff (e.g. Life Skills teacher or class teacher) Social skills: Therapist facilitates resolution of challenges (e.g. role play)	Empowerment: Learner practises skills he or she finds challenging at work
Visits to care centres, protected workshops and residential centres	Transition manager or senior staff member Parent Learner	Parental empowerment: Seek an appropriate facility in a timeous manner and book space
Seek sponsorships for start-up kits and continued financial support for small entrepreneurs	Relevant staff member or parent	Facilitate support for entrepreneurial projects
Post-transition stage		
Activities	Role players	Envisaged outcomes
Continued support: Job coach continues support until no longer needed	Job coach Parents	Inclusion: Sustained job placement Continued participation in social roles, shopping and so forth
Feedback obtained from parents and job coach	Staff member tasked with job placements	Improvement of the school's transition planning

Source: Malan (2022).

Participatory action learning and research as a unique genre of action research, as referred to in the 'Methodology' section, is the third leg of the transition triad and is vital for the sustainability of change.

■ Participatory action learning and action research as a vehicle for learning and change

The findings confirmed that PALAR facilitated collaborative learning and collective action towards improving the quality of life for adolescents with SIDA as they transition into adulthood. It aligns clearly with SDG 17 (Partnerships for the goals) as it opened the door for the various stakeholders in this project to learn with and from one another and collaborate towards the common goal of improving the quality of life of young people with SID as they enter the adult world. By focusing on the transition of adolescents with SID into employment, the ALS supports SDG 8 (Decent work and economic growth) by fostering initiatives that promote decent work opportunities and economic empowerment for all, including those with disabilities.

A favourite quotation of Zuber-Skerritt (2011, p. 5), who first conceptualised PALAR, is a sixth-century saying by Heraclitus: 'Learning does not mean to fill a barrel, but to ignite a flame'. Although the study was initiated because of the first author's passion for special needs education, the use of PALAR ignited flames in the hearts of each member of the ALS, who, in turn, spread that flame much more effectively than would have been the case if that one teacher tried to work in isolation. The PALAR research design incorporated ESD principles by promoting participatory learning, reflection and action towards sustainable development. During (and after) this study, it was shown beyond any doubt that an action learning group is an excellent way to accomplish learning and change. Actions leading to observable success trigger learning, and this learning, in turn, prompts change. When observing success, the members of the ALS began to ask such as 'Why did that work? How did that happen? Can we repeat that success? How can we repeat it?'

The institutional change that took place after the study was profound. Because the action learning group was the key driver of the research, the transition process model was implemented in the school with immediate effect, job coaches were recruited, and learners were placed in the open labour market. Parental support has become more evident, and partnerships with community stakeholders are being forged. However, the most important change is to be observed in the learners whose dignity is enhanced as they are included and empowered to improve their quality of life. There is still much to be accomplished as we research and learn, but flames continue to be ignited as we progress.

■ Conclusion

In investigating the challenges and support needs of the young learners with SID about to leave school, the ALS found that the three emerging themes were about core attributes and educational and societal attitudes that make a person with a disability a human among humans, that is dignity, empowerment and inclusion. Both the dignity and inclusion themes are closely related to SDG 10, which advocates for reduced inequalities so that no one is left behind (United Nations 2015). The empowerment theme addresses SDG 8 because it is hoped that young people with SID might be empowered to lead quality lives that may include a decent job and improved living standards (United Nations 2015). The issue of partnerships resonates with SDG 17 (partnerships for the goals), which entails inclusive partnerships towards the realisation of the other goals (United Nations 2015). Lastly, the fact that more transition-focused education is currently being undertaken addresses SDG 4 (quality education), which aims for education that provides everyone with the necessary knowledge and skills to stay healthy, obtain or create employment, and foster tolerance (United Nations 2015).

The findings of the study indicate that the transition triad – a learner-centred approach, enacted within the school-parent-community partnerships, through a process of continual relationship building and collaborative research (PALAR) – forms a strong basis for sustainable and effective transition into dignified adult life for young people with SID.

■ Ethical clearance

An ethics approval process was followed for the research study presented in this chapter. Ethical clearance (NWU-00537-19-S2) was obtained by the authors from the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee for research carried out with a non-health focus that involves vulnerable participants and/or where there is a medium- or high-risk possibility of potential disadvantages for the participants.

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Chapter 6

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Chapter 8

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Chapter 10

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This book features chapters by scholars from various education fields specialising in sustainability. As the first volume in North-West University's Community-based Educational Research Series, it focuses on transforming education through a participatory approach. The authors explore quality education across early childhood, primary, secondary and higher education by examining collaborative efforts among practitioners, parents and teachers.

This scholarly book provides empirical evidence on how collaborative initiatives can promote sustainable development. These initiatives encourage partnerships among community leaders, educators, learners, nongovernmental organisations, government and the private sector for lifelong learning and professional development. It highlights southern African experiences in collaborative education, aligned with the United Nations' sustainable development goal of achieving quality education. The book demonstrates various research designs and methods applied to educational practice from early childhood to tertiary levels through empirical research and community projects.

This book provides a fascinating insight into education for sustainable development theory and practice as it is understood and enacted in the southern African context. There is quite a substantive amount of learning that scholars who work in similar contexts can readily transfer. For those unfamiliar with the African context, the case studies are no less insightful but also instructive and reassuring to see familiar themes explored in different settings. Above all, this collection of studies, bound by a common interest in participatory research methods, reinforces the reader's sense of our shared humanity learning our way forward together.

**Dr Paul Vare, Department of Research Development, Faculty of Education and Science,
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This timely scholarly edited collection provides a clear view of possibilities for Participatory Action Learning and Action Research (PALAR) in varying contexts in South Africa. The chapters span across various school phases and contexts, providing a good perspective for developing education for sustainability practices informed by research. The recommendations and conclusions are derived from data produced through collaborative processes involving various relevant stakeholders in each chapter. This book comprehensively highlights critical aspects of education for sustainable development linked to technology in education and environmental issues such as climate change. A major contribution of this book is the illustration of the power and value of collaborative research work in local contexts and the potential contribution of such processes to education for sustainable development practices in formal education.

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