# SOUTHERN AFRICAN JOURNAL OF ENVIRONMENTAL EDUCATION

## Special Issue: TVET and Environmental Education Research

VOL 39
2023

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Institutional support for the Journal is provided by the Rhodes University Environmental Learning Research Centre in the Faculty of Education at Rhodes University (South Africa).

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ISSN 2411-5959

Cover design: Dudu Coelho
Cover photo: AWARD/USAID: RESILIM-O programme
Layout and typesetting: John Bertram, Tangerine Graphic Design

# Southern African Journal of Environmental Education

Volume 39 (2023)

***Acknowledgement***

*The support of the University of Witwatersrand and the Centre for Researching Education and Labour (REAL) is gratefully acknowledged by the Southern African Journal of Environmental Education for this Special Issue.*

# Special Issue: TVET and Environmental Education Research

EDITORIAL

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This edition of the *Southern African Journal of Environmental Education* carries five 'special issue' articles focussing on Technical and Vocational Education and Training (TVET), rightly identified by most authors as a 'neglected area' in education research more broadly, but specifically also in environmental education research. The purpose of a 'special issue' is to bring focus on a topic to a journal audience. So what do our five special issue authors bring to our attention about the connection between environmental education and TVET, and how can we read these articles together?

Our southern African scholarship contributes to a global conversation around the powers, shortcomings and possibilities of education, and so it is important to reflect critically on international trends and emerging trajectories. This editorial seeks to bring this volume of the journal into a precursory conversation with two international publications that recently entered the public domain, as a kind of benchmarking exercise or 'reflexive barometer' of our regional work in relation to international educational developments.

One strong theme emerging from the five special issue articles on TVET and environmental education is the key insight that it appears to be inadequate to 'box' our concepts of TVET into formal learning institutions tasked with TVET. There is a strong need to consider TVET either as a boundary crossing activity between formal and informal TVET learning situations, or to fundamentally re-consider TVET as an activity necessary in the informal learning arena.

The first article to address informality and TVET is by **Monk**, **Muhangi**, **Akite** and **Adrupio** writing from Gulu, Uganda. Their contribution addresses the question how Vocational Education and Training (VET) in Africa can be transformed if youth innovation and informality were to be brought into stronger focus. Their argument is that epistemic injustice characterises many VET settings due to the fact that it fails to include those that are not able to participate in formal VET learning settings, particularly young women. Given histories of exclusion, and immediate demands for VET support for social and environmental learning innovations, they urge readers to consider support for emerging VET innovations in more informal learning settings, where VET is still needed. Drawing on a social ecosystem for skills perspective which connects formal and informal VET offerings around local demand social innovation, they argue for a shift towards a climate and socially conscious social skills ecosystem capable of designing a positive future.

Authors **McGrath** and **Russon** also pick up the focus on informality and VET, with a similar argument to Monk and colleagues. In fact, one of the cases they describe is the case developed by Monk and colleagues in Gulu, Uganda. They also briefly describe


DOI 10.4314/sajee.v39.01
ISSN 2411–5959

three other cases which formed part of a VET Africa 4.0 research programme co-developed across four sites: Gulu and Hoima (Uganda), Alice and Durban (South Africa) (cf. VET Africa 4.0 Collective, 2023). Drawing insights from this co-authored book and collaborative international research project, their key argument is that VET in Africa needs to more proactively include a focus on informality, as this was a key finding from all of the case studies conducted by the South African and Uganda teams in the VET Africa 4.0 Collective research (which they summarise in their article). They note that this is a necessary focus for expanding VET beyond productivism towards sustainability narratives, and towards social ecosystem for skills approaches that allow for boundary crossing between formal and informal TVET settings.

The Alice case mentioned in the McGrath and Russon article, is elaborated by authors **Lotz-Sisitka**, **Sisitka**, **Chakona**, **Matiwane** and **Mutambo** who have been working on the Alice boundary crossing VET case for the past 10 years. Their article focusses on development of an evaluation approach tested in a VET Training of Trainers (ToT) programme and learning network, which focussed on the uptake and circulation of rainwater harvesting and conservation (RWH&C) knowledge in a particular formal and informal VET context in Alice, in the Eastern Cape, South Africa, where smallholder farmers were struggling to find water for producing food. The evaluated ToT course was catalytic in establishing a boundary crossing social learning network approach in a VET context that linked formal and informal VET. The article's main contribution, however, is an evaluation approach drawing on Wenger, Traynor and De Laat's (2011) Value Creation Framework that demonstrates the value created in the boundary crossing activity of Training of Trainers involving both formal and informal VET actors in a social ecosystems for skills approach which seeks to bridge the formal and informal VET context.

A second key theme emerging in the five special issue contributions relates to curriculum and programme design. Drawing attention to knowledge structuring and relations between theory and practice in VET curriculum and learning settings, **Winberg** and **Hollis-Turner** in their article, focus in on how technical curricula for renewable energy technologies are designed. With a focus on Renewable Energy Technologies (RET) subjects within the Electrical Infrastructure Construction programme offered by technical and vocational education and training (TVET) colleges in the Western Cape, South Africa, they analyse the knowledge that underpins the RET subjects. Drawing on Karl Maton's semantic code analysis from Legitimation Code Theory, they uncovered gaps and imbalances across the range of knowledge forms selected, noting particularly problems related to cumulative knowledge building. Their study points to how knowledge selection and sequencing (and mismatches) in technical curricula enable or constrain cumulative learning. Their article offers insights for VET in the Just Energy Transition, especially for design of TVET programmes focussing on RETs.

Using Practice Architecture Theory to analyse informal VET in the fishing industry, the article by **Ferguson** also draws attention to curriculum and learning process design in the context of informal VET, thus taking the theme of informal VET further, but also

considering its modalities, notably the design of blended courseware. Drawing on a case study of informal VET in a production training programme designed for approximately 400 seafarers, the study illuminates four characteristics concerning the practices of courseware creation for non-accredited VET, thus offering further perspective on how VET programmes can be designed and developed in informal learning settings.

The five special issue contributions therefore collectively challenge environmental educators interested in TVET to consider the relationships between formal and informal VET, between theory and practice, how knowledge is structured in TVET programmes, and how boundary crossing between formal and informal VET can create different types of value for those involved, as well as how courses are designed and evaluated in these different contexts of formality, boundary crossing and informal blended learning contexts. Given the large numbers of people excluded from formal TVET contexts, and the high demand for VET in the context of co-creating sustainable futures, this focus on the relationship between formality and informality, and theory and practice, value creation and course design could provide helpful insights for the TVET sector generally, but specifically for environmental educators engaged with TVET and VET more broadly in the pursuit of social and environmental justice and sustainable livelihoods.

The five special issue contributions are complemented by five contributions that add perspective to the special issue. Although not focussed on VET, the insights from the articles are potentially useful to VET readers, but also to the wider environmental education community in southern Africa. The paper by **Chandramoham** and **Bhagwan** focusses on an understanding of eco-justice and its related principles in the Health Sciences at a university in KwaZulu-Natal, South Africa. Their interest was in understanding how academics and students at a University of Technology understand eco-justice, the principles underpinning eco-justice and what eco-justice can be initiated amongst tertiary students. Their study finds that eco-justice was found to be associated with the need for care and preservation of ecosystems, especially through reducing over-consumption and the overuse of natural resources. They also found that participants were in support of projects that inter alia involved recycling, ocean protection and greening.

In the next article, **Leigh Price**, writing from the Inland University of Norway, deliberates an 'Enlightened Common Sense Approach' to environmental education. Drawing on the work of critical realist Roy Bhaskar and his theory of transcendental realism, she considers how such an approach would unfold with special reference to climate change. The article offers a critical reading of complexity theory, its ontology, approaches, and associated limitations. She argues that much of the critique offered on complexity theory can also be applied to posthumanism. From the perspective of transcendental realism, it is knowing 'how things work' – being enlightened – that is necessary, and often sufficient to deal with complex systems. This, Price notes, has implications for how environmental educators define climate and climate change, which can offer an antidote to certain challenges posed by climate change deniers. She points out that it would be better for environmental educators to refer to the Greenhouse Effect, focussing on the structural nature of the

problem, rather than climate change, as this can also immunise environmental activists from certain climate change denial arguments, such as that climate change science is not proper science. It would also give them permission to act even in the event of a temporary hiatus in global warming, which empiricists can argue proves that climate change is not happening. That is, activists are justified to act in open system contexts if the structures and mechanisms that will lead to a future problem exist, even if the effects of the structures and mechanisms have not yet shifted into the realm of the empirical.

The article by **Micklesson**, **Usai**, **Chinofunga** and **Oljans** considers health literacy capabilities of Zimbabwean school youth. In particular their contribution focusses on questions about the relationships between food and health, including the contextual conditions of food availability, accessibility and affordability. Drawing on capabilities theory, the research centres on co-creating knowledge with youth based on their valued beings and doings about health and considers how their health goals relate to food and the sustainability challenges of antimicrobial resistance (AMR). Their research uncovers children's health literacy capabilities to achieve non-predetermined health goals that align with their valued beings and doings. As such, the implementation gap between knowing and doing is bridged through practices of health and well-being contextually grounded in the lives and experiences of the student youth. Through the use of health literacy capabilities theory and exploring the social, political and commercial determinants of food and health, this article aligns with previous research that goes beyond individualistic approaches in health education, and offers perspective on how to move from being literate about health to becoming capable of achieving health.

The next article also focusses on environmental literacy with children, but this time the author, **Preston**, works with puppetry as an approach to advancing children's environmental literacy in Wakkerstroom, South Africa. The article draws on a 'wonders of nature' approach, and seeks to expose children to the natural environment using the arts, reflective practice and immersion into the natural environment. Focussing on a 'stop moment' in the educational process, her argument is that puppetry is a particularly effective approach to such education. Preston argues that arts-based approaches such as the use of puppetry, can enhance what is learned in formal classrooms, drawing attention to the use of multimodal approaches in environmental education.

The last article in the 2023 edition of the SAJEE, tackles the question of leadership in environmental education curriculum management. In particularly, it considers Africanising distributed leadership approaches. Authors **Shabalala** and **Gumbo** explain that distributed leadership is a collaborative leadership approach that involves sharing decision-making and responsibilities among multiple individuals or groups within an organisation or institution. Drawing on the African philosophy of ubuntu, and working with a Tswana proverb, *kgetsi ya tsie e kgonwa ke go tshwaraganelwa* (work is easier when people work together), they frame their study, which invites further research on local meanings of distributed leadership and their application in environmental education research. The article, constituted as a conceptual paper that offers an initial literature review on this topic, argues that in the

context of environmental education curriculum management, distributive leadership can bring several benefits to stakeholders. Distributed leadership is characterised by a collaborative and decentralised approach to leadership, and emphasises shared decision-making and responsibility among various stakeholders within an educational institution, potentially fostering a more inclusive and participatory environment.

Overall, the combination of the special issue contributions and the five additional articles included in the 2023 edition of SAJEE offers readers a rich platform to consider different dimensions and contexts of environmental education research. From challenging large scale programmes such as complexity theory and posthumanism to proposing tools for researching distributed leadership in a southern African context, to focussing on student and children's conceptualisations and capabilities for eco-justice and health, and considering methods such as puppetry, this edition offers a window of insight into the diversity of approaches that are being developed in environmental education research.

# Designing the Future: Youth innovation, informality and transformed VET

**David Monk**, Gulu University, Uganda; **Sidney Muhangi**, Rhodes University, South Africa;
**Irine Akite** and **Scovia Adrupio**, Gulu University, Uganda

## Abstract

This article argues that Vocational Education and Training (VET) can be a valuable space to develop the innovation required to deal with the wicked problems of the world; however, radical and rapid transformation in approaches to VET is needed. While we use a case study from Gulu, Uganda, the findings can be applied more broadly. A new approach cannot be taken in isolation from other social circumstances, and desperately needs to include epistemic contributions both in relation to content and approach so that it bolsters and supports the initiatives, designs and dreams of the intended participants, especially women. We argue that epistemic injustice is a major limiting factor for environmental learning and innovation. We share potential opportunities from our research to shift towards a climate and socially conscious social skills ecosystem capable of designing a positive future.

***Keywords:*** *Transformative Vocational Education and Training (VET), social skills ecosystem, epistemic justice, environmental sustainability, intersectionality and VET*

## Introduction

The planetary climate emergency brought on by 400 years of unprecedented and increasingly ruthless human destruction of the planet demonstrates a clear need for a reorganisation and reorientation of human relationship with the planet. We agree with critical and environmental Vocational Education and Training (VET) scholars (i.e. Allais, 2022, 2023; Rosenberg et al., 2019; Vet Africa 4.0 Collective; Wedekind et al., 2021) that such a reorientation and realignment with planetary needs requires a deep reorientation of learning systems which are currently nested in and reflect the oppressive, hierarchical, and competitive organisation of human living which glorifies puissance (power over another) and rationalises violence. In this article, we further this discourse with particular attention to generative, expansive, and innovative networks of informal learning and innovation to deepen understanding of the agential boundaries that limit the potentiality of a vibrant social skills ecosystem capable of catalysing the climate-induced and urgently needed socio-economic transformation. We recognise that women face compounded challenges related to climate change especially in rural areas and we therefore base our observations on three years of research examining the viability of a new, more equitable approach to VET in


DOI 10.4314/sajee.v39.06
ISSN 2411–5959

South Africa and Uganda (Vet Africa 4.0 Collective, 2023). This article focuses on the data drawn from a case study in Gulu. Gulu is a new rural city in Northern Uganda which is in a period of transformation and growth following more than two decades of civil war. It is characterised by a majority youth population, largely informal economy, many NGOs, a high number of early school leavers, and government strategy for development driven by vocational education. Development is being driven largely by local and informal youth networks of (vocational) learning for small enterprises oriented towards solving regional problems (Metelerkamp & Monk, 2023).

We first describe what a transformed VET could look like, and why it is needed. We tie this to problematic ontological underpinnings of life and learning, and we draw attention to emergent networks of youth-led innovators and environmentalists that are learning together in spite of, and often outside of, the formal education system. These learning networks offer a fruitful approach for VET learning, community development and sustainable futures. We argue that environmental sustainability in Uganda could be catalysed through a transformed and inclusive VET, but it must rest in the rough and rhythmic chaos that is visible in informal learning, and offer a new story about living together on this planet. We interchange the use of Technical VET (TVET) and VET throughout the article.

## TVET and environmental education

In Africa, TVET is a potentially transformative tool for sustainable development, especially in crucial sectors such as agriculture which are disproportionately affected by environmental and climate change. As potential hubs for advancing environmental education and innovation for sustainability, UNESCO is calling for the greening of TVET institutions. UNESCO stresses that credible and comprehensive skills systems can support individuals, communities, and organisations to generate and maintain enhanced and just livelihoods (McGrath et al., 2020; UNESCO, 2016). Referring to SDG 4, Roemhild and Gaudelli (2021) argue that climate change education – inclusive of climate justice – must be considered as a core component of quality education.

In their article revisiting the literature of TVET in Africa, McGrath et al. (2020) call attention to Sustainable Development Goal 4, which suggests the need for a transformation in learning and teaching in order to deliver quality education that can meet the learning needs of all. McGrath et al. (2020) suggest that, in the context of VET, in order for such a transformation to occur, there must be a corresponding and a priori transformation in the approach taken to learning and teaching and researching. Drawing on human rights education (Tomaševski, 2001), critical capability theory (DeJaeghere, 2018; Powell & McGrath, 2019), critical adult education (Freire, 1970; Zeelen et al., 2010), McGrath et al. (2020) propose a liberatory and empowering type of learning that situates the agentic needs of the learner within a broader context of learning and living, with particular attention required for vulnerable and marginalised people(s). They frame this in terms of addressing the complex challenges associated with obtaining decent work and sustainable livelihoods amongst the significant and growing threat of climate change. Likewise, Allais (2022) is

a strong advocate for integrated VET systems that attend to unequal power relations in social and economic structures. Importantly, Allais reminds us that VET training could be part of societal solutions, but is not an independent solution to the existing complex and intersectional social and environmental problems. Like McGrath et al. (2021), she is critical of VET narratives that suggest that training people alone is sufficient to solve social problems, because they do not account for – and sometimes even excuse – unjust structures that cause the problems. Lale and Eliala (2019) have explained that women's ability to respond to climate change is highly constrained by some systematic, social and structural factors. This increases women's vulnerability to climate change because they depend on climate sensitive sectors to provide livelihoods and well-being for their families. UN Women (2018) added that women are faced with a myriad of challenges including unpaid work and lack of access to productive resources.

In their book, *Green Skills Research in South Africa* (2019), Rosenberg et al. (2019) emphasised that transforming VET systems requires a paradigm shift in societal relations. They argued that a radical and rapid transformation of VET is needed to address pending environmental disaster, and that it must both happen alongside and include a transformation of social and economic systems to make them more cooperative, nurturing, and supportive.

The VET Africa 4.0 Collective (2023), drawing on their research to expand on a social skills ecosystem model (Hodgson & Spours, 2016), proposed a pathway towards decent and inclusive living, learning and working that accounts for the intersections of power, policy, and a variety of stakeholder interventions by formal, informal, national, international and local stakeholders.

In relation to Gulu, Uganda, Metelerkamp and Monk (2023) have drawn attention to the informal networks of learning in VET that are driving innovation. They remind us that African populations are mostly youth, and that 80% of African economies are informal. They suggest that youth are driving change in Gulu through international networks of learning informally in spite of vocational systems that are not meeting their learning needs. They explain that the learning experiences of young people informally are characterised by relationships with high levels of accountability for teaching fellow youth, and for developing their communities, and that learning is driven by and directly integrated with improving livelihoods and community needs.

The paradox is that the decision-makers claim that youth need a 'mindset change', to appreciate TVET as a decent career option, while they structurally diminish the cognitive domain of these youth. Excluding and disregarding their capacity to contribute to society is an act of epistemic injustice. Gaile Pohlhaus Jr. (2017) explained that epistemic injustice considers "how epistemic practices and institutions may be deployed and structured in ways that are simultaneously infelicitous toward certain epistemic values (such as truth, aptness, and understanding) and unjust with regard to particular knowers" (p. 13). She explained that epistemic injustice is a function of silencing individuals and groups of people's ability to authentically contribute to social pools of knowledge. Collins (2017) explained that this happens through discrediting certain people's epistemic credibility either purposefully

or through what Dotson (2011, as cited in Collins, 2017, p. 120) refers to as 'pernicious ignorance': "any reliable ignorance that, in a given context harms another person or sets of persons". Medina (2017) explained that epistemic injustice is often structural and socially constructed to the extent that entire groups of epistemically oppressed people are taught – and often believe – that they do not know.

Returning to the context of TVET and avoiding environmental catastrophe, epistemic injustice is also dangerous because, as Ramsarup (2019) explained in the South African context, education and work systems are unprepared for the environmental crisis, and therefore are forced to rely on the "agentic action of individuals" (p. 93). We demonstrate in the data below more specifically how youth are excluded and yet still find solutions for environmental issues. We call for a model of formal VET that can integrate the informal innovations and capacity to adapt. We argue that this will only be possible if the youth are included in such decisions. First, however, we briefly describe the research we are drawing on.

## Methods

In this article we draw on case studies from two distinct but connected research projects in Gulu (Uganda) examining vocational education in Africa. The VET Africa 4.0 research was undertaken over a period of three years, with two case studies in Uganda and two in South Africa. The research aimed to understand the challenges and opportunities for VET in developing decent work and sustainable future livelihoods, with particular attention to vulnerable and marginalised people(s). In Gulu, we followed a Participatory Action Research approach to the research (Monk et al., 2021), working closely with core stakeholders in an iterative process that involved network mapping, youth-led community learning cafes and radio talk shows, art-based inquiry, interviews and focus group discussions. Participants included government officials, students, teachers, principals, market and street vendors, farmers of all kinds, university lecturers, NGO and CBO and private sector workers. From the start, the research approach included an aspect of bringing stakeholders together, and developing networks of learning through strategic engagement in the research process. We began with formal institutions, and worked across sectors but in the end spent most of our time working with youth – which make up more than 70% of the population with some counts as high as 80% in the Northern region, with the pre-Covid median age of 15 years. We also worked very closely with a UNESCO Chair in Lifelong Learning Youth and Work youth group, and an environment-oriented community based organisation with short programmes in youth empowerment, and a group of herbal medical practitioners. All these involved an ethnographical element, with deep participation by the researchers in these spaces over the course of the research. Environmental issues were peripherally targeted throughout the research.

The second case study, Reimagining Agriculture Extension through a Learning Lens (RAELL), lasted eight months and followed directly from the VET Africa 4.0 Research. It involved case studies in South Africa, Zimbabwe and Gulu. In Gulu the research built on

the VET Africa 4.0 programme, with a focus on agriculture extension in the formal spaces. We conducted interviews and focus groups with farmers, students, government agriculture extension agents, Gulu university lecturers, and vocational schools. We also analysed job descriptions, curriculum and policy.

In both cases, research ethics was sought through the University of Nottingham in the UK and through Gulu Regional Ethics Council in Uganda. In the following sections we share some of the findings related to environment innovation and VET.

## Informal environmental initiatives (and learning)

The VET Africa 4.0 Collective (2023) documented the informality of the social skills ecosystem in Gulu as well as the rich learning networks that are driving it. Within this ecosystem frame, we can see a growing number of (mostly) youth looking for better futures. As Gulu is in a state of transformation, these youth are going out and finding learning through networks to develop new business ideas and they often see future markets and opportunities in environmental clean-up such as waste management and repurposing activities.

One respondent at the centre of the environmental movement in Gulu, who has a growing business printing building materials using recycled plastic bottles, explained:

> I've seen people developing apps for waste collection and there are people who are venturing into making compost from waste and earning a living from it – like selling it. And besides making the compost, some people are using the same process of breeding… They are called black flies. There is some category of flies that can be used as chicken feed, so people are realising how to transform waste into different resources. Yeah, even in the tailoring world, fashion and design world I have seen people transforming different categories of waste into pretty cool designs that they can sell and make money.

These initiatives are emerging out of informal spaces, and out of necessity because there is no formal employment. One participant making mats, earrings, key holders, and sponges out of recycled garbage elaborated:

> OK I started doing that because I was also jobless, it is really hard to get a job. So I thought … I can actually create something, be a job creator than a job seeker. So I had to figure out how to earn a living through making crafts, my hands, using my hands, figuring out things. I would always post the pictures on WhatsApp groups and all that.

At a youth-led community learning cafe investigating decent work (as a participatory component of the VET Africa 4.0 Research), a number of initiatives emerged that demonstrate the collaboration, cooperation, learning from each other, and community development that are central to the perceived success of the individual. One young woman has an eco-cultural tourist company. One of her key goals is to share the value of shea butter trees, which were traditionally considered the spirits of our ancestors and were not allowed to be cut without strict rituals. She explained that "Shea butter is like gold for Acholi people

– the tree is an important source of medicine". She is trying to revive care for the forests through demonstrating the value of this product made from its fruit.

Another small group of young agriculturalists are promoting a new approach to organic farming through the model of a community farm. People in the city invest in the farm, and receive weekly baskets of produce. Through this model, the youth are raising awareness about soil degradation and the need to conserve the environment.

An emerging group of young artists is using its talents to amplify environmental causes, hosting city clean-ups and producing dance and music videos together with art and fashion shows to bring attention to environmental problems in the city. They have also been repurposing materials in the products they are making, for example bags and laptop sleeves made out of recycled plastic. Another woman was using old shirts to make bath mats, and cleaning sponges.

In many instances, informally networked configurations of collaborative learning are important sites of adaptation, future thinking, and innovation. However, as Metelerkamp and Monk (2023) have documented, the formal learning systems are not able to accommodate them, or support their potential growth. In the next section we present some findings related to youth exclusions.

## Exclusion and gaps

Over and over, youth have demonstrated that they were being left out of decisions regarding their own lives, and that power structures – including the formal education system – have precluded them and limited their opportunities to participate. For example, we hear strong statements from youth such as "Schools are a violation of human rights, we need to be involved in the decisions", or "As long as it [TVET] is for the poor people, mindsets won't change". One participant in a community learning cafe explained that accessing TVETs was also difficult. He explained that he was an agriculturalist, growing a number of different crops and raising animals, but he was not admitted into a local agriculture college because he did not have the required academic credentials. Another explained a mismatch between programmes and needs. He cited a local innovation programme that was bringing people from another region to participate in leather training, when the local community (including his grandfather) traditionally were leather makers. He was adamant that if the programme had been developed locally, drawing on local traditions and expertise, it would have worked. Likewise, many farmers have described the harmful effects of designing new ideas for crops that looked good on paper, but often failed and left the farmer in a worse position. One farmer pointed out that modern farming practices degraded the soil and led to cutting of trees.

A researcher at Gulu University has identified the structural challenges preventing women in particular from engaging in climate smart businesses. Her research with women in climate related businesses in Uganda clearly highlighted that in addition to limited access to skills, lack of financing is another key challenge constraining women's involvement in climate change adaptation and mitigation. She explained that women often identify several

climate businesses that are never implemented due to lack of financing. Women's lack of ownership of productive resources like land poses a threat to them accessing financing. Most financial institutions require collateral like land to act as security for funds being disbursed and this favours men who have control over resources. One woman reported having been denied a loan because she had not brought her husband to give his consent.

Some private programmes recognise the need to integrate people's lives into their programmes. The director of a small non-formal ecologically oriented Fashion Design programme working with vulnerable women (also a business that emerged from the informal sector) commented on the need to include care at the centre of curriculum:

> I think my way of thinking about it is different…. I am trying to do something a little better with vocational education. I like to teach and the impact it has on people. There are a lot of people with potential but they have not had the opportunity for someone to give them the guidance to tap into that potential.

Another director of a similar institute that teaches hairdressing and building for vulnerable women observed:

> Most of them when you talk to them, they say they want to make money and earn a living, but there is more than that… the person has not yet discovered what it is they can be, and that is where the counselling sessions come in and they gradually come to know who they can be.

It is worthwhile noting here that the nurturing and holistic approach to living and learning is taken up primarily by women – another reason to include more women in decision-making related to TVET.

While the informal spaces represent possibilities for growth and high levels of adaptation, these informal spaces still require support, and could benefit from formal TVET programmes. A respondent from Gulu University acknowledged that:

> … many youth in Uganda irrespective of their education backgrounds or socioeconomic status have a lot of ideas but what they lack is how to push that idea into reality. And in order to do that, it is good for them to team up with mentors, to people who have tried similar things and it is working out, and then they also need connection to the market.

Drawing from the data above, we extract three core points to discuss below in relation to greening TVET. First, youth are innovating and learning informally to develop livelihoods, but they require more support; second, exclusion of youth (particularly women) is an act of epistemic injustice; third, programmes in community development, and TVET in particular, can and must learn from the cooperative, adaptive, model of learning found in the informal spaces which integrate life, learning, and community futures, and rely on sharing the diverse and different knowledges and skills of their networks.

## Discussion

We see from this data that environmental initiations and innovations are emerging rhizomatically from spaces of marginalisation. The environmental discourse itself has been marginalised and silenced. The environmental movement in Gulu is emerging out of a direct livelihood need, in those who are most impacted. Environmental learning and innovation is deeply entangled with attempts to craft decent livelihoods. There is a strong sense of interconnectedness – grounded perhaps in the African ontological context of Ubuntu, and perhaps as well in the need to pool together resources. The wisdom of lived experiences as theory and practice is integrated and valued. This assertion of collective epistemological agency can go a long way to inform and shift paradigms of learning and teaching – which is very different from the dominant deflating, zero sum, epistemological power game. It aligns with the transformative call to action of scholars interested in promoting justice and human flourishing in TVET (i.e. Allais, 2022, Rosenberg et al., 2019, VET Africa 4.0 Collective, 2023). Discussions about climate change always either emerged out of discussions related to future needs of the community or led to discussions of community development. There was a clear connection between climate change innovation and future opportunities and needs in TVET, and youth did not draw distinctions between climate change, decent work opportunities (entrepreneurship opportunities mostly because of the economic informality), and fair social arrangement.

In this article we have not travelled far from the discourse of agency, (relational) capability and living in TVET. By infusing into the discourse the concept of epistemic injustice, we seek to problematise systems that deny agency through epistemic silencing. Collins (2017) explained that this happens through discrediting certain people's epistemic credibility either purposefully or through what Dotson (2011, as cited in Collins, 2017, p. 120) referred to as 'pernicious ignorance': "any reliable ignorance that, in a given context harms another person or sets of persons". Collins (2017) framed the silencing as violence that functions to maintain and reproduce privilege, through 'epistemic gatekeepers' who carefully construct narratives and contexts that decide what knowledge counts. The stigma narratives and related structures developed around the VET space related to lower levels of knowing and TVET being for dropouts described elsewhere (i.e. Metelerkamp & Monk, 2023; Zeelen et al., 2010), are obvious points of epistemic injustice. Exclusions related to not including informal spaces (based in the same narratives) are less obvious. The concept of pernicious ignorance helps to clarify that by not purposefully creating spaces to learn from people or communities of knowers, an epistemic injustice is taking place. In other words, ignorance does not mean it is not happening. We feel that this is an important point for the field of TVET to take up in programme design. Programmes must include and understand the knowledge and experience of the youth (and other stakeholders – especially those who are absent or who are not understood well) in their design in order to become relevant and helpful. Arbitrary consultations are not adequate. The field must actively look for the gaps (in this case informality) and try to learn and adapt in order to understand them. This also extends to the field of research. Hawley (2017) claimed that

epistemically marginalised and excluded people(s), even when consulted, are often othered through research and consultation processes where they are treated as mere sources of information, rather than as equal epistemic agents. In the case of Uganda, the economy is mostly informally driven. This means that education (including TVET) needs to work in relation to and with the informal spaces if it is going to have an impact. This aligns with Wedekind et al.'s (2021) engagements in the intersections of informality and formality in TVET social skills ecosystems, claiming that a more democratic and adaptable TVET system needs to be put in place, which supports pathways, transitions and community needs.

## Conclusion

A popular mystic from India, Sadhguru (nd), explained that in Hindu there are 16 different senses. He suggested that the game of suppressing the knowledge of these senses is akin to driving a 16-wheel truck on only one wheel – this puts a lot of pressure on the one wheel. Knowledge has been used fallaciously by a few humans as a tool of power and colonisation to dominate and suppress the other. If we are to survive the climate crisis we will need new and different approaches to thinking about living together. From our perspective, a good place to start listening is the pockets of activity that are flourishing in the boundaries.

The climate crisis represents a unique opportunity for marginalised people(s) to jump to the foreground of positive intervention and equal global participation in transforming the world. However, to do so requires a healthy epistemic ecosystem. We feel that the TVET sector (in Uganda) is particularly well placed to catalyse environmental innovation; however, it needs to move beyond the haphazard agential action of a few (epistemically marginalised) people. Rather, it needs to shatter the epistemic silencing of the lived experiences of those who are most closely connected to the climate crisis. The case of women and girls who face intersectional injustices (Monk & Davidson, 2021) requires additional and particular attention. More than ever before we need to recognise our vulnerability and interdependence, and develop more harmonious relations that are respectful and value the glorious and beautiful diversity of the world in which we live. We suggest that a rhizomatic vocational pedagogy for environmental sustainability is useful to conceptualise and orient our learning and living systems.

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## Percentage contribution

| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | Monk | 40% |
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| | Akite | 20% |
| | Adrupio | 20% |
| Data collection | Monk | 45% |
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| | Adrupio | 45% |
| Analysis and interpretation | Monk | 25% |
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| Drafting the paper | Monk | 55% |
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# Towards Sustainable Vocational Education and Training: Thinking beyond the formal

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## Abstract

Mainstream vocational education and training (VET) has been complicit in unsustainable practices due to its longstanding relationship with productivism, extractivism and colonialism. However, it is beginning to address the need to balance its dominant focus on skills for employability with a growing awareness of the imperative to promote environmental sustainability, in terms of skills for sustainable production. There is also a sense that vocational institutions must also be sustainable in the wider sense of viability, durability, etc. While these positive steps are welcome, careful analysis is needed regarding how far recent initiatives are limited both by institutional capacities and wider disenabling environments, and how far they are meaningful steps towards sustainable VET for just transitions. Moreover, the current debate is also limited in its overwhelming focus on formal spaces of learning and work. Yet, most vocational learning and work sits outside this formal realm.

We contribute to this debate by exploring four case studies of complex skills ecosystems with varying levels of (in)formality taken from both rural and urban settings in Uganda and South Africa. We consider how the dynamics of each ecosystem generate complex mixes of sustainability and employability concerns. We suggest that, in cases like the more formalised ones presented here, there is a possibility to look at the development of centres of skills formation excellence grounded in sector and place but that this also requires thinking about bigger challenges of just transitions. More radically, by highlighting the contexts of less formalised skills ecosystems in two other cases, we point towards new ways of thinking about supporting such ecosystems' work on sustainable livelihoods in ways that enhance their durability. Although context always matters, we suggest that our arguments are pertinent beyond the countries or region of this research and have international salience.

***Keywords:*** *vocational education and training, Africa, green skills, sustainable development, skills for sustainability*


DOI 10.4314/sajee.v39.03
ISSN 2411–5959

## Introduction

Current vocational education and training (VET) systems were established to address a challenge experienced under industrialisation regarding worker productivity. Previous artisanal forms of working and training could no longer compete outside small niches but the industrial revolution's initial, though huge, productivity advances were unsustainable without greater attention to formalising industrial skills development. This provoked reform of older apprenticeship models and the rise of dual learning between formal workplace and formal, public training institutions, most developed in the Germanic tradition (Deissinger & Gonon, 2021).

With these origins, mainstream, formal VET is complicit in unsustainable practices. In Africa, this emerged through both the globalised negative effects of industrialised capitalism and the particular inflection of colonialism in different settings. Parts of Southern Africa experienced a form of 'settler VET' where formal provision developed relatively rapidly in response to concerns about the social and political positions of a large white population. The core occupations of formal vocationalism, moreover, were tied to the extractive logic of colonial capitalism and to the wider Northern paradigm of carbon capitalism, leading to VET focused on metals, mining, motors and manufacturing.

From the 1980s, neoliberalism led to public VET adopting a skills for employability discourse. Here, employability is concerned with the personal ability to gain initial employment, maintain employment, move between roles within the same organisation and obtain new employment if required (Hillage & Pollard, 1998). It downplays labour market contexts and places the responsibility for failure on learners (and providers) rather than employers and governments (McGrath et al., 2010). It has little to say about work's decency or sustainability.

This makes conventional public VET even more productivist:

> Cast within the ethos of productivism and the ideological framework of neoliberalism, the institution of TVET is based on a restricted and instrumental view of lifeworlds which reduces people and the environment to the status of human and natural resources for economic exploitation. (Anderson, 2009, p. 44)

More recently, there is a growing awareness that VET needs to engage more seriously with the climate crisis. Approaches have emerged that look variously at green jobs, green skills and green institutions. However, we need to consider how VET might support just transitions and we need to bring the economies of subsistence agriculture and informal trade and production into the discussion. After briefly exploring the existing literature, we discuss our research, looking at social skills ecosystems in South Africa and Uganda (VET Africa 4.0 Collective, 2022). While these cases reveal that we still have far to go in conceiving of and delivering VET for just transitions, we argue they offer useful insights into both challenges and possibilities in moving in that direction in both formal public VET and vocational learning in the informal economy.

## Concepts of sustainable VET

There has been limited engagement between the VET and education for sustainable development (ESD) communities. Indeed, this is one of the attractions of this special issue. For instance, in 74 years, the *Journal of Vocational Education and Training (JVET)* has only published two articles with titles including sustainab* and both are narrowly focused (Coll, Taylor & Nathan, 2003; Liu et al., 2020). Green skills appear neither in JVET titles or in keywords (but are discussed in McGrath et al., 2020) and only appear three times in the other leading VET journals (*Journal of Education and Work, Vocations and Learning, International Journal of Training Development, International Journal of Vocational Research*). There remains an apparent reluctance from VET academics to write about the issue. From the ESD side too, there is little engagement; the recent book on green skills in South Africa by Rosenberg, Ramsarup and Lotz-Sisitka (2020) is an important exception, although it is focused on skills formation systems more than public VET provision.

What is much more prevalent in the literature is two groupings of writings linked to development actors. First, there is work more focused on green jobs and skills (e.g., Cedefop, 2012; International Labour Organisation [ILO], 2011; Organisation for Economic Co-operation and Development [OECD], 2011; United Nations Environment Programme [UNEP], 2008). Second, there is work on VET associated with the UNESCO-UNEVOC International Centre in Bonn (e.g., Fien, Maclean & Park, 2008; Majumdar, 2010; Pavlova, 2018). The timing of the first references here is not coincidental. The 2008 financial crisis was catalytic for many international agencies in their considering how to stimulate growth while reducing environmental impact.

In contrast, Majumdar (2010) focused more on the supply side of VET providers, proposing a five-stage model of greening VET institutions, as outlined in Table 1.

**Table 1:** *Greening VET institutions (Source: Majumdar, 2010, p. 6)*

| Green campus | Green curriculum | Green community | Green research | Green culture |
|---|---|---|---|---|
| **Managing campus** | **Integrating ESD into the curriculum** | **Adapting community** | **Fostering research** | **Promoting culture** |
| ■ Energy management<br>■ Water management<br>■ Waste management<br>■ Pollution management | ■ Green technology<br>■ Clean technology<br>■ Green jobs<br>■ Greening existing jobs | ■ Capacity building<br>■ Renewable technology<br>■ Resource support<br>■ Unique practices | ■ Renewable energy<br>■ Water treatment<br>■ Green innovations<br>■ Waste recycling | ■ Green values<br>■ Green attitude<br>■ Green ethics<br>■ Green practices |

Table 1 is a comprehensive model and moving through these dimensions would appear to generate the kind of sustainable education institutions proposed by Sterling (2008, p.65) which have the following elements:

- sustaining ("helps sustain people, communities and ecosystems");
- tenable ("ethically defensible, working with integrity, justice, respect and inclusiveness");
- healthy ("a viable system, embodying and nurturing healthy relationships and emergence at different system levels"); and
- durable ("works well enough in practice to be able to keep doing it").

However, in bringing an ESD debate to VET we must acknowledge that there is a fragility to VET institutions across much of the globe, given VET's marginal location in both educational and economic fields. Allais (2020) argued that three interrelated factors undermine VET across Africa. First, the slow pace and limited spread of industrialisation mean that there are few formal sector jobs, with majorities engaged in survivalist activities. Thus, second, formal VET has almost nowhere to send its graduates. Third, the massive growth in secondary education has resulted in massified poor quality education. Not only are those entering formal VET less well prepared than they might be, but they are also coming in substantial numbers due to the breakdown in the formal school-to-work transition. Public VET institutions are expected to do the impossible, or at least delay the inevitable. Moreover, we also need to acknowledge that most vocational learning takes place outside the formal public college system. This is most apparent in highly informalised economies and learning systems (West Africa might be the most paradigmatic case here) but it is also a feature of formalised Northern skills systems where learning and work are far more complex than the orthodox story would allow.

New literature is emerging on skills for just transitions in complex labour market and vocational learning contexts (e.g., McGrath, 2020; Rosenberg et al., 2020). Let us clarify what we mean by just transitions:

> a process of increasingly radical incremental changes that accumulate over time in the actually emergent transformed world envisaged by the SDGs [Sustainable Development Goals] and sustainability. The outcome is a state of wellbeing founded on greater environmental sustainability and social justice (including the eradication of poverty). These changes arise from a vast multiplicity of struggles, each with their own context-specific temporal and spatial dimensions. (Swilling, 2020, p. 7)

McGrath (2020) argued that taking this challenge seriously means abandoning staples of conventional VET research such as school-to-work transitions, and skills for employability, productivity and growth. Rather, he argued, VET research needs to shift focus to questions of how vocational learning can "promote decent work that contributes both to sustainable

livelihoods for individuals and communities, and to wider efforts to restructure work and economic activities so that we live within our planetary boundaries" (McGrath, 2020, p. 8).

In stressing sustainable livelihoods over jobs, we follow Scoones (1998). For him, 'livelihoods' have three elements: more days of productive work, less poverty and enhanced capability. He argued that these are 'sustainable' if they increase the resilience of individuals, households and communities, and enhance the natural resource base available to poor people. The achievement of sustainable livelihood portfolios is seen as being shaped by the agency of rural people, structure and institutions.

Our emergent approach to skills for sustainable livelihoods (Wedekind et al., 2021) adapts Hodgson and Spours' (2013) social ecosystems approach. This has three key elements:

- Facilitating verticalities, policies that are intended to support learning, living and working;
- Collaborative horizontalities, networks between providers and other actors at the local level; and
- 45° activity, the connecting skills development activity that mediates between these two dimensions, centred on 'anchor institutions' and those offering 'skills planning leadership'.

This facilitates a shift from the institutional frame to thinking more about multilevel systems and the roles of actors and organisations within networked arrangements. This moves the focus beyond the sustainable provider of Majumdar's approach and addresses the limitations of a single institution gaze. Nonetheless, provider institutions are important and Hodgson and Spours (2018) highlighted the key role that leading (or 'anchor') institutions can play in anchoring the whole ecosystem through their ability to convene conversations and be exemplars of change. Moreover, they remind us that we must consider the key actors in such institutions and networks who are driving transformation, and what this costs them. We need to look at how moves towards sustainable VET are experienced by staff, students, communities and employers and how all are kept in sustainable relationships and activities.

## Methods

We draw on a three-year collaborative project between researchers at four universities in Uganda, South Africa and England. Although this paper is written by members of the English team, it draws on wider collaborations and sits alongside other papers from team members. The team co-constructed a multi-methods approach through a series of workshops, which was then refined iteratively due to COVID-19. It is based around four case studies, discussed in the next section. Each case team developed a context-specific suite of data collection approaches, including face-to-face and online interviews and focus groups (with vocational learners and staff, formal and informal sector employers, government officials, civil society

actors and youth); participatory action research with community groups and staff revising formal curricula; analysis of social media interactions in learning networks; surveys of lecturers; and analysis of policy texts and official statistics. Some team members were also insiders in the cases, in a variety of activist, institutional and consultant roles. We analysed data collectively and developed interpretations across a series of task-based writing groups and workshops.

We look at four very different cases of complex skills ecosystems in South Africa and Uganda, with varying levels of formal and informal VET in both rural and urban contexts. By doing so, we are able to consider how the dynamics in each generate complex mixes of sustainability and employability concerns. While regional and national contexts always matter, we suggest that the case insights on sustainable VET have regional and international salience.

## Case studies

### Gulu

Gulu, and the surrounding Acholiland region of Uganda, faces a series of major economic and environmental challenges. A series of conflicts in Northern Uganda (c.1981-2005) had profound physical and mental health effects and concentrated land ownership in few hands. This has forced many into farming unsustainably. The (largely illegal) market in charcoal is encouraging deforestation, further exacerbating land degradation. Local agricultural markets are limited as are opportunities to export nationally and internationally. In response, the Government of Uganda and several donors are encouraging large-scale agro-industry with little apparent concern for environmental issues.

The formal VET system is characterised by small, poorly-resourced institutions that are not easily sustainable in the longer-term. Public sector providers have little capacity for innovation due to a powerfully bureaucratic culture and centralised decision-making. Nonetheless, awareness is growing among staff and students of environmental issues, largely driven by a few senior managers who have seen green campus initiatives on international study tours.

There are other potentially significant signs of hope. While incorporating an environmental agenda into the national skills system moves slowly, several international agencies and national NGOs are working hard in this area, particularly in the agricultural sector. Moreover, Gulu University is trying to live up to its motto of "for community transformation" and is increasingly promoting organics and sustainability through its Faculty of Agriculture. Many Gulu graduates are environmentally aware and are looking to adopt sustainable farming practices. The University's UNESCO Chair in Lifelong Learning, Youth and Work also animates a network between youth, civil society organisations (including the traditional authority), international NGOs and training providers. Some formal public providers are involved, but as noted above, the system is poorly equipped

to be responsive. Where responsiveness is happening, it is largely due to external partner support.

Against the drive for modern agro-industry, the traditional authority, the Ter Kwaro Acholi, advances a cooperative model of development, focusing on the household and broadening to clans and communities. They have a significant long-term plan to return to the traditional Acholi cooperative model of living, which existed in closer harmony with the surrounding world, and see skills development as crucial to this endeavour.

Additionally, several initiatives are addressing food sovereignty, and related skills needs. A mechanised agriculture programme emphasises conservation agriculture, including not cutting all trees, leaving fallow fields, understanding where to plough, and which ploughs to use in which soil and terrain. This was set up by a woman who had worked in development agencies. A local farm is another example, promoting small-scale, organic farming for high yields and maintaining fertile soil. It is a popular place for student placements and has started providing training. Several local entrepreneurs are starting to make money from recycling and reusing goods. For example, one business collects plastic and converts it into building tiles. It started making plastic visors in response to COVID-19. Another example sees entrepreneurs making crafts, artwork and household items (such as sponges and mats) out of recycled goods. These innovators network with the University, particularly through key individuals and the UNESCO Chair holder who have forged connections with local youth groups, entrepreneurs (especially former alumni), local NGOs and informal traders as part of an emerging (though non-formalised) sustainable skills learning network.

This activity is enhancing the natural resource base available to poor people, although within the structural constraints noted above. It is typically more about sustainable livelihoods than decent jobs. Though nascent, some elements of Sterling's schema are evident in provision that is seeking to sustain people, communities and ecosystems, and which appears ethically defensible. However, institutional viability is harder to see in a poor, post-conflict, aid-dependent context, with many sustainability initiatives currently dependent on key individuals to drive and sustain them.

Equally, several initiatives are trying to adopt institutional greening strategies, though formalisation is limited. Indeed, we found evidence that projects (e.g., community or NGO led work-based training) were being used to move faster on environmental issues than was deemed possible if working fully through the national system. This points to the complexity surrounding facilitating verticalities. National policy more allowed rather than facilitated steps towards sustainability, but international organisations were able to bring other vertical benefits. However, collaborative horizontalities are much more apparent, although examples of 45° activity appear very dependent on both charismatic leadership and external resourcing. How sustainable these steps towards sustainability are remains unclear.

## Hoima

The development imperative in the Albertine Region of Western Uganda is linked to large oil deposits. Unsurprisingly, core tropes around employability are central, with environmental concerns effectively relegated to some window-dressing.

The British-German-Norwegian Skills for Oil and Gas programme (SOGA) has been a key actor here, providing external mediating activities, with three projects in the region.

First, there was a programme for creating jobs through business development and skills training for micro and small enterprises, delivered by a Ugandan NGO. Second, staff at local VET providers and some students were trained to international standards in welding, electrical engineering and scaffolding. This training was offered by an international consultancy firm and a local Catholic vocational provider. Third, upgrading support was provided to the local public training provider in Hoima through an international NGO.

These interventions were not aimed at direct employment in the international oil companies, or their principal sub-contractors. Rather, they were about increasing employability lower down the sub-contractor chain, and sustainable livelihoods (for instance, for women farmers supplying labour camps).

Furthermore, SOGA seeks also to build a skills response to the wider multiplier effects on the local economy of the oil investments. However, with delays in the final investment decision (FID) to start oil production, these multiplier effects have been reduced and postponed. While programme graduates may be more employable, their actual employment and livelihood improvements are limited. As of June 2021, the Ugandan NGO in charge of delivering project 1 reported only four supported enterprises had been registered.

While most vocational graduates in the region are clearly being trained without a deep sense of labour market dynamics, the second SOGA intervention was specifically organised around anticipated growth trades within the sector and the delivery of industry-required international certification. However, the FID delays have meant that these jobs have not yet appeared, while these internationally certificated graduates are overqualified for local skills markets. SOGA has sought to address this, and the bulk of the graduates are employed in their relevant trades with contact lists being maintained so that they can be contacted when better jobs do emerge. In phase two, SOGA is planning to train another 300 welders with one of the oil companies by the end of 2021. Decent work is clearly aimed at here, but its achievement has proved challenging primarily due to broader system challenges in increasing household and community resilience, issues that will also undermine sustainable VET.

Project 3 seems to have been largely unsuccessful, with interventions such as the introduction of System Analysis Programme (SAP) software doing little to address the real needs of the institution, which has not become markedly more sustainable in environmental or wider senses.

SOGA has worked hard to ensure employability despite the FID delay, but sustainability concerns feel more muted, both in terms of these employability programmes and as a direct response to the negative environmental effects of oil production.

The Ugandan NGO is responsible for another internationally-funded project which has a radically different feel to their SOGA work. It targets communities in several protected areas, such as community wildlife reserves and national parks, likely to be impacted by oil-related activities. It seeks to support them to generate income through biodiversity-related livelihood opportunities and has an explicit focus on the economic opportunities and green skills that should come from mitigation of environmental risks by the oil sector. The project is still in the initial stages of implementation but could be an interesting example of building sustainable livelihoods both in economic and environmental terms. Clearly this is closer to aspects of the visions of both Sterling (2008) and Majumdar (2010) though very much non-formal in nature.

The Catholic provider involved in SOGA project 2 has a degree of sustainability in terms of Sterling's four criteria, with its successes leading to considerable external support from the development community, thus reinforcing its financial viability. In contrast to the weak public, generalist vocational institution unsuccessfully supported by SOGA, it appears to have leadership and systems that work.

Another contrast with the all-purpose public provider is a new public Petroleum Institute. This was designed to meet skills needs closer to the core of the new oil and gas sector, although its engagement with the key sectoral players has been slow to develop. Without this, its sustainability will be limited. It is also mandated to work with the regional, general public VET institutions, but it will struggle to be any more effective than SOGA here.

However, in neither of these two stronger institutions does environmental sustainability loom large, and neither would fit any of Majumdar's (2010) five characteristics of a green VET provider. This is a continuation of the longer-standing extractive VET tradition.

Beyond the focus on oil and gas, there has been a wider raft of national VET reforms that impact regionally. The policy documents are very clear about the need to enhance employability or, rather, entrepreneurship, but there is little about environmental concerns. Staff also have little sense of such issues. Even if they do, the broader context is disenabling. This is equally true of curriculum changes intended to support decent work opportunities. In key local economic sectors such as catering, training has improved but livelihood opportunities largely have not. An eventual oil boom would change this, of course, although it would bring further problems and environmental challenges in its wake.

One funded project that has sought to build skills for sustainable livelihoods is a World Bank project on cage fishing, implemented by Gulu University's Hoima Campus. From 2017 to 2020, community groups were trained in cage fishing techniques, with a strong emphasis on environmental protection and conservation oriented towards restoring a natural resource base that is accessible to the poor. While some groups were successful in producing high yields within the first year, the project was designed with insufficient attention to market availability. Thus, the positive sustainable livelihood effects were muted, and the project's durability undermined. Though the project generated some good examples of local collective agency, there were also complaints about local politicians seeking to use access to the project as a way of rewarding supporters.

## Durban

KwaZulu-Natal Province in South Africa has seen major declines in manufacturing and agro-industrial employment. Transportation has become relatively more important as a result with the province home to the country's two largest ports. As befits a maritime province, marine resources sustain much economic activity, both through the ports and tourism. However, this is undermined by a history of problematic settlement patterns, poor land management and ineffective regulation that has generated large areas of environmental distress, undermining the potential economic benefits of the maritime economy.

In response, Durban has been the site of a series of major infrastructural development projects in the recent past, including stadium and airport developments linked to the FIFA World Cup in 2010. These form part of a wider set of government infrastructural development plans through the National Development Plan (National Planning Commission, 2012), the National Infrastructure Plan (Presidential Infrastructure Coordinating Commission, 2012) and the Oceans Phakisa initiative (Oceans Phakisa, n.d.). The National Infrastructure Plan contained 18 Strategic Integrated Projects, SIP2 being the Durban-Free State-Gauteng corridor. Key early provincial priorities in this were the development of two Special Economic Zones (Dube TradePort at King Shaka International Airport and the Richards Bay Zone); the expansion of container handling facilities in the Port of Durban; and the development of a new 'dig-out' port to the south of the existing Port of Durban. Oceans Phakisa is supposed to balance employment and environment imperatives. However, the economic imperative is clearly paramount, and this is located within a green growth paradigm, although tinted blue in this case. In practice, developments across all these initiatives have been far slower than intended (cf. Hoima), with Durban's developmental project receiving a further shock in 2021 during the Zuma riots.

When we turn to the skills system, we can see robust evidence of a provision that is viable, at least while the wider maritime economy is. This is organised around some specialist, private-for-profit institutions, and key industry players, such as Grindrod (private sector) and Transnet (parastatal), doing substantial amounts of formal in-house training. The eThekwini Maritime Cluster appears to play a strong coordinating role between these actors. However, this is an exclusive network, with limited engagement with both public skills providers and local environmental groups.

The public vocational system has faced a series of governance crises over the past decade, although there are centres of historical excellence, particularly linked to the automotive industry. As in Hoima, public providers face a challenge because they are not perceived as being serious actors by employers in a sector where international certification plays a big part.

In this light, the most interesting new skills initiative around the blue economy is a new Maritime Academy, opened in 2019 with funding by the National Skills Fund and the Transport Education and Training Authority. Oceans Phakisa support helped ensure Transnet's active involvement and initial programme development and delivery support

from Durban University of Technology. All programmes are accredited by the South African Maritime Safety Authority, ameliorating industry concerns.

In skills ecosystem terms, this Maritime Academy is an example of facilitating verticalities from the national state, which brought together a range of actors behind the project. However, what is striking is that the Academy is located at the public TVET college in Richards Bay, the province's other main port, 170km north of Durban. Given this location away from the main centre of maritime and wider economic activity, and the existing strengths of the private maritime skills ecosystem, it remains to be seen how viable this initiative will be. In skills ecosystem terms, it is less clear that the right collaborative horizontalities are present or that the Academy can function as an anchor institution.

The Academy has an explicit mandate to reach historically-disadvantaged learners, pointing towards at least further aspirations to be sustainable in Sterling's terms. However, our interviews with current students revealed considerable concerns about their prospects for decent work on graduation.

Although the Marine Academy is badged under Oceans Phakisa, which has a rhetoric of blue economy and a marine protection and governance stream, to date there is little sense that Majumdar's notions of green campuses or green curricula are emerging. Ironically, where innovations for green skills training and green jobs do occur within private sector training academies, there can be a disincentive for collaborating with public providers where this may be seen as providing training for competitors. Indeed, Masie and Bond (2018) have argued that the whole Oceans Phakisa model is one of extractivism with a very thin greenwashing.

## Alice

Located in the former 'homeland' of Ciskei in South Africa, the Alice area remains profoundly influenced by the legacy of the colonial Land Act of 1913. This established such areas as labour reserves to exclude black Africans from urban residence while providing migrant labour for mining and manufacturing. Such areas were never economically viable as small-scale farming regions, remaining permanently dependent on transfer payments from migrant workers or, later, the state. These lands were set aside for black African habitation precisely because they were not productive enough for commercial farming. This engineered combination of high population densities and marginal agricultural land set up an inevitable environmental challenge. This has been exacerbated by climate change, with water availability a huge constraint. At the same time, economic opportunities in the area remain extremely limited. The food sector dominates the local informal economy but there is limited scope for growth in scale due to the intense supermarketisation of the South African food system.

Several state agencies are active in the region. These include the Department of Rural Development and Land Reform, the Department of Agriculture, Forestry and Fisheries (DAFF), the National Youth Development Agency and the Water Research Commission (WRC). In contrast to the focus on industrial skills policies in the Durban case, the Alice policy

environment is dominated by natural resources and community development, including those policies oriented towards issues specific to the agricultural sector in the National Development Plan. However, policies are experienced as top-down and uncoordinated.

Here too, the local public TVET college is a minor player in place-based networks. Strikingly, however, another public institution, a tertiary institute under DAFF, is a significant actor in local agricultural learning networks. Its location under a national department other than the Department of Higher Education and Training is significant. Unlike many of the institutions across the case studies that are under education ministries, it has considerable autonomy due to education not being its parent department's main activity.

The institute is currently reviewing its curriculum to increase its relevance to the local agricultural sector, to natural resource management, and to sustainable livelihoods. Very few graduates end up in agricultural professions, particularly not as farmers and, increasingly, nor as agricultural extension workers (traditionally an aspirational destination for many graduates). Instead of catalysing the local farming economy, existing agricultural qualifications are commonly used to gain an advantage over others in accessing non-related, but more readily available jobs, in the formal sector, for example, as supermarket till operators or as teachers. The current curriculum review process is intended to counter this. However, as in the cases above, curriculum change cannot easily translate into better livelihoods or jobs without wider structural changes.

The tertiary institute is also an important actor in the Imvotho Bubomi Learning Network (IBLN), animated by Rhodes University and funded by the WRC. Central to the IBLN model is the need for a closer relationship between formal and non-formal learning systems, in a way that resists hierarchical approaches prevalent in agricultural extension.

IBLN is a powerful example of a learning network. It brings together these academic organisations with local economic development officers, extension services, farmers' associations, community radio and smallholder farmers around rainwater harvesting and conservation. This is a crucial issue in a low rainfall area experiencing warming at approximately four times the global mean.

A training of trainers' programme was established to mediate new knowledge from the WRC and to support the stakeholders in the agricultural learning system to utilise this knowledge. In the agricultural institute, lecturers were supported to develop curriculum innovation projects which included shared demonstration site development. Smallholders also participated in the course and were supported to mobilise their prior knowledge, experience and expertise in a local context, drawing on new knowledge from the WRC. This contributed to improved knowledge exchange and farming practice amongst farmers. Members subsequently intensively used social media to share knowledge.

This is an example that is environmentally strong, and which would meet several of Sterling's criteria. While its impact in terms of formal sector jobs is muted, it points towards more sustainable livelihoods and the potential emergence of innovative smallholder farmers into a third space within the agri-food system between subsistence and large-

scale commercial production. However, as in our other cases, the economic niches available for those engaging in improved practices are limited and much of the wider context is disenabling.

This case shows a relatively strong set of collaborative horizontalities and mediating actors. While the state believes itself to be a generator of facilitating verticalities, the reality is one of overlapping and sometimes contradictory policy initiatives, and a failure to address many of the biggest constraints on rural sustainable livelihoods. In the education sphere, the marginal role of the local public vocational TVET college, in contrast to more active roles from tertiary institutions, reflects the oft-reported lack of local autonomy of such providers. As with the other cases, the core set of public VET institutions appears to play a tenuous role in nascent efforts to make VET more sustainable.

While the case is a positive one in important ways, it is also necessary to note that the learning network is built around the contributions of a small group of what we might call anchor individuals. While several have institutional bases, we need to be aware of the potential difference between anchor individuals and anchor institutions when thinking about the sustainability of skills ecosystems. Durability is far from certain.

## Discussion

The set of concepts we introduced at the start of the paper are deliberately ambitious. They sketch out aspects of an approach to skills and development that supports a transition towards greater social justice and environmental sustainability. Therefore, it is not surprising that evidence of progress towards them is limited in all four cases. Nonetheless, they are useful tools with which to evaluate current and, especially, emergent practice.

Majumdar's (2010) model is focused on the single institution. In none of our cases can we see much meaningful progress by formal public VET providers relating to any of Majumdar's five pillars of campus, curriculum, community, research and culture. Where there are signs of institution-building, it is around sectoral centres of excellence in both the Hoima and Durban cases. While such centres have potential to build better industry relations, the grounding of both the oil and maritime examples here is somewhat uncertain, partly due to the strength of existing private sector skills arrangements. Moreover, in neither case is there considerable evidence of any greening of the approaches, located as they are in sectors with poor environmental records. However, our drawing on ecosystems thinking makes it clear that a single institution focus will only get us so far. Rather, it needs to be complemented by an exploration of networks. Moreover, the wider political economy is also crucial. Where there are strong or emerging economic sectors, the building of greener providers may be possible. However, it is imperative to understand the nature of the global skills formation system for those sectors and ensure industry buy-in. Beyond that, though, lie even greater challenges of addressing inclusion and environmental sustainability.

Part of our intention in this project was to explore skills formation systems beyond the conventional gaze of the industrial economy. In both Gulu and Alice, we found evidence of skills ecosystems bringing together diverse actors and which have significant concerns

regarding sustainable livelihoods. Although public VET institutions are largely absent from these ecosystems, formal education providers are key, but in the form of two universities and an agricultural institute.

In Sterling's terms, durability is perhaps the biggest question regarding the sustainability of both these skills ecosystems. External funding has been enabling, more so than national policies, but there are legitimate questions regarding whether it is really anchor institutions that are animating the networks or, rather, anchor individuals therein. The importance of nurturing such institutions, but also of realising when they are no longer able to play an anchoring role, points to a very different way of looking at skills formation systems and how to nurture them.

Hodgson and Spours' (2018) vision is of what could be rather than what is. What is apparent across all four cases is relatively weak facilitating verticalities supporting moves towards skills for just transitions at the local level. Policies are often contradictory, for instance, effectively greenwashing by talking about environmental imperatives but overriding these with the economics of business-as-usual. This is evident in both large-scale formal development cases, in Durban and Hoima. Often donors, NGOs and certain state agencies (e.g., the South African WRC) are providing support from above to more sustainable practices. As noted above, while there are some policy and funding opportunities in all the cases, this is far from a well-established enabling environment. Crucially, skills development has little ability to change the possibilities for decent work and sustainable livelihoods on its own. Too often, wider economic and labour market realities are unconducive to the changes being attempted.

The focus on social skills ecosystems as a site to examine VET sustainability does important work in moving us towards a better understanding of the possibilities and challenges of building skills for just transitions. Place is at the centre of this, but place must be enacted by social actors. All four cases show networks of actors, but participation varies hugely and is of crucial importance. The notion of anchor institutions is important too, but we need to be conscious that the actions of these institutions is often highly dependent on individuals who themselves anchor institutional involvement in networks. The approach also highlights the importance of thinking in networked ways around collaborative horizontalities, rather than in the very thin official approaches of state hierarchies that both preach engagement with limited stakeholder groups and are deeply suspicious of the threats such engagement brings to these hierarchies. It also frames these state VET system hierarchies through the notion of facilitating verticalities, the extent to which the wider policy and political economy environments are conducive to local developments. Any transition towards sustainability is necessarily disruptive of power and hierarchy, and will be very challenging to existing vertical relationships. Perhaps most crucially, the notion of ecosystems contains within it an implicit awareness of dynamic rather than static reality. Ecosystems can flourish but they are always subject to change and a finite existence. Taking this into account when thinking about the transition to sustainable VET is crucial.

## Conclusion

While we highlighted the importance of thinking about VET for just transitions at the start of the paper, we must be honest about progress in that direction. There is a long way to go, and our collective practical and theoretical steps have been tiny in the face of the enormity of the journey.

Yet, perhaps what these cases show is the need to start prioritising VET, sustainability and just transitions, as the current academic literature is shamefully silent on this subject. If we are to break out of VET's complicity in the Capitalocene and extractivism, we need to start reframing how we think about VET and its purposes.

Two opportunities emerge from our deliberately diverse case studies. First, in more formalised cases, like Durban and Hoima, there is a possibility to look at the development of centres of skills formation excellence grounded in sector and place but this also requires thinking about bigger challenges of just transitions. More radically, by highlighting the contexts of less formalised skills ecosystems in Alice and Gulu, we point towards new ways of thinking about supporting such ecosystems work on sustainable livelihoods in ways that enhance their durability. While the details of the dynamics of each skills ecosystem necessarily are unique, we suggest that these new ways of thinking are useful well beyond the cases themselves in allowing new questions to be raised about regional skills systems globally.

## Acknowledgements

This article derives from research funded by ESRC/GCRF – award number ES/ S004246/1.

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## Percentage contribution

| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | McGrath | 65% |
| | Russon | 35% |
| Data collection | McGrath | 50% |
| | Russon | 50% |
| Analysis and interpretation | McGrath | 50% |
| | Russon | 50% |
| Drafting the paper | McGrath | 80% |
| | Russon | 20% |
| Critical review of paper | McGrath | 65% |
| | Russon | 35% |

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# Evaluating Boundary Crossing Social Learning in Vocational Education and Training: A value creation approach

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## Abstract

This article focuses on the development and application of an evaluation model and approach for evaluating boundary crossing social learning in a Vocational Education and Training (VET) learning network in South Africa, with an emphasis on a Training of Trainers (ToT) course that helped to catalyse and strengthen this learning network via two iterations of the course over an eight-year period. The article shares how we adapted the value creation framework (VCF) of Wenger, Traynor and De Laat (2011; Wenger & Wenger-Traynor, 2020) in the evaluation of a VET Training of Trainers (ToT) programme and learning network that focussed on the uptake and circulation of rainwater harvesting and conservation (RWH&C) knowledge in a particular formal and informal VET context in the Eastern Cape, South Africa, where smallholder farmers were struggling to find water for producing food. The evaluated ToT course was catalytic in establishing a boundary crossing social learning network approach in a VET context that linked formal and informal VET (Lotz-Sisitka et al., 2016; Lotz-Sisitka et al., 2022; Pesanayi, 2019); hence we found it important to develop adequate tools for its evaluation. The focus of this article is to share how we developed an evaluation approach to this work. We share insights on the indicators developed for different types of value created, and also insights gained into the use of this evaluation approach in a boundary crossing VET social learning project that took a ToT course as focus. In short, evaluation findings show that the boundary crossing ToT course offers strong immediate, potential and applied value that can lead to realised and reframed value, especially if supported by ongoing learning network activities that follow the initial engagement in the boundary crossing ToT course. This leads, over time, to transformative value which is important in achieving the overall objective of such social learning, namely making knowledge more co-engaging, accessible and useful in the context where improved food security via better use of rainwater harvesting and conservation amongst smallholder farmers and household food producers is a necessary form of sustainable development. Orientation value, and enabling value were found to be vital for the emergence of other kinds of value. The evaluation model also allows for the lifting out of strategic value which points to wider uptake potential. All this creates the


DOI 10.4314/sajee.v39.04
ISSN 2411–5959

possibility for indicator development that can help inform iterative development of boundary crossing VET courses used to stimulate the co-construction of learning networks and ongoing social learning for sustainable development.

***Keywords:*** *Vocational Education and Training, evaluation, social learning, value creation framework*

## Introduction: The project and site of the evaluation

This article focuses on the development and application of an evaluation model and approach for evaluating boundary crossing social learning in a VET[1] learning network (the Imvotho Bubomi Learning Network/IBLN). This VET learning network was catalysed and supported in a Water Research Commission (WRC) research project focussing on creating a social learning model for knowledge uptake and use in South Africa (Lotz-Sisitka et al., 2016; Lotz-Sisitka et al., 2022; Pesanayi, 2019). More popularly known as the 'Amanzi for Food' project (www.amanziforfood.co.za), the IBLN learning network and a Training of Trainers (ToT) course was developed between 2014-2021 to support the uptake and circulation of rainwater harvesting and conservation (RWH&C) knowledge in a particular formal and informal VET context, where smallholder farmers were struggling to find water for producing food. The course was a boundary crossing course, in that both formal educators (lecturers) and students, as well as farmers, and extension service officers, NGOs and other government partners involved in supporting smallholder farmers in the area completed the course.

The course applies a situated, reflexive learning model (Lotz-Sisitka et al., 2022), and assignments included: 1) contextual profiling to find out what people knew about rainwater harvesting and what challenges farmers were facing to bring water to smallholder farming plots, 2) collaborative productive demonstration site development in which course participants chose a new rainwater harvesting and conservation practice to demonstrate to others in a productive farming plot, and 3) collective review and evaluation of the practice to decide whether it was viable to take forward as a local farming practice.[2] The content of the course was informed by materials produced by the Water Research Commission on 26 rainwater harvesting and conservation practices, made accessible via a 'navigation tool'[3] and a shared website (www.amanziforfood.co.za).

During the eight-year life of the Amanzi for Food project, the ToT course was run twice in the Eastern Cape Province, once in Mpumalanga, and once in the North West. The focus of this article is only on the Eastern Cape Province ToT course, with data generated in the rural Eastern Cape, in the Nkonkhobe municipal district. Fort Cox Agricultural and Forestry Training Institute (FCAFTI) and Rhodes University were collaborating partners supporting the ToT programme, with lecturers and students from these institutions also participating in the ToT and the learning network. Table 1 below provides an overview of the contextual aspects of the course.

**Table 1:** *Contextual aspects of the ToT course – Eastern Cape*

| | |
|---|---|
| **Province/location/ catchment** | Eastern Cape<br>Fort Cox Agricultural and Forestry Training Institute (FCAFTI)<br>Predominantly Amathole District Municipality with some participants from Buffalo City Metropolitan Municipality |
| **Course modality and assignments** | 3 x 1½ days,<br>3 individual and 1 group assignment<br>The first course was completed in 2015, and a second course in 2017 |
| **Participants** | Farmers, agricultural advisors (extension officers), NGO personnel, staff and students from FCAFTI and Fort Hare University<br>Local economic development officials |
| **Implications for learning network development** | Imvotho Bubomi Learning Network established the first running of the ToT course. This expanded through the second course, including NGO personnel. Network is centred on FCAFTI but with a strong and active farmer constituency, and comprises representatives of all stakeholder groups offering a good set-up for boundary crossing VET (formal and informal learning boundary crossing context). |
| **Productive demonstration site development out of ToT assignments (significant for boundary crossing VET learning)** | Productive demonstration sites established at FCAFTI and on farmers' lands out of first course. Added considerably between courses and during and following the second course. Course graduates sharing their experiences with others, using their own gardens and farms as demonstration sites. Strong links to the WRC Climate Smart Agriculture (CSA) project, and towards the end of the project productive demonstrations sites had increased from three initially to over 30. |

The Eastern Cape ToT course was complemented by other social learning approaches such as use of social media and community radio, change laboratories and learning network meetings to strengthen the social learning, with the productive demonstration sites becoming a key feature of the boundary crossing social learning model (Lotz-Sisitka et al., 2016; Lotz-Sisitka et al., 2022; Pesanayi, 2019). Supported by the boundary crossing ToT course, over time the IBLN developed into a social skills ecosystem (Lotz-Sisitka et al., 2022; Lotz-Sisitka & McGrath, 2023; Ramsarup et al., 2022; Wedekind et al., 2021). The wider context of the project is that it contributes to small-scale farming and household food production addressing the problem of household food insecurity in South Africa, which remains a national challenge (Hart, 2009; Labadarios et al., 2011; Wenhold and Faber, 2008 in Backeberg and Sanewe, 2010).

## Concepts of sustainable VET

As indicated above, our interest was to identify and test an appropriate evaluation methodology for the ToT programme in the VET learning network. There is a long history of evaluation research (Patton, 2010; 2018; Pawson & Tilley, 1997) which we will not repeat here. When searching for an evaluation approach, we turned to identifying suitable evaluation frameworks for social learning, with the Value Creation Framework (VCF)

of Wenger, Trayner and De Laat (2011) and Wenger and Wenger-Trayner (2020) being specifically developed for this purpose. As will be shown below, we adapted the value creation framework (VCF) of Wenger et al. (2011) and Wenger et al. (2020) to the context, and by applying data emerging from the Eastern Cape ToT course in the VET learning network (Lotz-Sisitka et al., 2016; Lotz-Sisitka et al., 2022; Pesanayi, 2019).

Social learning, as understood by Wenger et al. (2011) and Wenger et al. (2020) takes place in both communities of practice and networks. Communities of practice are defined as "a learning partnership among people who find it useful to learn from and with each other about a particular domain" (Wenger et al., 2011, p. 9). Social networks are defined as a set of connections among people who have personal reasons to connect for information flow, joint problem solving and knowledge creation (Wenger et al., 2011). Communities and networks have different effects on learning potential. The learning value of a community is the "ability to develop a collective intention to advance learning in a domain" (Wenger et al., 2011, p. 10). Wenger et al. (2011, p. 10) argued that "over time, a joint history of learning also becomes a resource among the participants in the form of a shared practice – a shared repertoire of cases, tools, stories, concepts and perspectives". Learning in a network can also become a resource to extend repertoires, tools, perspectives and practices on a landscape of practice. In our research, both were in focus as the ToT helped to consolidate the shared practice of rainwater harvesting and conservation via productive demonstration sites, and the learning network helped to expand these practices in the landscape of practice.

The VCF is a nuanced evaluation framework, specifically designed for evaluating social learning processes over time and in landscapes of practice. It is located more in the hermeneutic tradition, but can also be used within a co-construction model of evaluation, and can be deepened with a developmental and/or a realist approach that asks questions about what works for whom under what conditions (Pawson & Tilley, 1997). In designing the monitoring and evaluation (M&E) framework for the Amanzi for Food programme, we chose to work with the VCF, but needed to adapt it to the particular project context and mediation processes. We also aimed to underlabour it with realist questions such as 'what works for whom under what conditions' in a second phase of the evaluation, and were also interested in generative mechanisms that produce these conditions (see below). We focused adaptation of the Value Creation Framework for M&E of the Amanzi for Food project, with an in-depth analysis of the ToT course as this was the most catalytic of the social learning processes. We also undertook VCF analysis of the other social learning mediation processes, but with less in-depth analysis. This article therefore focuses on the ToT but links to other mediating processes.

## Methodology: An adapted Value Creation Framework (VCF)

The following questions, adapted from Wenger et al. (2011) framework were useful for guiding the evaluation design of the ToT programme in the VET learning network and the associated knowledge dissemination and uptake processes, where the knowledge dissemination was directly linked to practical interests:

- What is the value within the activities and interactions themselves?
- Does the learning network result in creation of knowledge and practice that can be shared?
- Are members able to leverage that knowledge and practice?
- What is the impact of knowledge and practice on learning network members' goals if any?
- How does involvement in the Learning Network and the knowledge and practice created and shared cause members to reframe, reconsider and transform their actions or work?
- What insights are gained for expanding the learning networks, for knowledge dissemination, and for managing and supporting such processes?

We drew on these and the VCF to develop a set of more detailed questions to guide the evaluation research (see Appendix A). These helped us to source evaluative insights from different data sources, and to develop value creation narratives. The VCF requires researchers to generate data from a range of different sources, and to develop value creation narratives which are then analysed to identify potentially eight different types of value (see Boxes 1 and 2). Wenger et al. (2011) explained that there are potentially five cycles of value creation in social learning initiatives which could help to establish how knowledge dissemination processes such as that being developed in the Amanzi for Food programme can be created (Box 1). In later work, Wenger et al. (2020) argued that these forms of value are influenced by, and also influence the generation of orienting value, enabling value, transformative value and strategic value, explained briefly in Box 2 (as also applied to the Amanzi for Food study), and as illustrated in Figure 1 below.

**Box 1:** *Cycles of value creation (Wenger et al., 2011)*

***Cycle 1 – Immediate value:*** whereby interactions and activities are observed and identified as valuable.
***Cycle 2 – Potential value:*** knowledge capital. In this cycle the value is in possessing knowledge that may be useful in the future.
***Cycle 3 – Applied value:*** changes in practices. In this cycle the value is in using knowledge to do something, particularly to do something new or different to what has been done before.
***Cycle 4 – Realised value:*** performance improvement. In this cycle value is observed by noticing that doing something differently as a result of new knowledge has yielded positive results, and has achieved the desired outcomes of the actions.
***Cycle 5 – Reframing value:*** redefining success. In this cycle the value is observed when the participants have developed a new understanding of success and value.

**Box 2:** *Additional types of value possibly created from the first five cycles of value (adapted from Wenger & Wenger-Trayner, 2020).*

***Orienting value:*** A social learning space always takes place in the context of a broader social-ecological landscape. Locating the social learning in such a space offers important orienting value to a social learning process. In this study we used contextual profiling to establish the orienting value for the social learning process.

***Enabling value:*** This refers to value that is created by the external context (e.g. resources, useful materials etc.), and the internal context (e.g. participants' willingness to learn and work together). The converse of this is constraining conditions (e.g. historical circumstances, lack of access to land etc.). In this study, enabling value is the value that is created by, for example, the WRC knowledge resources, and by the willingness of communities and lecturers and other partners to co-operate.

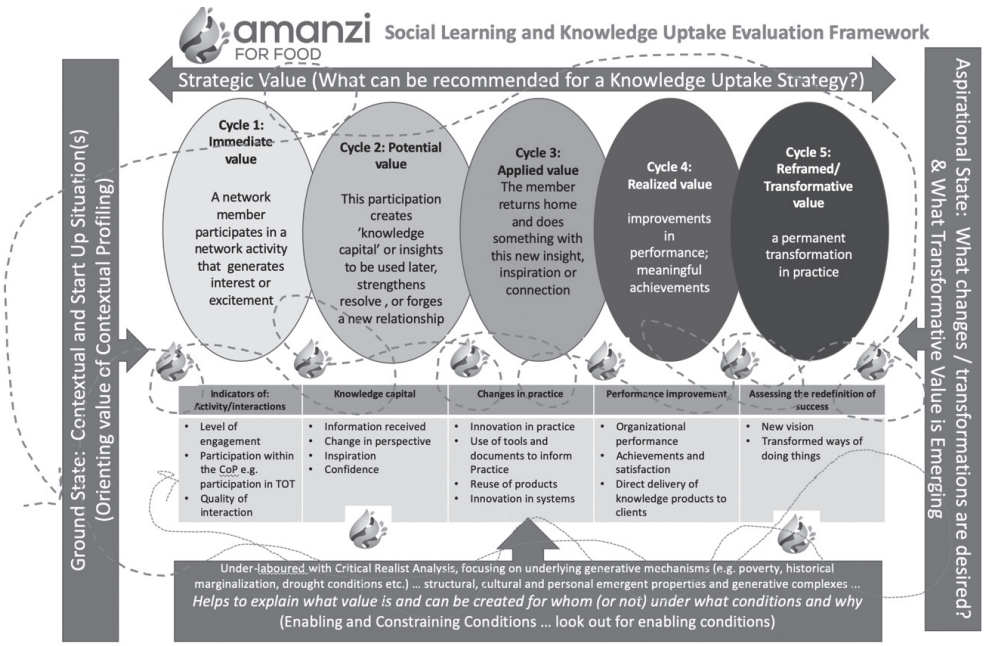
***Transformative value:*** This refers to the value created through significant changes to people, or something in the world – and aligns with 'reframing value' above. This is normally also value that challenges the status quo, or when very substantive, leads to transformation of social structures or deep changes in agent's capabilities. It is value that makes a real difference. In this study, this is signified by the difference that the social learning process is making to people, to farming practices, and to food production.

***Strategic value:*** This refers to value that helps to clarify the direction and usefulness of a social learning space or process. Strategic value is often necessary to elevate the relevance of learning in the mind of stakeholders, organisationally or societally. In this study, this is captured in the findings of the study that were most useful for structuring a Knowledge Uptake Strategy (Lotz-Sisitka et al., 2022) and the associated tools that have been produced for this work going forward with others in other social learning settings.

Value creation stories give meaning to value creation cycles and their complementary indicators shown in Figure 1 below. Wenger et al. (2011, p. 37) articulated this well explaining that "stories substantiate indicators, give them life, and make them more meaningful by connecting them into more extensive processes of value creation". Stories and indicators thus point to and reinforce one another and the data from each cycle needs to be combined with the cross-cycle stories in order to provide an integrated understanding of the value created in communities and networks. If this is not done then an indicator by itself is only suggestive and the story merely anecdotal. In Figure 1 below (which shows the overall evaluation design of the Amanzi for Food programme), this is indicated by the broken lines that show the cycles, and the connections between the cycles of value creation, and how these are influenced and shaped by the orienting and enabling value (and

constraining factors) and by the emerging transformative and strategic value, which in turn then can shape new orienting value and enabling value that helps to create new forms of immediate, potential, applied, realised and reframed value. This framework is very useful for social learning evaluation as it creates a means of monitoring and also reflecting on 'what value is created for whom under what conditions', with the critical realism of Bhaskar and Hartwig (2016) drawing attention to the underlying causality of the 'what conditions', which then sheds light on *how this value is created over time (or not),* not only what value is created for whom. Our ultimate goal of the programme was to inform a strategy for knowledge uptake and use via social learning approaches, hence we see 'strategic value' arising from the overall evaluation and other forms of value contributing to this wider goal as outlined in Figure 1.

**Figure 1:** *The Amanzi for Food Social Learning and Evaluation Framework, indicating the types of value, and types of indicators that can be developed in a social learning and knowledge uptake process over time (Evaluation framework diagram adapted and developed from Wenger, Trayner and De Laat (2011); Wenger and Wenger-Trayner (2020); Pawson and Tilley (1997) and Bhaskar and Hartwig (2016))*




Important to this evaluation design, is the emphasis that Wenger et al. (2011) placed on cumulative evidence when presenting stories. They explained that from the value creation narratives, and a following of the 'cumulative threads' across the stories, data is then analysed into a matrix – see Tables 2-6 below, where indicators are refined further for each type of value aligned with the different activities that make up the full knowledge dissemination process.

To construct the narratives informing the analysis matrix in Table 2 below, we drew on the following data:[4]

1. **ToT course observations:** Video and photographic data was generated from all course sessions), especially course excursions and practical demonstrations which helped to mediate the content of the WRC materials.
2. **ToT course assignments and assessments** contained information on the 'sense' that course participants made during their participation in the ToT programme. The course assignments (40 in total over two cohorts) also showed participants' plans for change projects, and gave indications on which of the WRC materials were most favoured for supporting their planned change projects.
3. **ToT course evaluations** provided information on how the programme was being experienced, as well as information gained, and value of the course to participants. Course evaluations were generated from all course sessions.
4. **Demonstration site observations via follow-up site visits:** Regular visits to capture evaluation data on the demonstration sites were undertaken over a period of five years. This captured data on the learning, and learning network links, as well as the practical value of the WRC materials and the demonstration sites.
5. **Learning network minutes and interactions on WhatsApp:** Learning network meetings were also documented using minutes, and ongoing interactions in the learning networks were captured on the WhatsApp groups between 2014-2021.
6. **Interviews with co-ordinators of the learning networks:** A series of interviews were done with ToT participants, co-ordinators of the learning networks, and with farmers who were benefitting from the use of the WRC materials (also ToT participants) to probe the value that created, as well as difficulties experienced.
7. **Ongoing contextual data generation including documenting radio, newspaper and website interactions and coverage:** The project continued to generate contextual profile data and document media interactions over the period 2014-2021.
8. **Evaluation questionnaire:** An online evaluation questionnaire was used to 'fill in' any gaps in insights that were not covered via the above-mentioned data sources.

In this article, we demonstrate how we undertook the value creation evaluation analysis based on the narrative data constructed from the above (cf. also Lotz-Sisitka et al., 2016, 2022). The evaluation analysis started with capturing information on the different types of value that were being created for different groups of participants and different types of activity (e.g. farmers, LED officers, lectures, NGOs) in the form of value creation narratives that were written up based on triangulation of the raw data. From here, cumulative narratives on key emerging themes were identified and written up, and these were then plotted into the analytical matrix, to inform the development of indicators which provide more insight into the types of value created via different types of activity via the social learning process. To make sense of the data within a useful evaluation framework for the

project, we needed to 'customise' the generic evaluation framework of Wenger et al. (2011) and Wenger et al. (2020) so that we could offer more meaningful interpretations of the value that was created (or not) in the evaluation work (cf. Appendix A and Tables 2-5 below).

The data to support the analysis was selected from the assignments, the course evaluations and other course records according to the key questions in the framework. The experiences related to some of the questions; many of those associated with Cycle 1, in particular, and some in Cycle 2, were inevitably similar for all participants within a particular course. These were analysed on a generic basis for each course. However, to illuminate aspects of the process with 'thick descriptions' we include extracts from the data sets (see Tables 2-5). The questions associated with Cycles 3 and 4 provided more opportunities for richly textured data to inform the thick descriptions. We integrated Cycle 5 into an overall analysis of transformed value.

## Findings from the evaluation analysis

Tables 2-5 provide insight into the value created by the ToT course and associated network activities as revealed by the five cycles of value (Box 1). Tables 2-5 also share the indicators relevant to the types of value identified in the Amanzi for Food programme. Each type of value is briefly discussed. We also recognise that there are often relationships between the types of value and while one type of value may for example be 'immediate value', it can also provide 'potential value'.

**Table 2:** *Cycle 1 – Immediate value created by the ToT*

| Indicators | Evidence and Outcomes |
|---|---|
| **1.1 Undertaking course in collective with others** | Participants were already in networks (UFH, FCAFTI) which were extended by the IBLN and farmers and other course participants who joined the ToT courses over the two iterations of the course. |
| **1.2 Gaining access to new information and ideas** | Some of the information concerning RWH&C was new to participants. Participants found the new information interesting and valuable, and shared information on other topics, such as seed saving, during the course. |
| **1.3 Collaborative activities** | Collaborative activities were strengthened by the group assignment that required work together on productive demonstration sites. |
| **1.4 Initial steps in developing networks** | Although there were networked relations already in the context at the start of the course, the ToT course consolidated the IBLN, and brought more people into these networks. The IBLN itself became more self-sustaining, taking on a more activist role with lobbying and advocacy linked to the increasing agro-ecology focus of the group. |

***Discussion:*** *Immediate value was created through the IBLN network relations and expansion, as well as access to new information that was presented in the course. This was strengthened by collaborative activity supported via the group assignment, especially the focus on shared development of productive demonstration sites. This later expanded to further collective concepts and work when the notion of 'ilima' was brought into the network (this is a traditional 'working together' isiXhosa practice).*

**Table 3:** *Cycle 2 – Potential value created by the ToT*

| Indicators | Evidence and Outcomes |
|---|---|
| **2.1 Reinforcement and extending existing knowledge** | The course reinforced and added new understanding and introduced new knowledge, principles and practices of RWH&C as well as on understanding of indigenous RWH&C practices, such as *'gelesha'* and *'matamo'.* One farmer in the course said, during a field visit to her productive demonstration site, "… before I joined the group I was an agroecologist. Trench beds and agroecology practices I learnt from the WRC books. I was interested in reading the Amanzi for Food books and getting knowledge from these because we are facing climate change issues" (Biko, pers. comm., 2020). |
| **2.2 Gaining new knowledge and skills** | The course involved some very knowledgeable and skilled farmers, and less experienced participants gained from their knowledge and skills, in addition to the information and ideas being formally shared through the course processes. For one of the course participants, "Before we went to the training of trainers' course, we did not know anything about the practices so we learnt from these practices, but after we attended the training of trainers course, we were constantly checking the WRC books for information." Development of new skills and the productive demonstration sites were achieved through the course practicals. |
| **2.3 Locating new knowledge into own context** | The course is designed to afford participants the opportunity to locate their learning directly in their work contexts, and the assignments are structured to support this process. Participants appreciated taking their new understandings and skills back to their communities, their work and implement new practices. From the evaluation of Module 3: "By telling my friends and other students, ... And when I am home I will tell my parents and other people in the community", and "Through organising farmers' meetings, field trials…, farmers days and visits", and "The information I got I will include in my practices". Perhaps most encouragingly, "During farmers' meetings, in church, in a taxi and the bus". A very specific example of location of knowledge into context was provided during a site visit by one of the farmers: "We chose the tower garden because we work with the elderly people from the community, so it is easier for them to work on the tower garden" (Nomphindiwe Msisiwe, pers. comm., 2018).<br>There is evidence of the change in participant dynamics from the first course to the second where the majority of participants were small-scale farmers and household food producers, who joined through their membership of the IBLN. This new dynamic was very welcome and led to considerable elements of the contact sessions being conducted in isiXhosa. This undoubtedly helped with the of the new ideas and information became internalised by the participants, who later located these in their own context within their households and communities. |
| **2.4 Establishing connections** | There were strong interconnections among many participants and these were extended to other participants, leading to a growth in the membership of the IBLN. The connections between farmers, education and training institutions, NGOs, department of agriculture and local economic development agency in this district has been extended to national and continental networks, such as the Rural Women's Assembly (RWA), and the African Biodiversity Network (ABN). |
| **2.5 Increased agency through connections** | The well-established IBLN with its growing activist membership and institutional connections is asserting more agency in promoting agroecological and RWH&C practices. Towards the end of the programme, members were engaging closely with the government whenever possible to influence policy or to express their concerns regarding agricultural issues. They also became more connected with national and continental lobby groups, such as the African Biodiversity Network. Large numbers of emerging farmers are being represented within the district, provincially and nationally. |

| Indicators | Evidence and Outcomes |
|---|---|
| **2.6 Increased understanding of and capacity for learning** | The process of learning and how different people learn in different contexts is a core component of the course. Considerable barriers to learning e.g. language, were recognised and the second running of the course in the Eastern Cape was mostly facilitated in isiXhosa (the main language of the group). This enabled participants to engage much more directly in the learning and discussions. Increased understanding of learning was reflected most clearly in the assignments, where participants indicated the different methods they would employ in sharing information. Participants in the formal education sector shared a range of learning approaches including formal presentations, discussions and practical exercises while farmers cited *'ilima'* as a key learning process. |

***Discussion:*** *Potential value was created by validating and expanding existing knowledge, including indigenous knowledge, and by creating space in the course for more knowledgeable and experienced farmers and agricultural educators to share their knowledge with all participants, including in their own language. New knowledge from course materials and tools was used to expand existing knowledge. Potential value was also created by participants' interest in sharing the new knowledge with others in their communities via the course emphasis on application of knowledge to practice. Potential value was also created through the relationships and connections that were being built through the IBLN networking activities, including wider networking with relevant agencies, and the policy system. These experiences were brought into the course to share with others, thus also linking more people to wider networks, advocacy and lobbying activities. While there was clear evidence of an enhanced understanding of learning, this was rarely if ever explicitly articulated as such by course participants. Their focus was almost solely on the practical outcomes such as the implementing and sharing of RWH&C practices. More focus on the learning processes used in sharing with others could help to further expand potential value.*

**Table 4:** *Cycle 3 – Applied value created by the ToT*

| Indicators | Evidence and Outcomes |
|---|---|
| **3.1 Changes in curricula/training processes** | A number of curriculum changes were proposed in the ToT change project assignments. For example, EC1/4 (assignment) states: "Within appropriate existing curriculum course modules – ideally within mandatory (foundational or core) modules… it is important for RWH&C to be included in the curriculum in order to … increase the knowledge around RWH&C … sustainable use of available resources is the key in agriculture. OR ... as a stand-alone short course… will be helpful to close the gap in literature and in knowledge. Especially for other clients such as farmers, educators and community. Also… As additional resource material ... RWH&C is also needed in the institute as another source of material on top of the information about water harvesting and conservation they have got from the course." Some changes were already implemented by the first course participants in the FCAFTI curriculum. In the second course, a lecturer from FCAFTI who was a participant from the first course presented on the changes introduced to and implementation of her curriculum: Agriculture Programme Exit Learning Outcomes "sustainable agriculture"; cross subject offerings for relationships within a programme e.g. Crop production option: irrigation, soil and water conservation, soil fertility and nutrition, crop production subjects, soil classification, rangeland and pasture management; Individual subject links and topics in vegetable production to RWH&C (Madikiza, pers.com., 2018). |

| Indicators | Evidence and Outcomes |
|---|---|
| **3.2 Use of new approaches/media** | The ToT and the IBLN use a range of media to communicate and share knowledge, materials and photos of RWH&C practices, and agricultural information regularly e.g. WhatsApp, WRC and Amanzi for Food websites, Facebook page and Forte FM (local community radio station). However, not all IBLN members are well connected to the internet, which means that not all ToT participants could remain connected to the IBLN, although those that were connected tend to continue sharing information and knowledge on the WhatsApp network after the ToT (the network is still active at the time of writing). The use of the radio helped to draw some participants into the ToT and the IBLN, and shared valuable information from the ToT into the wider community, but it required continued support and its influence faded by the end of the project. |
| **3.3 Adopting more collaborative approaches** | Most ToT participants, including farmers in the area valued collaborations that were established out of the ToT course, especially those emanating from the productive demonstration sites, which have expanded to an increase in *'ilima'* collaborative workdays. These have applied value in terms of increasing food production, and improving strategies for bringing water to food gardens. |
| **3.4 Drawing on information in WRC materials** | The WRC materials have become an indispensable tool to support many farmers in their farming, as cited in the ToT assignments and discussions by them, the college lecturers and students. For example, from EC4/4 (assignment): "… the materials that are going to be used will be adopted using the WRC information and that will make it more useful and more practical in implementing these aspects of RWH&C practices. The content followed from the WRC material … will be able to create a platform for farmers to learn, participate and share information", and from an interview: "We consulted the WRC books and we knew we had to read thoroughly to find the information. In the WRC books, you can find each of the rainwater harvesting practices. Practices such as raised beds, tower gardens and furrows can be found in the WRC handbooks." (Dwane, pers.com., 2020) |

***Discussion:*** *Evidence of applied value was found in changes in curricula in the agricultural colleges, as lecturers engaged in curriculum innovations drawing on the ToT course materials and processes, including the engagement with farmers. This led to fundamental changes such as introduction of more practical components like productive demonstration sites on campus and in the community, and participation of students in local ilima practices with farmers. This addresses a VET problem of a general reduction in the practical component of courses offered at Agricultural Colleges and Training Institutes over recent years. The opportunity to reverse this trend through the inclusion of RWH&C in curricula via the ToT processes was therefore welcomed. Other applied value was found in the use of social media tools such as WhatsApp and community radio that supported farming practice, as well as relationship building. The practical demonstration sites, and ilima practices were two tools introduced by the course and the IBLN members that had significant applied value in terms of actual food production. Additionally, the information the WRC materials was seen to have applied value as it helped farmers to develop a range of new practices to improve water for food production and improve food production. Applied value from the ToT processes enriched the agricultural and social networking practices of course participants and their family members, neighbours, communities and students.*

**Table 5:** *Cycle 4 – Realised value created by the ToT*

| Indicators | Evidence and Outcomes |
|---|---|
| **4.1 Enhanced and productive collaborations** | The idea of collaboration broadened constantly from the early ToT course to after the second ToT course. As one course participant explained during a site visit: "The people involved in the demonstration site at my home are my family, me, my husband, Mrs Madwendile, and lecturers and students from Fort Cox… I would also like to involve the community members in my area. I also have the liberty of involving people from outside my area." (Peter, pers.com., 2020).<br>The IBLN itself became a prime example of ongoing and productive collaboration, as articulated by a network member: "I do not face any challenges in accessing the information because there are many sources of information. I get most of the information from the IBLN where I have been a member since 2014. I also learn from students who have knowledge on these practices. The elderly people also have knowledge and we use their knowledge as well. The Rhodes University team and others also share their knowledge with us. The best place to access information is the learning network … It's good being a member of the IBLN."<br>And further: "I share my knowledge with people; I have shared my knowledge with people from Khayelitsha. I also teach other people on agro-ecology, I have so far assisted three households by teaching them agroecology practices. The tower garden, trench beds, raised beds and mulching were learnt for the WRC booklet on Water Harvesting and Conservation, Volume 2 Part 1." (Biko, pers.com., 2020) |
| **4.2 More effective lobbying** | Lobbying is a long-term process. Finding and assessing evidence of its effectiveness is challenging. However as reported on the WhatsApp group, IBLN members are increasingly invited to policy dialogues with the national and provincial government; they make their views known through the partners and wider networks with which they are involved. In particular IBLN members actively opposed the imposition of genetically modified organisms (GMOs) into the food chain, and any moves to restrict farmer seed saving and sharing. They were very involved in lobbying against the Monsanto proposal to introduce "Triple Stacked GM Drought Tolerant Maize", a proposal which the SA government rejected in November 2018, citing lack of credible scientific evidence for its effectiveness and safety. A striking picture of one of the very active members of the IBLN and Rural Women's Assembly, holding a copy of the government's rejection of the proposed GMP seed, was posted on the WhatsApp Group on the day following the decision. |
| **4.3 Recognition of achievements by external observers** | Considerable interest has been shown in the activities of the IBLN members, in particular the way they willingly and voluntarily share their learning with others. The Mxumbu Youth Group is very proactive in this respect, and as youths themselves they are powerful mentors for other young people. This was, for example, recognised by a GEF5 Sustainable Land Management Project operating in an area called Machubeni, Eastern Cape. The coordinator requested the help of the Mxumbu youth group in an email as follows: "My thinking was just to expose our team to some CSA (Climate Smart Agriculture) taking place in another communal area to get them excited and encouraged. I had asked the Mxumbu youth team if they could teach them how to do tied ridges, raised bed gardens and then speak a bit about their experiences with intercropping. … They seem to have done some really good work already and I'm sure it'll encourage them to know that they are sharing their knowledge with another communal area". |

| Indicators | Evidence and Outcomes |
|---|---|
| **4.3 Recognition of achievements by external observers** ***(continued)*** | Recognition of the IBLN members and their keenness to experiment has also been recognised by another WRC project, on Climate Smart Agriculture, based in Pietermaritzburg, KwaZulu-Natal. Several of the IBLN productive demonstration sites became sites for farmer experimentation with CSA practices and provided the Eastern Cape locus for this project which also operates in Limpopo. Further recognition was afforded by the Mxumbu Youth Group hosting a World Food Day event in partnership with the African Biodiversity Network (ABN). Three members of the IBLN were also invited to the Zimbabwe National Farmers Seed Fair in October 2018, where they presented on the work they are doing to save and share seeds, and experienced the vibrancy of the Zimbabwean food sovereignty networks. This trend continues. |
| **4.4 Productivity of sites** | The question of productivity is more complex than it appears. This could be due to unpredictable weather i.e. extended periods of drought experienced in the area in recent years, and also to the fact that many of the new RWH&C practices have been introduced on previously fallow land. The impact of drought has suppressed productivity to a considerable degree, while the cultivation of new areas of land as demonstration sites has inevitably led to increased productivity. Available quantitative data is insufficient to formally assess any changes in productivity but anecdotal evidence suggests that the farmers have experienced that practices such as trench beds, tower gardens, intercropping, and increased water availability are increasing their productivity, in particular through the scope for more intensive use of available land. Some initial quantitative experiments established at Fort Cox AFTI were not conclusive and more such experiments are planned with some in-depth research into site productivity carried by suitable qualified researchers. |
| **4.5 Cascading of demonstration site development** | Productive demonstration sites were taken up as course assignments, and learning was shared around a number of different sites. There is some evidence of cascading of productive demonstration sites to new locations and one researcher found a number of new productive demonstrations in different smallholder plots on a site visit to local farmers (Pesanayi, 2019). For example, in one case in Mxumbu village at the Xhukwane primary school, a demonstration site had been established by the principal, Mr Jende, with another site in his own garden, where he also takes learners. He said: "This type of agriculture has been forgotten in schools so I am trying to instil this knowledge so that the school kids grow up with the knowledge." The initial sites demonstrated a far wider range of RWH&C practices which were being added through the interests of the farmers on the sites, lecturers at FCAFTI and were often stimulated through discussions within the IBLN network. These new practices have been introduced and implemented through the *'ilima'* process, which still continues. Some sites, including that at FCAFTI have been expanded to allow for inclusion of further practices. Other sites were developed through the wide sharing of information by IBLN members with their families, neighbours and other communities. For example, the Mxumbu Youth Group, and the Zingisa Education Project are both involved in training farmers in different communities, with the training involving practical demonstrations and the establishment of RWH&C practice sites. |

| Indicators | Evidence and Outcomes |
|---|---|
| **4.6 Expansion and usage of elements of the ToT course and the WRC materials** | There is considerable evidence from all the productive demonstration sites that farmers and lecturers used the information from the WRC materials which formed an integral part of their training processes. Specific WRC materials were cited as being used to support their training with less evidence suggesting other elements of the ToT course itself. However the wide range of sources of information and support cited by the farmers suggests that the fundamental principles on which the course is built are being perpetuated through the sharing between farmers. One course participant and active IBLN member said that the sources of information from which she draws include: "the IBLN, WRC materials, the demonstration site we started in Alice where we went to a village in Memela. We also learn through the Rhodes University ToT course, the website, Google, WhatsApp groups from the discussions." (Peter, pers. com., 2020). The main course elements that are universally practised are the sharing of ideas through discussions, sharing experience, and practical demonstrations, supported by information in the WRC materials. |

***Discussion:*** *Collaboration is central to the achievement of realised value. As can be seen from Table 5 above, collaborations have been enhanced by the new ideas and information from WRC materials shared through the ToT course. Most collaborations are around practical activities such as productive demonstration site development and they are essentially productive. The ability to lobby effectively is directly connected to the sense of empowerment or agency felt by individuals or groups. IBLN includes many members who already had strong activist backgrounds, but also others who had little or no direct contact with lobbying activities. Their engagement with the ToT course and the IBLN provided a greater sense of collective empowerment and agency, leading to more direct involvement in farmer activism, including lobbying. The effectiveness of this is less easy to assess, but confidence to enable such engagement has been strengthened. Realised value is also visible in the increasing recognition of the work of IBLN members at local, national and regional levels. However, this is mostly within the wider agroecology networks, and not yet within the mainstream agricultural discourse. For longer term transformative value to emerge from this realised value, wider sharing of the IBLN members work is needed in mainstream agricultural media. An important realised value is the cascading of the productive demonstration sites, but there is a need for more quantitative assessment of productivity associated with the RWH&C practices being implemented at various productive demonstration sites. Realised value is evident from the WRC materials and the social learning system that has supported the uptake and use of this knowledge, including via the ToT course.*

## Orienting, transformed, enabling and strategic value

As can be seen from the above, the longevity of the IBLN (enabling value), following two ToT courses facilitated in the Eastern Cape enabled a more in-depth analysis of the impacts and value realised from the ToT course and social learning intervention associated with the WRC materials and the Amanzi for Food project in this province. When compared to the Mpumalanga and North West sites (shorter duration), the Eastern Cape setting provided data for an analysis of Cycle 4 of the VCF, which was not possible in the other areas. Expansion of the IBLN network, especially through the second iteration of the ToT course, brought in a number of new activist farmers and organisations who changed the network dynamic quite considerably. The new energy brought into the network by these members (enabling value) fostered a resurgence of interest in a range of pressing issues, including agroecology, seed rights and food sovereignty, through which alternatives to conventional agricultural practices were highlighted and explored, indicating a commitment to reframed and transformative value. Experience of drought (orienting conditions) also catalysed

ongoing interest in the IBLN and the ToT programmes as farmers were seeking solutions. Within the FCAFTI, a history of teaching monoculture and large-scale irrigation to students (orienting conditions) was increasingly seen to be inadequate to respond to the needs of local farmers, which also contributed to the emergence of transformative value. Throughout the process, farmers, lecturers, LED officers, NGO partners and extension services, sought to extend their knowledge of viable alternatives to use RWH&C practices, to strengthen food production, with the collaboration across these stakeholders producing significant enabling and transformative value. For many farmers, RWH&C became almost the default position in terms of water provision in the absence of regular rainfall and experience of drought periods (orienting conditions). The inherent activist nature of the new members also added to the already strong culture of sharing information and understanding (i.e. strengthened potential value), not only within the network, but beyond into their own and neighbouring communities (strategic value). The impacts of the ToT courses were therefore amplified through the passion and dedication of IBLN members (enabling value).

Tables 2-4 above contain detailed descriptions and analyses in relation to the first four cycles of the VCF, with the relevant indicators showing a strong and lasting impact in almost every area (i.e. sustained value creation). The most compelling areas are certainly the idea and proactive nature of collaboration and sharing (potential value), with a focus on practical activities (applied value), including productive demonstration sites (realised and transformative value), but increasingly focussed on individual farmer practices that are reframed towards more sustainable agricultural practice and improved food production and social engagement (transformative, strategic value). References to the use of the WRC materials have continued for several years after the implementation of the second course, indicating an ongoing engagement with the materials and their strong potential value for applied and reframed/transformative value. This is taken further by clear indications of wide sharing of the information contained in the materials through the social learning model, confirming their potential value for applied, realised, reframing and transformative value. However, we noted that before the social learning process and ToT were instituted, the materials had not been used, thus it is not the materials themselves, but rather the processes that enable contextually and socially relevant uptake and use of the materials that seems to be significant for applied, realised, reframing and transformative value creation.

IBLN members' involvement with activist networks both widened the influence of the IBLN and increased the levels of lobbying and advocacy for agricultural policies (potential value) that are better attuned to the needs of small-scale and emerging farmers and household food producers. There was also greater recognition of the importance of sustainable practices such as RWH&C (contributing to reframed and transformative value creation). Active involvement of lecturers and students led to curricula that are better attuned to the needs of smallholder farmers (reframed and transformative value, as well as increased potential value). These activities have led to greater recognition within and beyond the farming sector of the IBLN and what it stands for, as well as farmer-centred curriculum innovations (strategic value).

One Cycle 4 indicator with which the project has perhaps not been sufficiently engaged is the issue of productivity, in terms of the quantitative outputs achieved by farmers using RWH&C practices. Any serious analysis of this will require focussed research activities conducted in collaboration with agricultural scientists and other specialists going forward. We note that the WRC materials used in the Amanzi for Food programme were written and based on strong scientific understandings of RWH&C practices that were developed over many years by large groups of scientists (i.e. their scientific potential value has already been proven in the early stages of the WRC research), thus it would be helpful to undertake such an evaluation with these scientists, pending their availability.

## Conclusion: Insights into evaluation indicators and methodology for boundary crossing social learning in VET

As can be seen by the wealth of evidence in Tables 2-5, and the short discussion above, the VCF approach can provide useful insight into a range of processes and outcomes associated with boundary crossing social learning in VET, when supported via a ToT process that is oriented towards practice, as well as expansion of social learning networking, collaboration and knowledge use and uptake. We summarise the indicators of value creation identified in Table 6 below. In doing this, it is not our intention to prescribe indicators, but rather to share how we have come to develop these indicators from the VCF analysis as described above.

**Table 6:** *Indicators of value creation in a boundary crossing VET social learning 'Amanzi/Water for Food' network approach to knowledge uptake and use in a rural agricultural setting in South Africa*

| | |
|---|---|
| **Orientation value** | ■ History of neglect of smallholder farming in agricultural education and training<br>■ Extension services now empowered to develop social learning approaches to extension<br>■ Valuable knowledge of water harvesting and its relevance to smallholder farming and household food production not in use<br>■ Multi-stakeholder interest in working with farmers, and farmers willing to work with each other can support co-learning |
| **Immediate value** | 1.1 Undertaking course in collective with others<br>1.2 Gaining access to new information and ideas<br>1.3 Collaborative activities<br>1.4 Initial steps in developing networks<br>1.5 Being able to share own experience and challenges with others in a similar situation |
| **Potential value** | 2.1 Reinforcement of existing knowledge<br>2.2 Gaining new knowledge and skills<br>2.3 Locating new knowledge into own context<br>2.4 Establishing connections<br>2.5 Increased agency through connections<br>2.6 Increased understanding of and capacity for learning |

| | |
|---|---|
| **Applied value** | 3.1 Changes in curricula/training processes<br>3.2 Use of new approaches/media<br>3.3 Adopting more collaborative approaches<br>3.4 Drawing on information in WRC materials<br>3.5 Participating in productive demonstration site development |
| **Realised value** | 4.1 Enhanced and productive collaborations<br>4.2 More effective lobbying<br>4.3 Recognition of achievements by external observers<br>4.4 Productivity of sites<br>4.5 Cascading of demonstration site development<br>4.6 Expansion and usage of elements of the ToT course and the WRC materials |
| **Reframed/ transformative value** | ■ Farmers feeling more empowered and able to produce food<br>■ Social solidarity strengthened in communities<br>■ Stronger partnerships and networks for collaborative learning, production and marketing<br>■ Improved use of agricultural water in dryland conditions creating stronger safety nets<br>■ Farmer-centred curriculum innovations in place reducing dominance of monoculture and large scale irrigation as only way of teaching extension agents |
| **Enabling value and constraining factors** *(generative mechanisms – addressing the question: What enables and constrains the learning and knowledge uptake?)* | |
| **Enabling value** | ■ Relationality (building networked relationships) and co-learning (learning together)<br>■ Productive demonstrations that benefit farmers, as well as students and educators (mutual-beneficiation from practice-based, engaged approaches)<br>■ Social media tools (especially WhatsApp) for immediate, easy to apply communications and networking<br>■ ToT materials, tools, and facilitation processes bringing diverse stakeholders together around a common 'matter of concern' (water for food production)<br>■ The navigation tool's usefulness in mediating entry into a wealth of materials and ideas in the WRC archive<br>■ The agency of individuals who are willing to support others in a learning network and share their experience, expertise and knowledge |
| **Constraining factors** | ■ Droughts, transport, institutional hierarchy, inadequate time and resources, organisational cultures, hegemonic ideas and approaches, network links (e.g. monoculture, large scale irrigation etc.) |

In applying the VCF to the WRC Amanzi for Food project, we have also observed the following:

- It was important and useful to adapt the VCF questions of Wenger et al. (2011) to the specific context of our study (see Appendix A). This adaptation enables evaluation of both quantitative and qualitative impacts from the very beginning of social learning and knowledge uptake processes to a time when the impacts have spread beyond the immediate people and activities initially involved.

- We noticed that time was an important factor for the evaluation, especially in relation to the creation of realised value, and that this also affects transformative value. Our data analysis showed that applied value and realised value only emerged after a period of time. The creation of these forms of value were explicitly scaffolded by the practical demonstration site assignment in the ToT course, and the expanded set of social learning tools used, especially also the WhatsApp group, the *ilima* workdays and ongoing sharing of information from the WRC materials.

The evaluation also showed that it is important to develop an understanding of orientation value (through contextual profiling), and to document reframing and transformative value where it emerges. It is also important to look out for enabling value and constraining factors. Enabling value is particularly important as this can be expanded via the social learning process and network as has been shown across this study. The study also showed that it is crucial to produce immediate, potential and applied value as these are catalytic of realised and reframed value which in turn shapes transformative value possibilities and actualisation. These processes occur in cycles and are iteratively related (i.e. not necessarily linear).

In sum, our article has outlined an adapted monitoring and evaluation approach for evaluating boundary crossing VET ToT social learning processes. It drew on a brief historical analysis of the main trends in evaluation research to identify a suitable approach for social learning evaluation, used contextual profiling to establish orienting value, focussed on empirical analysis of Cycles 1-4 in the VCF which offered insight into Cycle 5 reframing/ transformative value creation, and drew on critical realist underlabouring to understand enabling value and constraining factors. The monitoring and evaluation methodology, as applied and developed here, shows potential for further adaptation and development, and has importantly also shown up areas where there are inadequate sources of data to provide perspectives on the indicators. This can therefore also improve the methodological processes for ongoing monitoring and evaluation of initiatives that seek to support boundary crossing VET ToT programmes that support uptake and use of new knowledge in smallholder farming contexts in Africa.

## Acknowledgements

The authors would like to acknowledge and thank the Water Research Commission of South Africa, who funded the Amanzi [Water] for Food project and enabled the generation of this article. The authors also recognise the National Research Foundation (NRF) and Department of Science and Innovation (DSI) for their support of the SARChI Chair in Global Change and Social Learning systems whose core research funding also supported the writing of this paper. The wider team of researchers, farmers and IBLN members who contributed to the Amanzi for Food programme over the eight-year period are also recognised, especially the late Tich Pesanayi, whose pioneering PhD work established the basis for the network and ToT programme in the first iteration.

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## Percentage contribution

| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | Lotz-Sisitka | 45% |
| | Sisitka | 40% |
| | Chakona | 5% |
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| Data collection | Lotz-Sisitka | 0% |
| | Sisitka | 65% |
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| Drafting the paper | Lotz-Sisitka | 40% |
| | Sisitka | 35% |
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| Critical review of paper | Lotz-Sisitka | 70% |
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# Appendix A

## *The VCF Adaptation for Amanzi for Food*

### *Amanzi for Food VCF: Indicators and Questions*

**Cycle 1 – Immediate Value: *Activities and Interactions***

1.1 Undertaking course in collective with others (individuals, organisations, departments, disciplines etc.)
- People/organisations involved in collective?
- Degree of interactions within collective?

1.2 Gaining access to new information and ideas (WRC materials, others' experiences, input from facilitators etc.)
- Sources of information?
- Types of information?
- Means of access to the information?

1.3 Collaborative activities (group discussions, field visits etc.)
- Types of activities?
- Engagement with the activities?
- Initial outcomes of activities?

1.4 Initial steps in developing networks (or consolidating and expanding networks)
- Locus and membership of networks?
- (Proposed) structure of networks?
- (Proposed) focus for networks?

**Cycle 2 – Potential Value: *Knowledge Capital***

2.1 Reinforcement of existing knowledge (including indigenous/local)
- Types of existing knowledge?
- Sources/locations of existing knowledge?
- Applicability of existing knowledge?

2.2 Gaining new knowledge and skills (from WRC materials, course texts, videos, facilitators, other participants)
- Types of new knowledge?
- Sources of new knowledge?
- Applicability of new knowledge?

2.3 Locating new knowledge into own context
- New knowledge located in context?
- Reasons for selection of this knowledge?

2.4 Establishing connections (some overlap with networks indicators)
- Kinds of connections established?
- With whom connections established?
- Purposes for establishment of connections?

2.5 Increased agency through connections/collaborations
- Collaborative activities undertaken?
- Outcomes of activities?
- Evidence of strengthened agency through collaborations?

2.6 Increased understanding of and capacity for learning (from open process of ToT and learning-focused elements within the course), including of notions of curriculum and training processes
- Learning processes engaged in within the course?
- Course elements dealing with learning processes?
- Learning processes drawn on for assignments?
- Learning processes proposed for further sharing of information?

**Cycle 3 – Applied value: *Changes in practice***

3.1 Changes in curricula/training processes:
- Curriculum/training process changes identified in assignments?
- Justifications for these changes?

3.2 Use of new approaches/media, including establishment of WhatsApp groups, for sharing information and ideas from WRC materials:
- New approaches/media uses identified in assignments?
- Justifications for these new approaches/media uses?

3.3 Adopting more collaborative approaches through planning for/developing productive demonstration sites and other activities:
- Collaborative processes, described in assignments, for planning and developing productive demonstration sites?
- Collaborative processes associated with other activities?

3.4 Drawing on information in WRC materials (and other sources) to support changes in practice:
- Information used to inform changes/activities?
- Sources from which information is drawn?
- Specific information from specific WRC materials used to support changes/activities?

**Cycle 4 – Realised value: *Performance improvement***

Not directly relevant in relation to courses and assignments but some evidence available through more established Learning Network activities:

4.1 Enhanced and productive collaborations
4.2 More effective lobbying
4.3 Recognition of achievements by external observers
4.4 Productivity of sites
4.5 Cascading of demonstration site development
4.6 Expansion and usage of elements of the ToT course and the WRC materials

**Cycle 5 – Reframing value: *Redefining success***

Limited scope in most situations at this stage; insufficient data for analysis:

5.1 Previous definitions of success
5.2 Changes in definitions
5.3 Reasons for changes

## Endnotes

1 We use the concept of VET here as used by the VET 4.0 Africa Collective (Lotz-Sisitka & McGrath, 2023, p. 8), which encompasses "an expansive view of VET, one that avoids seeing this as only referring to formal provision, more narrowly to public provision, or even more narrowly still to only that provision that falls under an education ministry. This makes us view conventional boundaries between adult/community/lifelong research and vocational as problematic … we see our concerns as having an important ontological dimension".

2 ToT course materials: https://amanziforfood.co.za/courses/online-training-of-trainers-course/

3 https://amanziforfood.co.za/wp-content/uploads/2017/08/New_Navigation-Tool_1.pdf

4 An extensive report on the whole programme including presentation and analysis of all of these data sources is offered in Lotz-Sisitka et al. (2016 and 2022), as well as in the PhD study of Pesanayi (2019), and the M.Ed studies of Weaver (2016), Lupele (2007), Sithole (2018), Matiwane (2020) and Maqwelane (2021). These were not evaluation studies, but rather sought depth of perspective on different aspects of the programme. The studies provided useful insights that also informed the VCF analysis.

# Renewable Energy Technologies: How technical curricula could enable a brighter future

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## Abstract

The potential of renewable energy technologies to mitigate climate change while meeting the energy demand of future generations is recognised globally. In South Africa, occupations such as wind turbine technicians and solar photovoltaic installers are in high demand. In response to these needs, Renewable Energy Technologies (RET) subjects were developed as specialised electives within the Electrical Infrastructure Construction programme that is offered by technical and vocational education and training (TVET) colleges. The focus of this study is the knowledge that underpins the RET subjects. The guiding research question is: What forms of knowledge underpin the RET curricula, and what is the relationship between these knowledge forms? The semantic dimension of Legitimation Code Theory was used to explain the knowledge forms underpinning the RET subjects. The study uncovered gaps and imbalances across the range of knowledge forms selected, while the relationships between the knowledge forms constrained cumulative knowledge building. The contribution made by the study is a principled understanding of how knowledge selection and sequencing in technical curricula could enable cumulative learning and build valued competencies within the renewable energy field.

***Keywords:*** *renewable energy technologies, technical and vocational education and training, wind turbine technicians, solar photovoltaic installers*

## Introduction: Greening TVET

The potential of renewable energy technologies to mitigate climate change while meeting the energy demand of future generations is recognised globally. Many countries have consequently initiated technical and vocational educational training (TVET) programmes to meet the demand for skilled renewable energy technicians. In South Africa, in the light of failing electrical infrastructure and environmental damage caused by coal-generated power, renewable energy is of increasing importance for social and economic development. The need for skilled technicians in the field is a major driver for future occupations in the green economy (Durrans et al., 2020). According to the Renewables Global Status Report (REN21) "the renewable energy sector employed (directly and indirectly) around 11 million people worldwide in 2018" (REN21, 2019, p. 17). Occupations in solar and wind-generated power are in high demand as new and more sustainable forms of electricity supply are


DOI 10.4314/sajee.v39.09
ISSN 2411–5959

sought. But while renewable energy provision has gained prominence, knowledgeable and skilled technicians in the sector are in short supply. In fact, occupations such as wind turbine technicians and solar photovoltaic installers are at the highest level of demand in South Africa (Department of Higher Education and Training [DHET], 2019).

Since 2013, the German Ministry of Economic Cooperation and Development's Programme *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ) and Skills for Green Jobs (S4GJ) have, in cooperation with the South African Department of Higher Education and Training (DHET) and Department of Science and Technology (DST), run a pilot project on the greening of TVET colleges. The collaborators developed specialised elective subjects in Renewable Energy Technologies (RET) for the National Curriculum Vocational in Electrical Infrastructure Construction (NCV-EIC). Thus, a key area of TVET provision for the green economy is the RET subjects that are offered at introductory, intermediate and advanced levels. These subjects are the focus of this study.

The field of renewable energy technologies brings together many of the key debates in TVET curricular studies, including how a technical curriculum might prepare young people for competent practice and employability in a growing sector, the kinds of scientific underpinning such a curriculum should have, the role that practical training might play, as well as broader issues of citizenship and sustainable development. The research question guiding this study is: What forms of knowledge underpin the RET curriculum, and what is the relationship between these knowledge forms?

## The literature on renewable energy technologies education

Renewable energy sources include bioenergy, geothermal energy, hydropower, solar energy, ocean (tide and wave) energy and wind energy. The demand for renewable energy technologies to meet human needs and industrial and commercial processes is growing in South Africa and internationally (Fouché & Brent, 2019). Renewables are key "to help mitigate climate change" and "to meet [the] energy demand of future generations" (Owusu & Asumadu-Sarkodie, 2016, p. 2). Many countries have consequently initiated vocational programmes in renewable energies (Kandpal & Broman, 2014).

There are many routes to becoming a renewable energy technician. Technicians generally require a post-secondary qualification (Stroth et al., 2018), but students could undertake an apprenticeship comprising classroom learning and hands-on work under the supervision of experienced technicians (Jennings, 2009), or be trained by one of the companies providing wind or solar power (REN21, 2019). For colleges to provide relevant and appropriate training for renewable industries, a range of formal programmes, as well as short term, on-the-job training courses for updating knowledge and skills, are required (Kandpal & Broman, 2014).

The knowledge base for the initial education of technicians for renewable energy technologies comprises both scientific and practical knowledge (Malamatenios, 2016). Mathematical knowledge is important for performing energy calculations, while electrical engineering knowledge is basic to the full range of occupations in the renewable energy

field. In the practical training of heat pump installers, for example, errors tended to occur when the scientific basis of practice was not clear to technicians (Gleeson, 2016).

The practical knowledge needed by renewable energy technicians is field-specific to underpin the ability "to construct, install and maintain the equipment that collects, generates, or distributes power through renewable means" (Malamatenios, 2016, p. 4). Including practical knowledge in the curriculum is particularly important for the transfer of concepts to practice. Transfer requires students to engage in diverse episodes of practice that explicitly build causal links and associations to the underpinning concepts (Vosniadou & Skopeliti, 2014). Building causal links is central to problem-solving and competent practice (Billett, 2018). Students' dispositions towards the occupation are likely to be shaped by their practical learning experiences, observing others, and making judgements about the value of concepts and practices and how these can be reconciled with what they experience (Billett, 2018). Opportunities to engage in practice tend to motivate students, but when such opportunities are not readily available, students' engagement through gamification and simulation is recommended (Spangenberger et al., 2020).

The relationship between scientific and practical knowledge is crucial in technical curricula. Ongoing debates around the degree to which curricula should be determined by disciplinary knowledge, or by occupational standards are evidence of the neglect of the relationship between theoretical and practical knowledge in vocational education (Winch, 2013, p. 281). With regard to renewable energy, Jennings (2009) advised that training should include courses in construction safety, energy systems, English, mathematics, installation techniques, site analysis and design. Employers usually require applicants to have had some experience in the field of renewable energy technologies, thus educational provisions include "laboratories, practical demonstration of operational systems, field visits and field installation of actual working systems, and hands-on-skills training such as trouble-shooting, design, and manufacture besides lectures, tutorials, assignments, and seminars" (Kandpal & Broman, 2014, p. 7). Recent studies suggest that climate science and environmental assessment studies should be integrated into technical programmes and that "disruptive innovations, extremes, and broad sustainability questions must be explored" (Nikas et al., 2021, p. 119).

A number of studies found gaps between more theoretically oriented academic curricula and the practical competences required by industry (Durrans et al., 2020; Fitch-Roy, 2013; Kandpal & Broman, 2014; Lucas et al., 2018). Research undertaken on the impact of the gaps in education and training in renewable energy industries worldwide shows that many renewable energy courses fail to deliver the kind of practical hands-on training that is needed to address skills shortages (Lucas et al., 2018). These include installation, operation, construction, and maintenance. It is recognised that vocational training provides a valuable form of education, with a specific focus on practical hands-on training. However, "only about 15% of existing courses fall into this category" (Lucas et al., 2018, p. 453). Consequently, there is a need for industry and TVET to collaborate in order to address the misalignment between education and training offerings and industry needs and standards. South African

TVET programmes have been found to require "more consideration of the nature and trajectory of sectors, firm dynamics [and] their particular occupational structures" (Allais et al., 2021, p. 650). The field of renewable energy is "cross institutional, cross sectoral and also inter- and transdisciplinary" which necessitates innovative approaches and "transformative, transgressive forms of learning that move beyond the boundaries of single institutions" (Lotz-Sisitka, 2020, p. 143).

## A theoretical framework to guide theory and practice in a technical curriculum

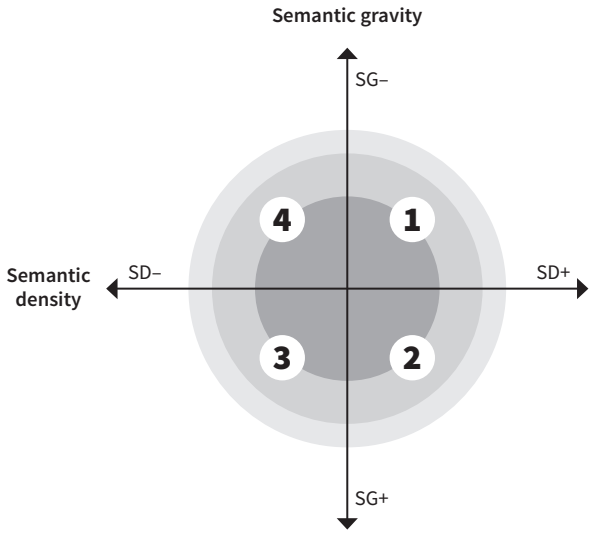
Legitimation Code Theory (LCT) was chosen as the theoretical framework for this study. LCT has been extensively used to investigate the knowledge that underpins various types and levels of educational curricula (Maton, 2014), including vocational education (e.g., Johansson, 2020). LCT offers a range of concepts and tools for examining practices, with each dimension exploring the organising principles that underpin dispositions, practices and fields.

### The internal language of description

The semantics dimension of LCT is particularly appropriate for this study as it attempts to identify the unpinning knowledge structures of curricula. The organising principles of semantic structures are "conceptualized as semantic codes comprising semantic gravity and semantic density" (Maton, 2014, p. 2). Semantic gravity refers to the degree of context-dependence, while semantic density refers to the degree of condensation of meaning (Maton, 2014). While semantic density is often understood as equivalent to 'theory' and semantic gravity as equivalent to 'practice', this is not the case. Both theoretical and practical knowledge can have stronger and weaker elements of semantic density and semantic gravity. How they are applied in specific curricula will vary. For example, an installation procedure might have strong semantic gravity and strong semantic density if it is both contextually complex and underpinned by scientific knowledge. The same procedure could be simplified, thus have a weaker semantic gravity and weaker semantic density when introduced into the curriculum at an introductory level. The same applies to disciplinary concepts.

The success of a vocational curriculum depends on an appropriate relationship between semantic gravity and semantic density. Effective relationships between semantic gravity and semantic density promote 'cumulative learning' (Maton, 2014, p. 143), and enable relationships between theory and practice (Waite et al., 2019). Semantic gravity and semantic density are conceptualised as two intersecting continua, creating a semantic plane (Figure 1). Different forms of semantic gravity and semantic density can be located at a range of positions on the two continua, resulting in many possible combinations. The four key combinations are labelled as quadrants 1, 2, 3 and 4.

**Figure 1:** *The semantic plane.*[1] *Source: Maton, 2014, p. 131*




The first quadrant has weaker semantic gravity (or contextual content) and stronger semantic density (or conceptual content), which is typical of the basic sciences. The second quadrant has both stronger semantic gravity and stronger semantic density, which is characteristic of the applied sciences, such as the engineering sciences that have high levels of both contextual and conceptual complexity. Quadrant three has stronger semantic gravity and weaker semantic density, making it typical of knowledge developed in practice. The fourth quadrant has both weaker semantic gravity and weaker semantic density, which usually indicates generic subject matter that is not directly related to the technical area, although the subject could be valuable, such as communication skills. Table 1 represents the semantic plan in tabular form.

**Table 1:** *Semantic gravity and semantic density combination*

| Quadrant | Semantic combinations | Codes | Examples |
|---|---|---|---|
| 1 | Weaker semantic gravity, and stronger semantic density | SG-,SD+ | Basic sciences |
| 2 | Stronger semantic gravity, and stronger semantic density | SG+,SD+ | Engineering sciences |
| 3 | Stronger semantic gravity, and weaker semantic density | SG+,SD- | Practical knowledge |
| 4 | Weaker semantic gravity, and weaker semantic density | SG-,SD- | Generic knowledge |

Table 1 represents the range of knowledge forms that technical curricula would draw on: scientific concepts, applied sciences, codified forms of procedural knowledge and knowledge arising from practical tasks and activities, as well as generic content. Engaging in the

full range of knowledge forms, conceptualising, applying concepts to practice (as in the engineering sciences), preparing for practice (through study of standardised procedures) and implementing the procedures (e.g., constructing, installing, maintaining, repairing) builds occupational competence (Johansson, 2020). Generic knowledge about the field, such as its history, policies and development, can broaden students' understanding of their future occupations. It is "the strengthening and weakening of *both* semantic gravity and semantic density ... that makes possible knowledge-building across different contexts and over time" (Maton, 2014, p. 143). Typically, a concept is introduced and simplified, but, as Waite et al. explained: a technical curriculum needs to be iterative with each concept "building on the previous one, rather than assuming that once a technical, abstract concept has been explained it can be used from there on" (Waite et al., 2019, p. 4); there has to be continuous traversing of the knowledge range for students to 'make the links'. For example, following a practical exercise, students need to debrief and evaluate what they accomplished against codified procedures (Lucas et al., 2018). Reflecting by drawing on the full semantic range enables students to draw on scientific and engineering concepts in order to formulate solutions to the challenges they confront in practice (Waite et al., 2019).

## Methodology

This study is part of a national project on evaluating TVET colleges supported by the TVET division of DHET. The data for this curriculum evaluation was obtained from the RET Subject Guides and Assessment Guides, as well as the textbooks developed by the S4GJ/GIZ collaboration. The curriculum documents are listed in Table 2.

**Table 2:** *Curriculum data*

| Curriculum Documents | NQF Level | Year | Abbreviation |
|---|---|---|---|
| Renewable Energy Technologies Subject Guide (2015) | 2 | 1 | RET-SG 2, 2015 |
| Renewable Energy Technologies Assessment Guide (2015) | 2 | 1 | RET-AG 2, 2015 |
| Renewable Energy Technologies Subject Guide (2016) | 3 | 2 | RET-SG 3, 2016 |
| Renewable Energy Technologies Assessment Guide (2016) | 3 | 2 | RET-AG 3, 2016 |
| Renewable Energy Technologies Subject Guide (2017) | 4 | 3 | RET-SG 4, 2017 |
| Renewable Energy Technologies Assessment Guide (2017) | 4 | 3 | RET-AG 4, 2017 |
| Text books | | | |
| S4GJ & GIZ (2016). *Renewable Energy Technologies National Certificate (Vocational): Introduction to Renewable Energy and Energy Efficiency (Levels 2 and 3)*. Pretoria: DHET | 2 & 3 | 1 & 2 | S4GJ/GIZ 2/3 |
| S4GJ & GIZ (2017). *Renewable Energy Technologies National Certificate (Vocational): Introduction to Renewable Energy and Energy Efficiency (Levels 4)*. Pretoria: DHET | 4 | 3 | S4GJ/GIZ 4 |

Note that the guides are identified by National Qualification Framework (NQF) level, not by year level. The South African NQF comprises 10 levels. Basic compulsory education from grades 1 – 9 are included in NQF level 1. Senior school, from grades 10 – 12, are at NQF levels 2, 3 and 4, respectively. Levels 5 – 10 cover higher education from first year (level 5) to doctoral studies (level 10). Vocational education currently resides in the same band as senior school, that is, NQF levels 2 – 4. The first year RET Study Guide is thus at NQF Level 2. The RET electives enable students to specialise in renewable energy technologies within the field of Electrical Infrastructure Construction. The guides explain that the RET subjects include a theoretical component (30 – 40%), which is externally assessed, and a practical component (60 – 70%), which is internally assessed. A year mark out of 100 is calculated by adding the marks of the theoretical component and the practical component of the internal continuous assessment.

## Outcomes: The external language of description

All TVET curricula are outcomes-based; study and assessment guides largely comprise exit level outcomes, learning outcomes and assessment criteria. Table 3 shows the distribution of the 34 exit-level outcomes across the three RET modules.

**Table 3:** *Exit level outcomes across the RET modules*

| NQF Level 2 | NQF Level 3 | NQF Level 4 |
|---|---|---|
| **Topic 1: Introduction to renewable energy resources and energy efficiency** | | |
| 1. Explain international and national climate change policies.<br>2. Explain the differences between energy resources.<br>3. Explain the significance of solar radiation. | 13. Explain the economic and environmental benefits of solar water heating (SWH) systems.<br>14. Demonstrate the realistic potential for this technology in South Africa.<br>15. Prepare a simple cost/benefit analysis for a residential SWH installation.<br>16. List and describe relevant norms, standards and regulations for South Africa's SWH-Industry. | 24. Explain the economic and environmental benefits of wind power generation.<br>25. Demonstrate the realistic potential for this technology in South Africa.<br>26. Explain the economic and environmental benefits of electro-mobility and fuel-cell technology.<br>27. Compile an overview of advantages and disadvantages of hydrogen and fuel cell technology. |
| **Topic 2: Basic scientific principles and concepts** | | |
| 4. Explain energy concepts and investigate energy efficiency options.<br>5. Explain the concept of electricity and its base values.<br>6. Build simple DC circuits and perform calculations. | 17. Understand and apply the basic principles of SWH and relate those to the key components of SWH systems.<br>18. Explain the basic principles for roof mounted collector installation.<br>19. Perform basic calculations relevant for system sizing. | 28. Explain the basic principles of wind power generation.<br>29. Explain the basic principles of hydrogen and fuel cell technology.<br>30. Explain eMobility concepts. |

| NQF Level 2 | NQF Level 3 | NQF Level 4 |
|---|---|---|
| **Topic 3: Safety** | | |
| 7. Describe and demonstrate safe work practices. | 20. Describe and demonstrate safe work practices for working at heights. | 31. Develop technology relevant workplace health and safety processes and procedures. |
| **Topic 4: Basic principles of Photovoltaic (PV) systems** | **Topic 4: Applications of SWH-systems** | **Topic 4: Application of wind turbine and fuel cell systems, and batteries** |
| 8. Explain the basic principles of Photovoltaic (PV) systems.<br>9. Identify and explain the use of training kit components and/or industrial components for experiments.<br>10. Explain the characteristic of solar cells under different conditions.<br>11. Demonstrate the effect of series and parallel connections of solar cells under different conditions.<br>12. Emulate the effect of diurnal variation and design a simple off-grid network. | 21. Identify the different components of solar hot water systems and explain their specific application/function.<br>22. Explain the different types of thermo-siphon systems and describe measures to ensure frost, hail, and scale resistance.<br>23. Prepare and install a pre-fabricated low-pressure thermo-siphon system on a training roof. | 32. Connect wind turbine components using didactical training kits or small-scale industrial components.<br>33. Connect fuel cell system components using didactical training kits or industrial components.<br>34. Explain the operation and performance of batteries for renewable energy systems. |

Each exit level outcome has five to ten learning outcomes. The learning outcomes are numerous and comprise the main content of the RET subject guides. Each learning outcome has associated assessment criteria that make up the main content of the assessment guides. The texts and tasks in the RET textbooks follow the learning outcomes; the textbooks start with learning outcome 1.1 and conclude with learning outcome 34.13. The textbooks include texts and tasks that 'flesh out' the learning outcomes. Each learning outcome, as well as its accompanying texts and tasks in the textbooks, was studied to determine the relative strength of its semantic gravity and semantic density, as explained in the following section.

## A translation device: Linking the internal and external languages of description

A 'translation device' (Maton & Chen, 2016) was developed to apply the concepts of semantic gravity and semantic density to the study of the curricular outcomes (Table 4). Accordingly, the tables of exit level outcomes, learning outcomes, and assessment criteria and accompanying textbook texts and tasks were studied and coded to identify the kinds of knowledge underpinning the outcome.

**Table 4:** *Translation device for a renewable energy technology curriculum*

| Semantic range | Knowledge types | Semantic codes | Quadrant | Examples of learning outcomes |
|---|---|---|---|---|
| ↕ | Conceptual | SG-, SD+ | 1 | Basic scientific concepts, e.g., 'Describe the principle of energy conservation' (30.2).[2] |
| | Applied | SG+, SD+ | 2 | Engineering science principles e.g., 'Explain arrangement required to connect wind turbines to the grid (installation of transformer, medium and high voltage switchgear, high and low tension power lines' (28.8). |
| | Practical | SG+, SD- | 3 | Codified procedures or knowledge acquired in practice, e.g., 'Perform testing and fault finding on all of the above set-ups, installed small-scale installations' (32.12). |
| | Generic | SG-, SD- | 4 | Generic knowledge, e.g., 'Design health and safety checklists that can be used at the learning institution' (31.4). |

The translation device describes the range of knowledge types needed in technical fields (e.g., Johansson, 2020), including renewable energy technologies (e.g., Gleeson, 2016; Kandpal & Broman, 2014). The double arrow in the 'Range' column indicates that iterations across the full range of knowledge types are necessary (Waite et al., 2019). Each code was given a numerical value that corresponds to the four quadrants of the semantic plane (Figure 1).

## Using the translation device to analyse the data

To analyse the data, we studied each of the 34 exit level outcomes, their learning outcomes and associated assessment criteria. We also studied the relevant sections of the two textbooks, which provided more detail on the types of activities, exercises, calculations and experiments to be undertaken at each level of the RET subjects. The outcome descriptions, assessment criteria and key aspects of the textbooks were captured on an Excel file and coded for semantic gravity and semantic density, and knowledge type (Table 5). The codes were consolidated across learning outcomes, assessment criteria, and textbook activities and then re-checked and refined. For example, learning outcome 32.4.2.8, 'Operate the electrolyser with a miniature wind turbine' was initially coded as having stronger semantic gravity and weaker semantic density (SG+,SD-), but was subsequently recoded as reducing the semantic gravity and strengthening the semantic density, shown by the upward and downward arrows respectively (SG+↓, SD-↑). The reason for weakening the semantic gravity was because of the oversimplification of the device used for the wind experiments, while the reason for strengthening the semantic density was because the function of the wind experiments was to consolidate and deepen students' understanding of theoretical concepts.

The analysis enabled us to identify each knowledge type, with reference to its quadrant on the semantic plane (Figure 1), as well as its curricular level, which was indicated by impact of the activities, exercises and experiments on strengthening or weakening semantic gravity and density. The first finding thus explains the characteristics of the knowledge types across the RET modules, while the second finding focuses on the curricular level.

**Table 5:** *Example of how data were analysed*

| No. | Learning outcome | Reference | Assessment criteria | Reference | Textbook | Reference | Semantic code | Quadrant |
|---|---|---|---|---|---|---|---|---|
| 28.2.1.2 | Describe the principle of energy conservation. | RET-SG4, p. 9 | The principle of energy conservation is described. | RET-AG4, p. 12 | Equations and exercises to explain first law of thermodynamics. | S4GJ/GIZ 4, pp. 94-96 | SG-;SD+ | 1 |
| **Notes:** Basic scientific knowledge; conflation of outcomes and assessment criteria; the topic was mainly covered in RET3 - brief summary/definition in RET4. | | | | | | | | |
| 32.4.1.4 | Determine the output power of a generator at different wind speeds. | RET-SG4, p. 10 | Output power of a generator at different wind speeds is determined. | RET-AG4, p. 16 | Explanations of energy transfer; exercises and calculations with application to wind turbine. | S4GJ/GIZ 4, pp. 97-103 | SG+,SD+ | 2 |
| **Notes:** Applied knowledge; conflation of outcomes and assessment criteria; text book provides exercises and calculations. | | | | | | | | |
| 32.4.2.8 | Operate the electrolyser with a miniature wind turbine. | RET-SG4, p. 11 | Operation of electrolyser with a miniature wind turbine (in combination with the wind turbine training kit). | RET-AG, p. 18 | Introduction to training kit, assembly, exercises, experiments and calculations. | S4GJ/GIZ 4, pp. 136-145 | SG+↓,SD-↑ | 3 |
| **Notes:** Practical knowledge (but not work-oriented); experiments and exercises consolidate sciencific and applied scientific knowledge; far removed from actual practice. | | | | | | | | |
| 24.1.1.6 | List and compare the advantages and disadvantages of wind power generation. | RET-SG4, p. 9 | The advantages and disadvantages of wind power generation are listed and compared. | RET-AG4, p. 10 | Textbook has text only on reducing GHG emissions, mitigation of climate change, environmental impact assessment, public participation processes, etc. | S4GJ/GIZ 4, pp. 50-57 | SG-,SD-↑ | 4 |
| **Notes:** Generic knowledge; outcomes and assessment criteria are conflated; textbook is text heavy, no exercises, small research projects, or activities. | | | | | | | | |

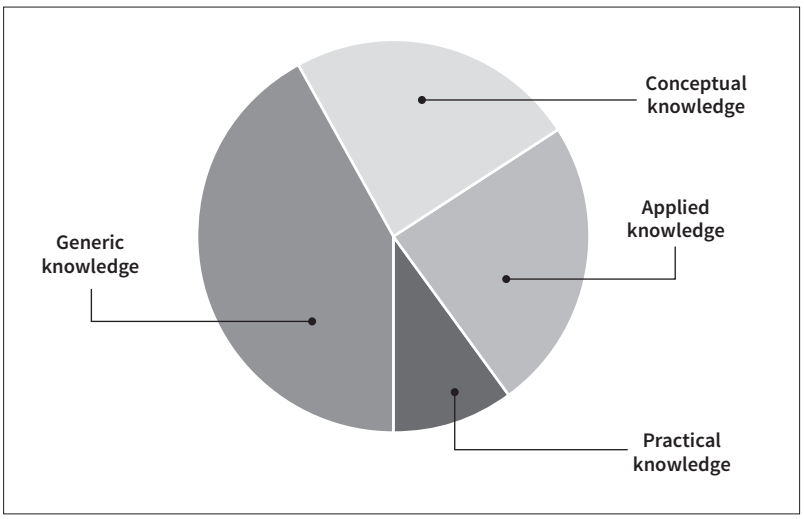
## Finding 1: Knowledge across the RET subjects

The purpose of the RET subjects is explained as follows:

> Renewable Energy Technologies has been designed as an optional vocational subject that … addresses the necessary trade-specific skills, knowledge, values and attitudes [in order to place students] in a better position for future job placements in the green economy. (RET-SG 4, 2017, pp. 2-3)

Figure 2 illustrates the range of exit level outcomes. Generic outcomes take up considerable curricular space (42%), conceptual and applied knowledge outcomes comprise 24% each, while practical knowledge has very little curricular space (10%). Of the 34 exit level outcomes, 14 outcomes have to do with renewable energy policies, regulations, legal frameworks, costs and benefits, or general safety issues. Of the remaining 20 outcomes, eight outcomes are underpinned by basic sciences, eight by engineering sciences, and only four outcomes involve practical knowledge, such as: 'Prepare and install a pre-fabricated low-pressure thermo-siphon system on a training roof' (23). Some outcomes that appear to be practice-oriented, such as 'Build simple DC circuits' (6), are exercises or laboratory experiments that help students to consolidate theoretical knowledge and are not work-oriented.

**Figure 2:** *Distribution of knowledge types across the exit level outcomes*




Many forms of knowledge underpin RET, but the exit level outcomes favour the generic above the occupational-specific. Thus the majority of outcomes are located in quadrant 4 of the semantic plane (Figure 1), that is, that have both weaker semantic gravity (SG-) and weaker semantic density (SD-). Many of these generic outcomes have value outside of the engineering knowledge base and such generic outcomes can be useful for planning

(Nikas et al. 2021), or for reflection on the contribution made by particular technologies (Durrans et al., 2020). A stated intention is to help students to understand that renewable energy is a crucial part of "South Africa's future energy mix and green economic growth" (RET-SG 4, 2017, pp. 2-3), but it has been pointed out that generic provision tends to have 'little sectoral specificity and little integration into economic development strategies' (Allais et al., 2021). Stronger semantic gravity, for example, in the form of work-oriented tasks derived from actual work practices, is necessary to better align curricular and occupational outcomes (Durrans et al., 2020). The spread of outcomes is not consistent with the claim that the RET subjects comprise-30-40% theory and 60-70% practice.

The RET Subject and Assessment Guides, as well as the supporting textbooks, are packed with the exit level and learning outcomes. For example, RET 4 has four topic areas comprising eleven exit level outcomes and 79 learning outcomes and assessment standards. This level of detail makes time consuming and perplexing demands on lecturers (Atkinson, 2016). Each outcome is understood separately and has no explicit relationship to the one before or after. Substituting lists of outcomes for a curriculum will not enable cumulative learning as relationships across the knowledge range are missing (Johansson, 2020; Waite et al., 2019). Treating each outcome separately is likely to reinforce the theory-practice divide. For example, a module might begin with an outcome underpinned by basic scientific knowledge (SG-,SD+), such as energy conversion and heat transfer; then progress to outcomes related to the engineering principles of solar water heating devices, such as including laboratory experiments to investigate the principles of solar water heating devices (SG+, SD+). Outcomes related to procedures for installing the essential components of a flat plate collector might then follow (SG+,SD-). But they do not go back and forth across the semantic range to reflect on practice in relation to procedures, engineering science, or relevant scientific concepts.

The pattern we detected across the three RET modules was: 1) the guides and textbooks start with information about the environmental and economic benefits of renewable energy technologies (SG-, SD-), 2) scientific principles are then introduced (SG-,SD+), 3) next, engineering principles are presented (SG+,SD+), and 4) practical activities follow (SG+,SD-), although these practical activities tended to have a weaker semantic gravity than required as the task has been overly simplified (represented as SG+↓). No explicit links between the four identified knowledge forms were made, for example, there are no activities that require students to reflect on the scientific or engineering principles underpinning practical tasks. This could be described as one-way traffic from theory to practice, thus no two-way traffic between theory and practice. Cumulative learning requires the application of theory to practice, but also identifying the theory in practice, by critically reflecting on practice. Without cumulative learning there is a tendency to over-simplify and constrain the critical thinking needed to address new problems in new contexts (Waite et al., 2019).

The exit level outcomes do not have the qualities of a vocational subject. For example, most outcome statements use the verb 'explain', which requires scientific or theoretical knowledge – these are outcome with higher levels of semantic density (SD+) and lower levels

of semantic gravity (SG-). Very few outcomes contain occupational requirements implied by verbs such as 'implement', 'assemble', 'connect', 'install', 'test', 'troubleshoot', 'calibrate', 'modify', 'repair' or 'provide assistance'. Thus outcomes with higher levels of semantic gravity (SG+) are largely missing in the subject and assessment guides. Several studies have explained how gaps between academic curricula and the practical requirements of industry negatively impact students' employability (Durrans et al., 2020; Fitch-Roy, 2013; Kandpal & Broman, 2014; Lucas et al., 2018). The under-representation of practical knowledge in the RET subjects makes it unlikely that graduates will acquire the 'trade-specific skills, knowledge, values and attitudes' required for 'job placements in the green economy' (RET-SG 4, 2017).

There is considerable repetition across the RET exit level outcomes. Each RET level comprises four topics (see Table 3 above). Topic 1 covers policy and economics at different levels. Topic 2 covers concepts in basic sciences, such as "differences between fossil and renewable energy resources, the sun as the principal source of energy, fundamentals of electricity in direct currents" (RET-SG 2, 2015). These same basic concepts are repeated across all three RET modules. At each level, Topic 3 is a stand-alone item on 'safety' with similar content across all three subjects. While safety is particularly important in electrical engineering and renewable energy technologies, it is covered in every subject of the NCV-EIC. In the RET subjects, safety issues need be more specific to the field of renewable energy resources. For example, the Global Wind Organisation (GWO) has established standards for safe practice in the wind turbine industry. In solar energy, safety measures address hidden ground faults, wire sizing, and rapid shutdown, and so on. Topic 4 represents the practical component, such as installation processes for solar water heating systems, wind energy, hydrogen power and fuel cell technology, eMobility and batteries. The wide variety of technologies does not enable a focus on the practical knowledge required for the installation, maintenance and repair of particular technologies. Breadth, rather than depth, in the coverage of renewable energy technologies inevitably results in a weakening of the semantic gravity as the tasks required are necessarily simplified (SG+↓). Thus while there are practical tasks, represented by the plus sign, these have insufficient complexity for the occupational context, represented by the down arrow.

Not only are topic areas repeated across the RET subjects, there is also considerable overlap with other sections of the NCV-EIC curriculum. For example, Topic Area 2 ('Basic scientific principles and concepts') at Level 2 repeats much of the key vocational subject content 'Electrical Principles and Practice' (Level 2) (see Table 6).

**Table 6:** *An example of repetition across the curriculum*

| **Electrical Principles and Practice (2)** | **Renewable Energy Technologies (2)** |
|---|---|
| Explain the concept of electricity and its base values.<br>Build simple DC circuits and perform calculations | Explain the concept of electricity and its base values.<br>Build simple DC circuits and perform calculations. |

While outcomes specific to renewable energy, such as "explain energy concepts and investigate energy efficiency options", are appropriate, the repetition across the RET subjects seems largely unnecessary and potentially demotivating. RET 4 states that it is necessary to repeat key concepts across levels (RET-SG 4, 2017, p. 2), but there does seem to be excessive repetition, which is associated with student demotivation and attrition (Johansson, 2020).

## Finding 2: The curricular level

In this section we determined the curricular level by focussing on a practical exit level outcome. The NQF level 4 RET subject was chosen for in-depth analysis as its outcomes could be expected to approximate to standards of practice in industry; in fact, the level 4 assessment guide claims that "emphasis is placed on practical activities and the use of training kits or industrial components" (RET-AG 4, 2017). The RET Level 4 curriculum has a focus on wind energy; in this section the focus is on the learning outcomes and assessment standard of exit level 34 (Table 7).

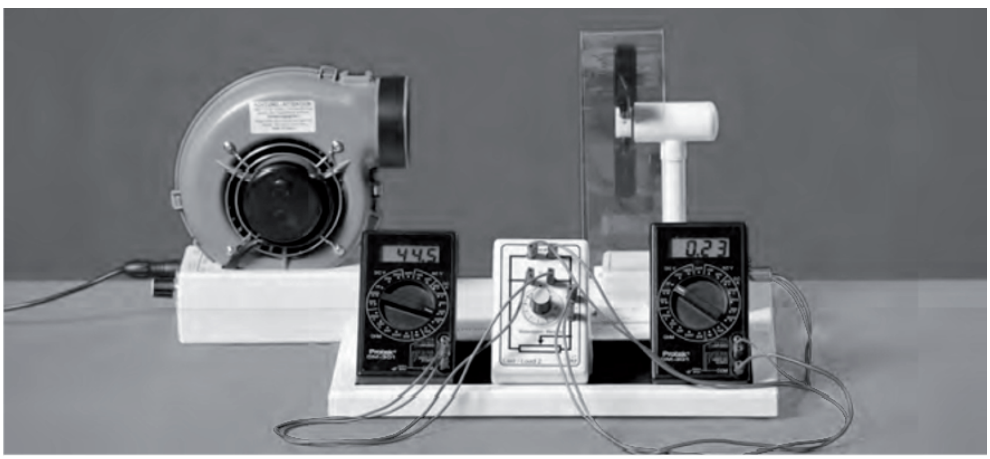
**Table 7:** *Learning outcomes and assessment standards for exit level outcome 34*

| **Connect wind turbine components using didactical training kits or small-scale industrial components (34)** | |
|---|---|
| **Learning outcomes** | **Assessment standard** |
| 1. Identify training kit components or small-scale industrial components.<br>2. Measure wind speed in the environment.<br>3. Measure wind speed using a wind machine.<br>4. Determine output power of a generator depending on blade shape, on the number of blades and blade position.<br>5. Record the V/I characteristic line of a generator at a constant number of revolutions.<br>6. Record the V/I characteristic line of the generator on the resistor with drive rotor at constant wind speed.<br>7. Determine the output power of a generator at different wind speeds.<br>8. Charge an accumulator using a wind generator.<br>9. Set an isolated network up.<br>10. Perform testing and fault finding on all of the above set-ups. If available perform testing and fault finding on installed small-scale installations and, hypothetical in context of large scale installations. | 1. Training kit components or small-scale industrial components are identified and the general experimental set-up is established.<br>2. Wind speed in the environment is measured and results documented in a table.<br>3. Wind speed is measured using a wind machine at various settings and the results documented in a table.<br>4. Output power of a generator is determined depending on blade shape (straight, curved), number of blades (2, 3 or 4) and blade position. The results documented in tables.<br>5. The V/I line of a generator at a constant number of revolutions is recorded and the results documented in a table.<br>6. The V/I line of the generator on the resistor with drive rotor at constant wind speed is recorded.<br>7. Output power of a generator at different wind speeds is determined.<br>8. An accumulator is charged using a wind generator.<br>9. An isolated network is set up.<br>10. Testing and fault finding on all of the above set-ups is performed. In addition also on installed small-scale installations and, hypothetical in context of large scale installations. |

| Learning outcomes | Assessment standard |
|---|---|
| 11. Reflect on the installation, commissioning and servicing of electrical equipment and cabling on turbines, transformers and substations, high voltage switchgear and erection of high and low tension power lines. | 11. Relevant aspects regarding installation, commissioning and servicing of electrical equipment and cabling on turbines, transformers and substations, high voltage switchgear and erection of high and low tension power lines are explained. (Range: Medium and high voltage switchgear, transformers, cables, bus bars etc.) |

The learning outcomes and assessment standards are intended to guide and assess students' practice (RET-AG 4, 2017, pp. 16-17). The practical orientation of the learning outcomes is evident in terms such as 'measure', 'record', 'charge', 'set-up', and 'perform testing and fault-finding'. These more practically oriented verbs indicate that the semantic gravity will be stronger (SG+). However, students carry out the tasks on an extremely simplified device (Figure 3), which is useful for reinforcing basic scientific and engineering knowledge but does not approximate to practice. The use of the simplified device results reduces semantic gravity (SG+↓), or contextual complexity, indicated by the down arrow in the annotation. Learning outcome 32.11 requires students to reflect on "the installation, commissioning and servicing of electrical equipment and cabling on turbines, transformers and substations, high voltage switchgear and erection of high and low tension power lines". This reflection will not be possible as all that students are expected to accomplish are tasks with a training kit.

**Figure 3:** *The IKS WindTrainer junior set with some assembled components. Source: Renewable Energies Technologies Textbook, Level 4, p. 137*



No outcomes relate to the specific functions that wind turbine technicians perform. Performing tasks on a simple kit is not adequate preparation for a wind turbine technician. While the simple kit involves practical work, the semantic gravity is not equivalent to that

of an actual or more closely simulated training turbine. Wind turbine technicians need to know how to use safety harnesses while using a variety of hand and power tools to do their work. They also use computers to diagnose electrical malfunctions. Most turbine monitoring equipment is located in the nacelle, which can be accessed both on site and off. The Assessment Guide recommends that "visits to local wind farms or single turbine installations are arranged to experience the setup and connections to the grid" (RET-AG 4, p. 17). While site visits are useful and will increase the semantic gravity, site visits are not enough – more hands-on experience is necessary.

The assessment criteria restate the topic area content, sometimes even repeating the same sentence phrasing. For example, the outcome: "Determine the output power of a generator at different wind speeds" is re-stated in the assessment criteria: "Output power of a generator at different wind speeds is determined". When assessment standards repeat the learning outcomes there is no indication of the performance level required, thus that students might not be developing necessary skills. Assessment in vocational education usually requires students to demonstrate or apply what they have learned in ways that are relevant to the occupation (Billett, 2018). The repetition of the outcome in the assessment criterion suggests a misunderstanding of assessment standards. Conflation results in 1) a lack of clarity with regard to the expected performance; 2) this can also lead to unfair assessment practice (due to the lack of clarity and reduced validity and reliability); 3) as a result, feedback is likely to inconsistent; and 4) for students conflation can lead to a lack of focus, and a shift from learning and skill development to merely achieving the desired outcome, leading to a 'teaching to the test' mentality. When outcomes and criteria are conflated, the design of assessment tools and rubrics are less effective. Clear assessment criteria are necessary for creating valid and reliable assessment instruments. In the case of the RET modules, clear assessment criteria would specify the level of performance required, that is the strength of the semantic gravity, as well as the level of scientific knowledge, or the strength of the semantic density. To avoid these consequences, it is essential to establish and communicate clear assessment criteria that align with appropriate outcomes.

## Reflections and conclusion

The study addressed the research question: 'What forms of knowledge underpin the RET curricula, and what is the relationship between these knowledge forms?' The study found that scientific and engineering knowledge, that have stronger semantic density (SD+) was generally well represented. Generic knowledge was over-represented. The study found that practical knowledge was under-represented, and the level of practical work required by learning outcomes was far off the occupational standard. Practical knowledge building through strengthening the semantic gravity (SG+↑) with appropriate practical tasks was largely missing, creating an imbalance in the curriculum. The relationships between the different knowledge forms was not made explicit. Across the RET guides and textbooks, learning outcomes and assessment standards were conflated. This conflation resulted in lack of clarity with regard to the level and standard of performance required. The level

of over-specification in the RET guides suggested a mechanistic approach as well as a misunderstanding of what a curriculum is and what appropriate assessment requires. Lists of outcomes and standards replaced the curriculum, leading to fragmentation, inflexibility, and over-simplification, exacerbated by excessive repetition. We drew on semantic gravity and semantic density to analyse the knowledge forms that underpin curricular outcomes and the relationship between knowledge types. This analysis is the basis of our claim that the RET subjects do not prepare students adequately for entry into occupations in renewable energy.

Changes are needed to include meaningful practical knowledge in the curriculum. A curriculum mapping exercise could highlight key concepts (some of which may benefit from repetition) and clarify knowledge and skills progression across the curriculum. The under-representation of practical outcomes should be addressed, in particular work-oriented tasks that would better prepare students for employment in the green economy.

Successful practical work requires flexible and up-to-date approaches, committed and skilled teachers, engaged students, and the involvement of industry partners in the organisation and facilitation of practical activities – as well as the commitment of educational leaders (Atkinson, 2016). The provision of RET in colleges is unlikely to be successful without multi-institutional involvement and commitment. The involvement of appropriate stakeholders would help educators to develop tasks more appropriate to the field of renewable energy technologies, thereby strengthening the semantic gravity across the curriculum and enhancing the potential for the RET subjects to be relevant and to prepare students for work placements and employment. Currently, addressing the inadequacies of the curriculum relies on dedicated lecturers committed to sustainable energies to go beyond the curriculum.

The knowledge contribution of this study is related to understanding the relationship between the theoretical and practical knowledge forms in a technical curriculum. For cumulative learning to take place, the curriculum should not only include conceptual, applied, practical and generic knowledge, but include iterations across the knowledge forms. In other words, more explicit links between the knowledge forms should be included in an appropriate practical task. A strong vocational curriculum might start with scientific knowledge, or weaker gravity and stronger density (SG-,SD+); the introduction of related engineering principles (SG+,SD+) would strengthen the semantic gravity (SG+,SD+), while introducing practical tasks at the appropriate level would further strengthen the semantic gravity, and weaken the semantic density (SG+↑,SD-) to enable a focus on the complexity of the task in context. However, writing a report and reflecting on the task, enables cumulative learning by connecting the different knowledge forms. Writing a report on practical activity (or engaging in another form of debriefing) could assist students to understand how engineering principles underpinned the procedures. Similarly, providing students with opportunities to reflect on an practical task, would help them to link the scientific principle with the performance of a device. While the outcomes might be listed separately in an official documents, considerably more guidance is required to enable

vocational educators to construct a curriculum that has appropriate levels and forms of semantic gravity and semantic density, and in which the different knowledge forms are related. Building RET knowledge and competence requires conceptualising, understanding the engineering problem, the logic of the procedures, and learning in the context of practice. It requires reflection on practice from the viewpoints provided by the different knowledge systems, including that of RET practice. Such curriculum change will pave the way towards a brighter future for South Africa including the students undertaking RET studies.

## Notes on Contributors and their Contributions

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| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | Winberg | 50% |
| | Hollis-Turner | 50% |
| Data collection | Winberg | 50% |
| | Hollis-Turner | 50% |
| Analysis and interpretation | Winberg | 50% |
| | Hollis-Turner | 50% |
| Drafting the paper | Winberg | 50% |
| | Hollis-Turner | 50% |
| Critical review of paper | Winberg | 50% |
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## Endnotes

1 Note that Maton (2014) reverses the standard positioning of the Y-axis to represent the 'downward pull' of gravity. The semantic plane is not intended to be a mathematical representation.

2 The subject outcomes are referred to by exit level and subject level, thus outcome 30.2 is learning outcome 2 of exit level outcome 30.

# Learning at Sea: Blended courseware creation for non-accredited vocational education and training for sea-farers at sea and ashore

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## Abstract

Approximately 80% of South Africans do not receive formal post-school education and training (Southafricami, 2020) which implies that the majority of adults may receive non-accredited Vocational Education and Training (VET) or teach themselves. This article provides a theoretical and practical lens for VET educators and researchers on *non-accredited VET courseware creation* at an intra-programmatic level and it joins a long conversation in the regional and international academy on VET. It draws upon the case study of a production programme which was rolled out in three phases over five years for approximately 400 seafarers. The production programme was a forerunner in the deep-sea trawl industry and facilitated the inclusion of sea-going factory workers in workplace training for the first time. The Theory of Practice Architectures was employed as a conceptual framework to analyse and synthesis the corpus of data arising from a case study with nine methods for data collection. The findings reflect four characteristics concerning the practices of courseware creation for non-accredited VET. Three recommendations are made in the conclusion of this article which concern theoretical, methodological and systemic areas of of non-accredited VET.

***Keywords:*** *non-accredited Vocational Education and Training (VET); Theory of Practice Architectures; courseware creation; sea-going workers*

## Introduction

This article aims to explain the practices involved in the creation of a non-accredited Vocational Education and Training (VET) programme in the South African fishing industry. The reference to non-accredited VET refers to workplace training which falls outside of the South African National Qualifications Framework. The insights presented arise from the five-year roll-out of a production programme which was designed to upskill 400 seafarers to process fish aboard the factory ships of a multinational deep-sea trawl company (Company A). The article draws upon a broader doctoral study (Ferguson, 2023).

This article joins the long conversation on VET in the region and beyond. This is a conversation intended to provoke engagement around VET policy, practice and research


DOI 10.4314/sajee.v39.07
ISSN 2411–5959

in order to meet the challenges of VET (for sustainability) in the Age of the Anthropocene. Examples of recent and significant contributions to this conversation can be found in the scholarly body of work emanating from the southern African academy on non-accredited VET which focuses on agriculture and fishing (Kachilonda, 2014; Lotz-Sisitka et al., 2017; Mphepo, 2020; Mukute, 2010; Mukwambo, 2021; Pesanayi, 2018). Another example is a large-scale international research project completed by a scholarly collective entitled VET Africa 4.0 (VET 4.0 Collective, 2023).

Implicit in this article is the premise that non-accredited VET is significant. Understanding how non-accredited VET works, including how courseware is created, is particularly important as over 80% of South Africans, whether employed or not, do not receive an accredited post-school education at a tertiary institution (Southafricami, 2020). They may only ever receive non-accredited VET in the workplace or they may simply be left to teach themselves. This was the case with the majority of the sea-going factory workers of Company A who received no workplace training until 1995; from then onwards sea-going staff were offered non-accredited VET through the company.

The foundation of the current post-school education and training institutions system was laid in the White Paper for Post-School Education and Training (Department of Higher Education and Training [DHET], 2014). Although these formal institutions have recently experienced an increase in enrolments, demand outstrips supply:

> The upsurge in the number of 'people not in employment, education or training' suggests the need to expand access to post-school education and training opportunities in the system beyond current provisioning levels in order to accommodate such growing number of people who are 'people not in employment, education or training'. This requires Post School Education and Training institutions to offer a diversity of programmes not only to take account of the needs of the youth who completed schooling, but also for those who did not complete their schooling. (Khuluvhe & Negogogo, 2021, p. 3)

While non-accredited VET falls outside of the accredited post-school education and training system, it may offer one way of provisioning demand-led VET to ease the gap identified by Khuluvhe and Negogogo cited above. This could be achieved by capacitating workers for specific jobs, required at a specific times in a specific company through non-accredited in-house training programmes such as the production programme in this study. As a large multinational organisation, Company A invested in both accredited VET for senior and technical staff and non-accredited VET for sea-going factory workers over the last 25 years. Without these non-accredited VET programmes, the majority of the sea-going workers would neither have received any form of post-school education, nor reaped the socio-economic benefit of continued employment which these non-accredited workplace VET programmes afforded them. Despite the fact that the production programme was non-accredited, it was nevertheless recognised in the deep-sea trawl industry because the improved skills and knowledge of the sea-farers had become known along the quayside.

The contribution which this article seeks to make is to deepen both the theoretical conception and the practical application of the practices required to create non-accredited VET courses which equip workers with an "education to live well in a world worth living in" (Kemmis & Edwards-Groves, 2018, p. 134). This work speaks to Goal Four of the Sustainable Development Goals 2030 which seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations [UN], 2019).

The scope of this article is firstly limited to the *intra*-programmatic level of *non-accredited* VET. It neither addresses matters of the industry-wide or national VET system, nor the broader scholarly debates on VET within the region or abroad. Secondly, although it is acknowledged that there are other practices involved in the development and deployment of non-accredited VET, this article is limited to the practices of creation of non-accredited courseware. This is because the data in the doctoral study, on which this article is based, indicated that the creation practices had a disproportionately large effect on the production programme as they informed the teaching and assessment practices and influenced the transfer and scaling of the programme as it matured. With this in mind, it seemed appropriate to privilege the creation practices of non-accredited VET in this article.

This article traces the creation practices of non-accredited VET through four sections. The first section lays out the context of the production programme, while the second section focusses on the conceptual framework, research design and methods employed to open up the creation of courseware practices of the production programme. The third section addresses the findings of the study and the article concludes with a number of recommendations.

## Context of the production programme case study

### Use of terms: Accredited and non-accredited VET

This article addresses the creation of coursework for a *non-accredited* VET programme. It is thus important to understand the use of the terms 'accredited' and 'non-accredited' VET in the context of the production programme case study. Accreditation is a significant area of study, however, the description provided here is limited to providing context for this study. The distinction between accredited and non-accredited in the South African VET landscape is important to this topic as the type of VET informs the range of creation practices required for the development of either an accredited or a non-accredited training programme.

It is noted that there are many different definitions of accredited, non-accredited, formal, informal and unformal education which appear to hinge around a number of criteria inter alia, un/structured nature of learning; un/recognised qualifications; whether the intention of the learning was deliberate or incidental; the use of artefacts e.g. curricula and assessments; and the agency of the learner and the teacher (Ramsarup, 2017, pp. 118-120). For the sake of clarity, this study uses the terms 'accredited' and 'non-accredited' VET.

In this case study *accredited* VET is considered to be those programmes which are conducted under the aegis of the South African National Qualifications Framework and delivered through the Post-School Education Training Institutions.

*Non-accredited* VET includes training programmes which are not accredited by the South African National Qualifications Framework and may be regarded as,

> … education [which] consists of courses which draw upon a particular body of knowledge and are delivered with clear objectives. The aim is most commonly to share knowledge and build skills and competence required by an organisation. The form of assessment may vary, or there may be no assessment at all, and learners are issued with a certificate of attendance. Non-accredited VET is often delivered by private providers at the behest of the company. (Ferguson, 2023)

The rationale behind Company A's substantial investment in 14 *non-accredited* VET programmes over an almost continuous period of 25 years is worth elucidating. The organisation's motive was three-fold, Firstly, the content of the production programme contained intellectual property around the firm's processes and premier products; by formally accrediting this course, this information would have fallen into the public domain. In addition, there were no suitable accredited VET courses available for sea-going production. Secondly, the need to improve production efficiencies through improved knowledge and skills was urgent and the formal accreditation route through the Sectoral Education and Training Authorities (accrediting bodies of the South African National Qualifications Framework) can be a time-consuming and inflexible process. Thirdly, Company A could claim a portion of the costs, albeit a smaller portion, of the *non-accredited* VET through the Skills Development Fund (generated through employee taxation and distributed to companies for providing VET to their employees as per a Workplace Skills Plan).

## The production programme case study

The deep-sea trawl sector is regulated by the South African Maritime Safety Authority (SAMSA, n.d.) and the Department of Forestry, Fisheries and the Environment. Entities compete for the 33 long-term fishing rights and may be granted rights with an annual Total Allowable Catch which is measured in landed seafood product. The South African Deep-Sea Trawling Industry Association (SADSTIA) reports that the industry earns approximately R 4.3 billion in annual sales, and employs 12 400 directly and indirectly (SADSTIA, 2022). There are 53 freezer and fresh fish trawlers operating out of Cape Town, Saldanah, Gqeberha (Port Elizabeth), Gansbaai and Mossel Bay. The industry has a strong sustainability directive and organisations hold memberships with the Responsible Fisheries Alliance and the Marine Stewardship Council.

Company A operates freezer vessels and fresh fish vessels. The former are bigger, produce market-ready frozen fish fillets and stay at sea for about 35 days, while the latter process fresh fish as the raw material for a shore-based seafood processing plant and these vessels average five- to seven-day trips. The objective of the production programme was to

improve production efficiencies aboard the fresh fish and freezer fish vessels. This was both good for business and good for the environment as more products could be made with less fish. Company A had embarked on 14 non-accredited VET programmes with the author over a period of 25 years from 1995. This meant that the non-accredited VET production programme benefitted from the programmes which preceded it and contributed to those which followed. There were three phases or generations of the production programme which ran over five years. Roughly speaking, the first generation covered production principles and key procedures; the courses followed a classic 'talk and chalk' pedagogical model ashore and very limited assessment was introduced. The second generation occurred at sea and ashore, covered every single procedure on every freezer vessel and introduced strong, workplace-based and continuous assessments. The third generation was in the pilot phase when this case study was finished and was pursuing a bold model of blended online learner-driven VET at sea using ubiquitous internet apps. Each generation was a pioneer in the industry at the time. Several hundred men were equipped to process fish at sea through the creation of course content, the teaching and assessment of the production programme. Processing seafood in the onboard factories is complex, precise and dangerous. This requires employees to develop specialist knowledge and practical skills which are demonstrated in the hard measurements of production efficiencies commonly applied to food processing factories.

The essential pedagogical problem to solve for the sea-farers working on the factory ships was how to produce effective learning for staff with an average level of English literacy and numeracy of Grade 7 (primary school), who had very little or no internet connectivity when at sea, and who were mostly unreachable as their workplace was at sea. The sailors came from many southern African countries and had diverse cultures and spoke many languages (multiple southern and central African languages, French, Portuguese and English). The sea-going workforce consists of only men aged 18-60 years-old, and the workplace is also the living and learning space which comes with significant social opportunities and challenges. For most of the learners, the production programme was their first training experience since leaving school many years before. There was a universal fear of 'book' learning and a lack of confidence amongst the learners. The creation of courseware practices were foundational in meeting these pedagogical challenges and surmounting the emotional and relational hurdles to learning mentioned.

## Framing of the study

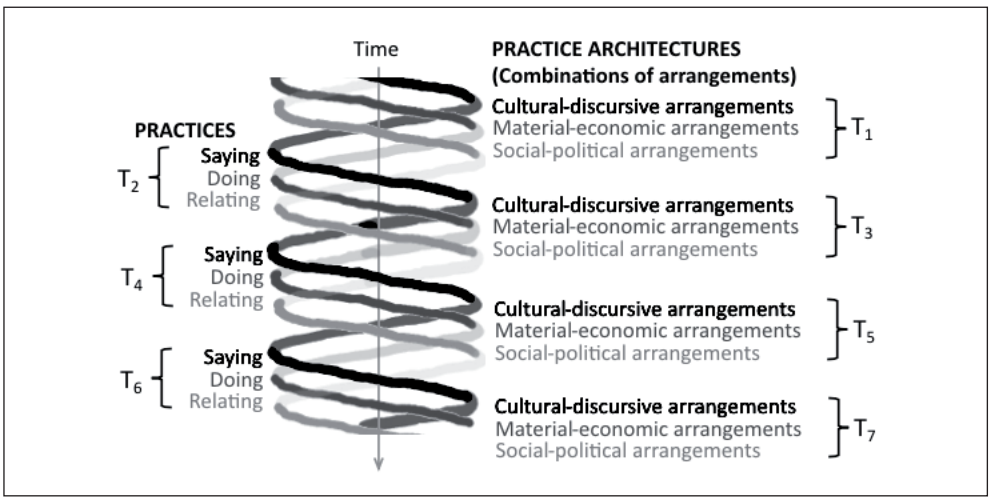
### Conceptual framework

The Theory of Practice Architectures (TPA) was used as the conceptual framework to analyse and synthesise the data. The choice of TPA for this study enabled the isolation and identification of the *creation of courseware practices* from the corpus of data which held many different kinds of practices, for example, practices of teaching and learning or assessment.

TPA is one of a group of socio-material practice theories and it provides a site ontological perspective on practices i.e. what *courseware practices* actually took place rather than what *courseware practices* one thinks or assumes took place. TPA afforded a granular 'zoom in' perspective of the sayings/thinkings, doings and relatings of the *creation of courseware practices* for sea-going staff, and whether these practices confounded or promoted the production programme. This theoretical approach also allowed for a 'zoom-out' abstraction of the data for the identification of an overarching dimension or the Practice Architecture of Range (see fourth section of this article) which held the *creation of courseware practices* identified in place. A metaphor for practices and Practice Architectures is a river and its banks – where the river (practices) shapes, and is shaped, by the river (Practice Architectures). TPA, embedded in a theory of education, is a complex and comprehensive theory. For the purposes of this article, only the building blocks of TPA most relevant to the *creation of courseware practices* and the Practice Architecture of Range are described. A detailed account of TPA as an educational theory may be found in Kemmis and Edwards-Groves (2018), Mahon et al. (2016) and Kemmis et al. (2014).

Figure 1 below illustrates the dynamic and multi-directional process of thinkings/sayings, doings and relatings practices bundling together into practice arrangements as the practices move through the cultural-discursive, material-economic and social-political inter-subjective spaces respectively. These arrangements combine to form Practice Architectures over time. In Figure 1 the illustration starts with practice arrangements (T1) and moves left to influence practices (T2) which in turn moves right to influence practice arrangements (T3) and moves left again to influence practices (T4) and so on over seven time periods in this illustration. Figure 1 shows a cycle of mutual shaping which occurs between practices and practice arrangements combining to form overarching Practice Architectures (Ferguson, 2023).

**Figure 1:** *Practice arrangements and architectures (S. Kemmis, personal communication, July 31, 2021)*



Recent theoretical developments of the TPA helped to make visible, the invisible pedagogical practices of the *creation of courseware* in the Production Programme. These enhancements included inter alia, embedding TPA in a theory of education (Edwards-Groves et al., 2018); the conception of leading as a transformational practice in education (Edwards-Groves & Grootenboer, 2021; Edwards-Groves et al., 2020; Gibbs, 2020; Wilkinson, 2021); the idea of travelling practices (Wilkinson et al., 2013); and the description of the 'leverage professional' (Jenkin, 2020). Practice theory in combination with social theories of time (Blue, 2019; Blue et al., 2020; Karger, 2021; Southerton, 2003) was also useful as the practices described took place over five years and built upon 20 years of *creation of courseware practices* which preceded them.

## Research design and methods

The research design was a nested case study. Nine methods for data collection were used, namely, a historical reflective narrative; two semi-structured focus group interviews; three semi-structured individual interviews; four WhatsApp videos and one mini-podcast; two mobisodes (3–4-minute teaching videos); 29 documents, ten questionnaires and 16 photographs.

Noteworthy in the collection of data for the practices of courseware creation was the flexibility required to accommodate the changing circumstances brought about by the Covid-19 pandemic and a switch of company executives at Company A. Covid-19 was particularly disruptive to the collection of data using in-person methods as the sea-farers were isolated on the vessels whilst in port, and the researcher was not permitted on site to prevent the spread of the disease ship-shore. A "methodology of chance" (Yahalom, 2020) was adopted which enabled an agile approach to convenience sampling. As the data collection deviated from what had been planned, determining how much data was enough become crucial. Malterud et al. (2016) offered the practical concept of "information power" as a way of assessing the quality and quantity of data collected based upon five criteria – aim, specificity, theory, dialogue and analysis. Information power also provided a reflective tool throughout the data analysis and synthesis stages.

The practices of the *creation of courseware* were identified from this corpus of data using the TPA-heuristic tools provided for the analysis and synthesis of data (Kemmis, 2022; Kemmis & Edwards-Groves, 2018; Kemmis et al., 2014). These tools were useful in ameliorating positionality and are worth further research and application for this reason (cf. section on Recommendations).

## Discussion on findings

The findings concerning the *creation of non-accredited VET courseware practices* were fourfold namely, 1) 12 distinct courseware practices were identified; 2) the process of the creation of courseware was both fun and iterative; 3) the creation process was disruptive; and 4) the bigger context of the practices of courseware creation was explored. These four characteristics are described below.

### The twelve practices of non-accredited VET courseware creation

The creation of courseware for Generations One and Two of the production programme started from scratch as there were no similar training programmes in the industry or the company to use as a departure point. The creation of courseware began with mapping out the variable production processes on the fresh fish and freezer vessels, then determining each procedure which made up this process, and finally creating qualitative and quantitative measurements for each procedure. The knowledge products created for Generations One and Two were a number of physical workbooks, a 500-page comprehensive manual and approximately 35 standard operating procedures with measurements. Supporting material for the *non-accredited* VET educator and assessors was also created. The creative output of courseware for Generation Three is discussed under the disruptive element of courseware creation (two sections ahead). The use of TPA as a conceptual framework allowed the researcher to isolate and identify particular courseware practices by asking: What were we thinking/saying (cultural-discursive), what were we doing (material-economic), and how were we relating (socio-political) as we created non-accredited courseware? The heuristics available to work with data using the TPA conceptual lens (Kemmis, 2021; Kemmis & Edwards-Groves, 2018) were useful. These helped firstly, to 'zoom in' and disaggregate the data into sayings, doings and relatings and secondly, to 'zoom out' to spot trends and dimensions i.e. the overarching practice architectures which are combinations of the arrangements which hang together and move through time making practices possible as illustrated in Figure 1 above.

Twelve practices of courseware creation were identified in the data. These practices are represented in Table 1: The range of courseware creation practices or tools and their use in each generation of the production programme. As described earlier, there were three phases or generations of the production programme; two thirds of the practices of courseware creation were used in all three generations (shaded blocks), while one third were used in some of the generations (unshaded blocks). The last mentioned relate to the creation of simulation exercises, and the creation of a blended (ashore and at sea) offering. The reason for this is that these creative practices were 'once-off' in the instance of the production programme.

**Table 1:** *The range of courseware creation practices or tools and their use in each generation of the production programme (Ferguson, 2023)*

| # | Course creation tools | Generation 1 | Generation 2 | Generation 3 |
|---|---|---|---|---|
| 1 | Research content | X | X | X |
| 2 | Map (production) process | X | X | X |
| 3 | Observe process | X | X | X |
| 4 | Interview subject matter experts | X | X | X |
| 5 | Experiment with different methods of presenting content e.g. simple simulation exercises | X | | X |
| 6 | Discussion amongst co-creators (Knowledge was held collectively as not one of us had all the information) | X | X | X |
| 7 | Curate content and draft the courseware material for the Learner's Guide, Facilitator's Guide, Portfolio of Evidence, assessments | X | X | X |
| 8 | Shooting of videos and/or photographs for content purposes | X | X | X |
| 9 | Creation of online content i.e. mobisodes | | | X |
| 10 | Create online platform – internet-based community TV | | | X |
| 11 | Creation of online and offline learning platform called the Future People Online-In-Person Learning Platform (FOIL) | | | X |
| 12 | Revise courseware and PowerPoint | X | X | X |

## The creation of courseware was collaborative, iterative and fun

Having fun and the institutional space to experiment with was key to the creation of courseware in this pioneering work. The courseware creation group consisted of a subject matter expert (production manager), the researcher-practitioner and a VET consultant. The quote below is taken from a focussed group interview with the courseware creation team which illustrates the dynamic process of creativity and relationality amongst the courseware developers as they iteratively developed the courseware for Generation One over *time*. The extract also shows the interrelated nature of the doings, sayings and relatings of the TPA framework.

> **Researcher-practitioner:** If we take a big, giant step back and say what we were thinking … [explain] your gin moments [a reference to the manager's moments of inspiration on Friday evenings after work] …
>
> **Manager:** I wasn't thinking much to be honest; I was doing … [laughing]
>
> **Facilitator:** And experimenting …

**Researcher-practitioner:** I think it is brilliant. It was experimenting. It was a very creative process.

**Manager:** It had to be because it was new and hadn't been done before. So it wasn't just taking something that was there and dusting it off and improving it with a little bit of creativity…we had to be creative all through …

**Facilitator:** And brainstorming … I think there was a lot of brainstorming.

**Manager:** There had to be a lot of brainstorming …

**Facilitator:** So your [Manager] experience of hands-on understanding of the business and our influence from training, practical things, and exercises. I think it was a good team to develop and brainstorm and figure out what would work or what didn't work.

**Manager:** It didn't have to be done alone.

**Researcher-practitioner:** Why do you think the brainstorming, the creativity worked well between the three of us? What made that happen well?

**Facilitator:** For me, we challenged each other. And then we would land on something. And then we would try something, and it didn't work …

**Manager:** One of the bigger things was there like-mindedness in the sense of we all wanted something better.

(Ferguson, 2023. Emphasis added by author)

Due to the urgency of the Company A executives' instruction to improve production knowledge and skills amongst the sea-going factory workers, the courses were 'built in flight' i.e., the delivery of the course began whilst the course was still being created. This meant that the courseware creators could be responsive to the reaction of the material by the learners and tailor-make meaningful courseware. For example, this dynamic allowed for the inclusion of additional training activities to help the learners get over the emotional and language obstacles to learning in the classroom. The courseware development led to the introduction of practicals, artefacts, and simulations, props and metaphors into the training material because,

> The challenges of trying to find simple and applicable ways to get complex messages across… it was just trying to find these because you couldn't use words because of the literacy issues … (Production manager in Ferguson, 2023)

The challenge of creating courseware sufficient to get complex principles and practices across to the learners is unlikely to have been successful without the collaborative, iterative and fun element of courseware creation. The conceptual lens of TPA was helpful as it speaks to changing practices, arrangements and architectures over *time*. The TPA lens opened up the data which indicated that the courseware creation practices mutually shaped each other over time i.e. material was created in T1, tested in the classroom in T3, reviewed and further developed in a virtuous cycle of courseware creation in T3 and so on (c.f. Figure 1)

## The creation of non-accredited VET courseware was disruptive

Creation of courseware practices for Generation Three of the production programme (and another *non-accredited* VET course being developed at the time in Company A) was entirely different and was done by the researcher-practitioner working alone. The courseware creation practices disrupted the 'chalk and talk' shore-based training model to meet changing operational requirements, and differently constituted doings, sayings and relatings in the *non-accredited* VET context. The courseware development involved both the creation of a technical solution and the generation of course content which was suited to the technical delivery. The objective of the *non-accredited* VET blended online model was described in a report to the executive:

> A disruptive methodology for [non-accredited] VET, dubbed the 'Earning & Learning' Model, is proposed to achieve the above deliverables. [Non-accredited] VET is moved out of the shore-based classroom and onto the vessel, and learning moves from facilitator-led to learner-led. Assessment is no longer achieved using simulated exercises but is done on the line by an assessor who is a subject matter expert e.g. Sea-going Production Manager. Material is presented in short, manageable chunks called mobisodes and continuous learning becomes part of the working day and training courses ashore are obsolete. The 'Earning & Learning' Model is an agile and responsive method of training which means that new content can be added easily to meet a business requirement e.g. introducing a new cutting pattern for fillets. Advances in both the VET field and technology enable the emergence of a 'disruptive' and innovative way of reaching sea-going staff which has not been possible before. (Ferguson, 2023)

To suit the learning context, this had to be achieved without a learner management system, and the online *non-accredited* VET model needed to cater for learners with English literacy, numeracy and digital literacy challenges; and low or no connectivity in the workplace on the ships. At the time the General Manager of Company A stated,

> To reach more people in less time and to add value efficiently all the time … time off is sacred … certification [industry marine and engineering tickets] has been done at an institution, therefore, do the developmental training at work to maximise time at work. The blended online model was the perfect vehicle for that.

Despite the challenges and the organisational resistance to change, the blended, learner-driven *non-accredited* VET model increased the inclusivity of the lowest paid workers in training; and it meant that they could direct their own learning in the workplace (ships) for the first time in the industry. The blended model of *non-accredited* VET was met with excitement by the learners and there was early adoption of the technology. The online blended model of *non-accredited* VET drew on the work of Metelerkamp and Ferguson (2021) concerning the functionalities and social networking capabilities which ubiquitous low data apps offered *non-accredited* VET in particular. The digitisation of the production programme was in the pilot phase at the time this case study came to an end. TPA as a conceptual tool

provides a *site ontological perspective* rather than an epistemic one. Practices are "*situated* in time and space" (Kemmis et al., 2014, p. 33). The TPA lens shows what *actually took place* rather than what could have, should have, ought to have taken place. It was thus possible to make the claim articulated in this point that the practices of non-accredited courseware creation were disruptive because the practices which substantiated this claim were in plain site as observed through the TPA lens.

### The creation of courseware practices in context: The bigger picture

The creation of courseware practices rolled up into the Practice Architecture of Range which also included the practices of teaching and learning (18 practices identified) and the practices of assessment (12 practices identified) (further details of these are shared in Ferguson, 2023). This makes a total of 42 practices. The practices of courseware creation, teaching and learning and assessment could each be regarded as a toolbox with a number of tools in each toolbox where,

> Not only can each tool from each toolbox be used in different combinations with each other but so can the toolboxes be used in different combinations with each other. For example, in Generation One and Two of the Production Programme, the tools and toolboxes were learner-centric, whereas, in Generation Three the tools and toolboxes were arranged to be technology-centric and focussed on the Future People Online-In-Person Learning Platform. (Ferguson, 2023)

This represents a limited form of "fluid ontology" (Srinivasani & Huang, 2005) because tools can be curated in endless permutations by many users to suit a particular context of an *non-accredited* VET intervention.

## Recommendations

There appears to be an opportunity to work into the space of *non-accredited* VET and three recommendations are made to this end.

### TPA as a theoretical tool

A theoretical recommendation for VET researchers is to use TPA as an,

> Analytic toolkit to investigate the social and material accomplishments and connections that form the basis for work and learning but have too often been treated as invisible or unimportant. (Hopwood, 2014, p. 349)

One of the challenges of the research which informs this article was the proximity of the researcher to the data over many years. Kemmis and others (Kemmis, 2022; Kemmis & Edwards-Groves, 2018; Kemmis et al., 2014) published a number of TPA-related heuristic tools. Some of these were the Tables of Invention which were helpful in untethering the researcher from the data. This was done by disaggregating data into the different practices

and the Practice Architectures which they formed, which could then be considered afresh as they played out over time. The courseware creation practices and the Practice Architecture of Range discussed in this article emerged from the corpus of data, firstly, through the development of analytic memos through an iterative process of reading through and listening to the nine data sources mentioned, and secondly, by populating a table of invention for the practice of courseware creation. The application of TPA and the heuristic tools of TPA in VET is a study in itself, and this methodological angle is beyond the scope of this article; nevertheless investigating TPA is encouraged.

### Practical training on the 12 practices

The equipping of VET educators on the practical knowledge and skills of courseware creation may be helpful. This could be done through a *non-accredited* programme, or ironically, through an *accredited* course which forms part of an *accredited* VET educators' programme which is currently offered by some higher education institutions in South Africa. This is likely to lead to a growth and diversity of creation of courseware practices amongst the VET community of practice which may 'speak to' the many and varied training needs in this country.

### Articulation between non-accredited and accredited VET

In the instance of the production programme, the certificates of completion were recognised in the deep-sea trawl industry simply because it was known along the quayside that the learners had production skills and knowledge above industry norms. This enabled sea-farers to follow a job development pathway within the industry, and in some cases, within the broader food processing sector. However, this kind of recognition and mobility is not always the case. This recommendation is supportive of research and practice which explores the ground between non-accredited and accredited training especially in terms of a) access of learners; b) recognition of additional skills; c) a flow of resources (money, human resources, knowledge capital, space and place etc.) amongst institutions and private providers to the benefit of learners.

## Conclusion

Circling back to the remark made by Khuluvhe and Negogogo that there is a "… need to expand access to post-school education and training opportunities in the system beyond current provisioning levels …" (2021, p. 3), one could consider actively including *non-accredited* forms of VET to contribute towards closing this gap. However, to do this effectively a deeper theoretical and practical understanding of *non-accredited* VET is required, as well as its place in the broader national post-school education and training landscape. This article provides a first building block towards this project by opening up both theoretical and practical knowledge and skills for the *creation of non-accredited courseware*. The reason that courseware creation practices were privileged in this article is that the content and

process of the creation of courseware is the genesis of the process of *non-accredited* VET, which significantly shapes the practices of teaching and assessment practices that follow. The *non-accredited* production programme described in this study enabled more than 400 seafarers to experience VET for the first time which enabled them to better 'live well' in a 'world worth living in'.

## Notes on Contributor

Ferguson, Robin

Dr Ferguson was awarded her PhD in the area of non-accredited Technical Vocational Education and Training (TVET) for sea-going employees. Robin is the managing director of Future People (Pty) Ltd and has a special interest in developing and delivering blended learning for those who are (further) disadvantaged in the Digital Age.

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# Towards an Understanding of Eco-Justice and its Related Principles and Interventions that can Advance Environmental Justice

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## Abstract

Deep ecology considers the ecosystem as a living whole with humanity only one part of this whole (O'Donnell, 2015). There is growing concern regarding environmental problems that are challenging human and environmental well-being. Current social, health and environmental damage warrants the consideration of eco-justice as a paradigm that can potentially advance environmental preservation. Drawing on in-depth interviews and focus group discussions, with Health Science academics and students at a University of Technology in KwaZulu-Natal, this study sought to inquire how they understand eco-justice, the principles underpinning eco-justice and what eco-justice projects could be initiated amongst tertiary students to preserve the environment. Eco-justice was found to relate to the need to care for and preserve ecosystems, by reducing over-consumption and the overuse of natural resources. Of significance was that participants supported the need for projects related to cleaning the oceans, planting trees and crops and recycling to advance the eco-justice mandate.

***Keywords:*** *eco-justice, academics, students, health, South Africa*

## Introduction

According to Brown (2017), the roots of the word 'eco' lie in the Latin word 'oikos' which refers to a home. A home comprises various relationships with people, creatures, ecosystems, economy, environment, food, water, air, and the rules facilitating the social, cultural, spiritual and emotional well-being of all in this home. It is in this context that Murphy (2014) and Costanza (2012) wrote that eco-justice seeks to preserve and enhance the ecological well-being and the integrity of the Earth. The latter refers to the properties of the Earth that sustain all forms of life, including human life (Costanza, 2012). These represent the natural systems (water, air, soil, forests, oceans, etc.) as well as intergenerational knowledge that includes growing and preparing food, medicinal practices, arts and ceremonies shared freely by all communities (Bowers, 2009). Bowers (2009), the pioneer of eco-justice, argued that society must work towards preserving the integrity of the environment, saying that unjust social suffering and environmental degradation must


DOI 10.4314/sajee.v39.08
ISSN 2411–5959

be eradicated. Social suffering and environmental degradation are inextricably linked as society depends on the environment for natural resources such as fresh water, food security and a comfortable climate (Lupinacci, 2017). Paige et al. (2018) added that it was important that future generations are not depleted by the current environmental destruction and that non-human forms of life are also acknowledged as having rights within the larger ecosystems, of which we are all a part. Within the literature therefore, a central theme of eco-justice is socio-economic and environmental conservation (Paige et al., 2018).

Since humans depend on the natural environment and the services provided by the ecosystem, the human dimensions of the environment must also be considered when discussing conservation and eco-justice (Brown, 2017). Ecosystem services can be used in either a consumptive and/or non-consumptive manner and can provide humans with subsistence and/or commercial benefits (Brown, 2017). The dynamic and complex components involved in conserving ecosystems are influenced by equally dynamic and complex human activities (Barnard, 2012). In this complex web of interrelationships, where all species are dependent upon each other, this organic pattern must be sustained (O'Donnell, 2015).

The United Nations has highlighted the importance of ecosystem services and the need to support provisioning, regulating, cultural and supporting services (Washington et al., 2018). This includes providing food and water and regulating the climate, as well as cultural aspects such as reducing stress and anxiety (Washington et al., 2018).

Although there is little focus on eco-justice in South Africa, it is included in the Constitution of the country (Hattingh, 2013; Preece, 2013). The Constitution states that everyone has a right to the following: an environment that is not harmful to his or her health or well-being, an environment protected for the benefit of present and future generations, through reasonable legislative measures that would prevent pollution, ecological degradation and would promote conservation and secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development (Hattingh, 2013).

The world is constantly confronted with complex challenges such as water shortages, climate change, global food security and social inequality. As part of the response to these challenges, Dostilio and Welch (2018) posited that higher education plays a critical role in addressing these challenges and university-community engagement should be encouraged.

The White Paper on the Transformation of Higher Education (Department of Education, 1997) committed universities to policies and programmes for community development, as part of the universities' mandate. Beere et al. (2011) posited that engaging with communities has the following positive benefits for higher education institutions: it helps university faculties to remain relevant and to keep content up to date; it keeps faculties aware of the relationship between what they are teaching and the real world; it provides powerful examples to discuss in the classroom; it provides novel research ideas as well as contributes participants and research sites; and it provides consulting opportunities. The community also benefits from projects and programmes initiated by community engagement (Beere et

al., 2011). In particular, eco-justice projects have tremendous potential for communities and students to learn more about eco-justice principles and become better empowered to take on eco-justice issues. Universities should institutionalise the notion of community engagement, which should become sustainable, and intensified. Community engagement can be useful for environmental education because it makes communities feel responsible and empowered to take action, towards their vision for a better community, by raising their awareness of critical environmental issues (Assadourian, 2017). Butin (2012) supported this notion, adding that such changes that have taken place in higher education worldwide over the past few years can be referred to as a revolution and should be intensified. The emergence of a knowledgeable society as outlined by Jowi (2012) is a major development for all societies and universities.

## Bowers theory on eco-justice as a theoretical framework

Bowers (2006) noted that the globalisation of the western techno-scientific-industrial culture is accelerating the rate of change in three areas that affect the quality of life on this planet: (1) the loss of linguistic /cultural diversity that plays a role in maintaining biodiversity; (2) the loss of intergenerational knowledge that represents cultural alternatives, with a move towards a consumer dependent lifestyle; and (3) the degradation of potable water, topsoil, fisheries, climate change, and spread of toxic waste. He cautioned that these changes are progressing on a scale that makes it impossible for billions of people around the world to escape the rampage of disease and poverty.

For this reason, Bowers (2006) proposed a shift from the term 'environmental education', to 'commons education' or 'educating for commons' which equates to eco-justice. The commons, he said, represent the natural systems (water, air, soil, forests, oceans, etc.) and the cultural pattern and traditions (intergenerational knowledge ranging from the growing and preparation of food, indigenous medicinal practices, art, craft, ceremonies etc). Bowers (2006) cautioned that disregard of the commons will negatively impact on the present generation and generations to come. He argued for the revitalisation of the commons which would involve taking democratic responsibility for the quality of air, water, soil, plants, animals and all other aspects of the spaces that we share and depend upon.

With Bowers as a backdrop, Cock (2021) cautioned that we need to bring together environmental justice in order to build an eco-socialist future for South Africa. This needs strong leadership and solidarity where there is appreciation for cooking one's own meals from a well sustained garden and a reduction in the need for material goods that only satisfy one's own ego and produce little for our society as a whole (Cock, 2021). Given the paucity of literature on eco-justice in South Africa, this study sought to explore how academics and students at a University of Technology understand eco-justice, its related principles and what eco-justice initiatives could steer eco-justice. This could create a pathway towards preventing the ecological collapse in South Africa and ensuring food security while maintaining justice for the environment. Based on the principles of Bowers

theory (2006, 2009), this study can guide academic, students and communities towards promoting environmental justice.

## Literature review

White (2013) defined eco-justice as the principle of being fair or equitable with regard to ecological sustainability and the protection of the natural environment, as well as showing respect for social issues. Scholars have argued that humans depend on the natural environment and the services provided by the ecosystem for survival (Brown, 2017, O'Donnell, 2015). Hence consideration must also be given to humankind which forms part of the environment, within a broader consideration of eco-justice (Vaughan-Lee & Hart, 2017).

The 2001 United Nations Annual report on environmental change argued that over a short course of history, humans have altered the balance of nature, changed the world's climate, and threatened the sustainability of Earth itself (Hawkins, 2010). The report concluded that the greatest challenge of the 21st century is to address the resultant ecological calamity caused by humans before the very environment that sustains humankind is destroyed (Hawkins, 2010). Studies have found that the changing climate has had significant effects on human health (McIver et al., 2016). Climate sensitive health risks which were uncovered included trauma from extreme weather events, heat-related illnesses, the compromised safety and security of water and food, vector-borne diseases, zoonoses, respiratory illnesses, psychosocial ill-health, non-communicable diseases, population pressures, and health system deficiencies (Mclver et al., 2016). It is against this backdrop that the World Health Organisation (WHO) conducted an international climate change risk assessment (CCRA), to estimate future climate change attributable health effects and future annual mortality rates (WHO, 2014). The following health models were used: coastal flooding mortality, diarrhoeal diseases, malaria, dengue fever and undernutrition. The impact on health was projected for the years from the 2030s to 2050s, under various climate change scenarios and compared to the time periods 1961 to 1990 (WHO, 2014). This inquiry found that climate change is projected to have substantial adverse effects on human health, with an estimated 250 000 more deaths annually, due to climate change between 2030 to 2050. The most substantial impact was projected to be caused by undernutrition and infectious diseases due to climate change and food shortages (Campbell-Lendrum et al., 2015).

The World Health Organisation has projected that climate change will negatively affect future generations (WHO, 2014). Additional deaths are projected for the year 2030 resulting in 38 000 due to heat exposure in the elderly, 48 000 due to diarrhoea, 60 000 due to malaria and 95 000 due to undernutrition in children (WHO, 2014). By 2050, deaths related to heat exposure (over 100 000 per year) have been projected to increase (WHO, 2014). The results are envisaged to be greater in lower socio-economic countries with sub-Saharan Africa projected to have the greatest burden of mortality impact, attributed to climate change by 2030 (WHO, 2014). Such environmental damage benefits the global north and elite groups within South Africa who mass produce at the expense of the environment

and poorer communities (WHO, 2014). These results have implications for the linkages between climate, health, sustainable development objectives and justice (WHO, 2014).

Schewe et al. (2014) found that daily living is influenced by certain prerequisites, such as adequate water and food for human health and survival. This requires that a sufficient amount of water must be drawn from rivers, lakes, and groundwater aquifers daily (Schewe et al., 2014). Waldron (2016) noted that freshwater is a vital natural resource that humans need for health, drinking, sanitation and agriculture. Schewe et al. (2014) cautioned that modest global warming has the potential to lead to a severe reduction in water by about 8% to 17% of the global population. They added that this, combined with population growth, would expose a significant amount of the world population to chronic or absolute water scarcity (Schewe et al., 2014).

Marais (2017) has argued that South Africa is experiencing the worst water crisis in decades. This is evidence of the planet's water scarcity and its effect on human health and well-being (Marais, 2017). The notion of "water of life" as regarded by many churches and other religious communities shows concern by faith-based communities on the effects of the scarcity of water on human health and well-being (Marais, 2017, p. 77). In recent years, the effect of the national water crisis was critical in Cape Town, with water restrictions reaching level four, in an attempt to prevent the taps from running dry. Consequently, the water crisis was declared a national disaster (Marais, 2017). This, together with poverty, escalating mobility and high mortality in South Africa requires academic institutions, communities and religious institutions to work towards saving the environments that sustain life and addressing environment challenges (Marais, 2017).

Additional water is needed for agricultural irrigation and industrial use for hydropower and the cooling of thermoelectric power plants (Schewe et al., 2014). These activities are dependent on a sufficient amount of freshwater from rivers, lakes, and groundwater aquifers. Schewe et al. (2014) further stated that freshwater is a vital natural resource and human beings require clean water for daily living and this basic need is being threatened. They cautioned that the expected global population growth over the next decades and the growing economy will increase water demand and therefore aggravate water shortages.

Dostilio and Welch (2018, p.177) posited that higher education plays a critical role in addressing complex challenges like water shortages (as discussed above), climate change, global food security and social inequality. University-community engagement involving a diversity of thought, experience and knowledge is needed. Community engagement efforts have been part of higher education since 1914 and community engagement initiatives have slowly begun increasing since the 1980s. Institutionalising community engagement and providing high quality support to faculty and students to engage with community partners remains a challenge, however, that must be urgently addressed (Dostilio & Welch, 2018).

According to Brown (2017), the increased burdens associated with climate change add to the complexity of eco-justice. Similarly Portier et al. (2010) noted that future generations could not live quality lives without understanding their place as part of the natural world, and without caring for the earth, which sustains and governs existence.

Progress and existence which considers the health and well-being of earth, humans, and future generations is key (Brown, 2017).

## Methodology

### Study design

A qualitative research approach with an exploratory research design was used to guide this study. According to Polit and Beck (2012), qualitative research places the researcher in a real world context by focussing on the whole human experience, and the meanings ascribed by individuals to such experiences. The study was undertaken at a University of Technology in the province of KwaZulu-Natal in South Africa. Samples were taken from academics and students in the Faculty of Health Sciences. Data was collected from the academics using semi-structured interviews. Due to the large number of students, two focus group discussions were used to collect data from students. This allowed for the input of a large number of students collectively.

### Sample

Participants were recruited using non-probability purposive sampling, which involves the selection of individuals or groups of individuals that have experience and knowledge regarding a particular area of interest (Polit & Beck, 2012). The two samples were purposefully chosen from the Departments of Nursing, Environmental Health and Homeopathy because of their extensive engagement in community sites related to eco-justice. A total of 14 academics (professors and lecturers) and 24 students ultimately participated in the study. All participants had a good understanding of English and could be a considered a cross-section representing the demographics within South Africa. The academics were of a mature age while students were in their twenties. Data collection stopped after no new information was noted, indicating that data saturation was reached. Academics were identified as 'A', followed by the corresponding interview number e.g. (A1). Students were identified as 'S' followed by the number of the participant and the focus group discussion number e.g. S3 FGD1. Given that there were two focus groups, they were identified as FGD1 or FGD2.

### Ethical considerations

KwaZulu-Natal Province in South Africa has seen major declines in manufacturing and agro-industrial employment. Transportation has become relatively more important as a result with the province home to the country's two largest ports. As befits a maritime province, marine resources sustain much economic activity, both through the ports and tourism. However, this is undermined by a history of problematic settlement patterns, poor land management and ineffective regulation that has generated large areas of environmental distress, undermining the potential economic benefits of the maritime economy.

## Data collection

Data was collected between October 2018 and March 2019. Fourteen academics were interviewed and a total of 10 and 14 undergraduate students were included in two group discussions. Questions focussed on how participants conceptualised eco-justice, their understanding of the principles underpinning eco-justice and what eco-justice interventions could be implemented in communities within KwaZulu-Natal. The scope of the interviews included how eco-justice could be initiated and sustained with local communities of KwaZulu-Natal.

## Data analysis

The six phases of thematic data analysis, as described by Braun and Clarke (in Javadi & Zarea, 2016), were used to guide the analysis, as outlined below.

### *Phase 1: Familiarisation with the data*

Data obtained was digitally recorded and transcribed verbatim. All the interviews and group discussions were transcribed.

### *Phase 2: Coding*

Succinct codes/labels were developed to identify important features of the data relevant to answering the research questions. Thereafter all data was collated and relevant data extracted. The data was then organised into significant groups and given labels.

### *Phase 3: Searching for themes*

During this phase the researcher examined the groupings and collated the data to identify significant broader patterns of meaning (potential themes). Data relevant to each theme was collated, so that the researcher could review the viability of each theme (Javadi & Zarea, 2016). The researcher in this study identified themes related to community engagement and eco-justice from the codes/labels. Similar labels were brought together in a set. Similar emerging themes were grouped and categorised according to the content they represented. A title was given to each set and a concise explanation for the name of the set was noted by the researcher.

### *Phase 4: Reviewing themes*

This phase involved checking the themes against the data to determine whether the data reflected a correct narrative of the data, and whether the themes answered the research questions (Javadi & Zarea, 2016). In this study, the researcher went back to the extracted codes/labels of each theme and noted whether these codes/labels formed a consistent pattern. The validity of themes, in relation to the entire data set was checked.

### *Phase 5: Defining and naming themes*

This phase involved developing a detailed analysis for each theme by determining the focus of each theme and finalising each theme (Javadi & Zarea, 2016). The researcher in this study summarised the scope and contents of each theme. The researcher then gave each theme a clear and accurate name which would enable the reader to identify the theme at a glance.

### *Phase 6: Writing up*

In this final phase, the researcher weaves together the data extracts, and finally contextualises the analysis in relation to the existing literature (Javadi & Zarea, 2016). In addition, data from the state-of-the-art literature review on eco-justice was used. This included best practices on eco-justice obtained from international and national literature, principles of eco-justice as well as community engagement strategies.

## Discussion of findings

In analysing the data, it was found that both academics and students had similar concepts of eco-justice. Three themes and nine sub-themes emerged from the data.

### Theme 1: Conceptualising eco-justice

Most participants (academics and students) said that eco-justice was a new concept to them. They were only able to conceptualise eco-justice by separating the words 'eco' and 'justice'. Participants conceptualised eco-justice as:

### *Sub-theme 1: Caring for the environment*

Most participants agreed that eco-justice had to do with caring for the environment, being "ecofriendly" and being responsible for preserving the planet. They said:

> "I think when you speak about eco, it comes to mind as eco-friendly, where we are called to take care of the environment; flora fauna, the atmosphere, pollution; those kinds of things." (A11)

> "Saving the planet, it is about saving the environment. Each person should be responsible for the environment". (A1)

> "We are talking about caring and preserving the environment." (S9 FGD1)

Gray and Coates (2015) concurred with these views saying that in order to preserve the natural environment, humankind needs to care for the environment and understand that eco-justice and transformative change is crucial in addressing the impacts of the global environment crisis. Environmental activists have cautioned governments against the over-emphasis of economic development, at the cost of broader issues such as global poverty, social justice and the depletion of the natural environment (Boetto, 2017).

### *Sub-theme 2: Being fair and maintaining the rights of the environment*

Participants expressed that eco-justice was about protecting the rights of all in the ecosystem, including animals, marine life and nature, all of which are voiceless to protect themselves. They argued that all living and non-living entities had rights and that humankind should be considerate to all, to ensure peaceful co-existence. They said:

> "I think eco-justice encompasses the rights of the environment. Who speaks for the environment … I mean nature, the oceans and marine life, birds, animals because we are starting to see that it is us as in humans against the world." (A3)

> "Equality of all resources to every living being on earth. Treating all living things fairly." (S20 FGD2)

> "I think it's about being gentle to the environment/nature, and also being considerate so that we can live together without harming … we need these things in terms of our daily lives." (A6)

One student expressed that eco-justice was crucial to conserving natural resources:

> "Eco-justice is being fair, to protect the natural environment. Conservation of natural resources, for our future." (S12 FGD2)

Scholars such as Heydon (2018) and Adekunle (2017) have also argued that eco-justice is underpinned by a quest for fair and just treatment at two interrelated levels: fair treatment of people and fair treatment of the environment. Adekunle (2017) added that for humankind to enjoy the basic necessities of life, an enabling environment is required and hence what is fair for the environment is that people protect the environment and keep it safe, so it can be sustained for the next generation.

### *Sub-theme 3: Maintaining harmony with the environment*

Participants described this sub-theme as follows:

> "Eco-justice for me is balance in nature. I will be doing justice to nature for our world and also because I think if we destroy the environment, if we do injustice to the environment, if we don't take care of the environment, the consequences in the future will be very bad." (A2)

> "Eco-justice for us we believe there must be balance in symbiotic relationships where you know you're not growing or developing at the expense of another. I think it's basically a humanitarian principle, but love must be reciprocated; you can't be pouring into others and there's no reciprocation." (A5)

### *Sub-theme 4: Eco-spirituality*

Academics described eco-justice as embodying spirituality; they felt that all of creation is a gift from God that should be respected and preserved for future generations.

> "Caring for the environment is ultimately a spiritual act. We believe it enriches us, it raises our awareness. It's God's work." (A9)

> "You will get to know more about the Brahma Kumaries World Spiritual University. Their vision of a society that is equal, peaceful and sees nature as Godly. A society free from any abuse, or indifferences towards any and all of God's creation." (A 6)

The interconnection between eco-justice and spirituality is further reflected in an environmental publication by Pope Francis, 'On Care for Our Common Home', which brought to light the pervasive and escalating destruction of the environment, and the blatant disrespect humanity has displayed towards the natural earth and its life forms. The Pope reflected on current environmental issues such as pollution, climate change, water shortages, biodiversity loss, and global inequality, to explain the causes of the overall decline in the quality of human life (O'Donnell, 2015).

## Theme 2: Principles underpinning eco-justice

### *Sub-theme 1: Showing respect for natural environment*

Participants emphasised respect for the natural environment, which includes plants, water, animals and marine life, all of which collectively constitutes the cultural commons as follows:

> "We must show respect. This involves respecting the natural environment; plants, water, animals and marine life, which make up the cultural commons that will serve as sustenance." (A6)

> "Respect for the environment … prevention of pollution and protection of the ozone layer because we need it." (A11)

The need for respect was also supported by Adekunle (2017) who said this was necessary for sustainable development and the survival of all Earth's species. He added that humankind should therefore realise that the Earth's natural resources are not limitless resources and that human health and well-being would ultimately suffer if the Earth could not supply the sustenance needed for survival (Adekunle, 2017).

### *Sub-theme 2: Fairness towards the ecosystems*

Participants stated that fairness emerged as another important principle of eco-justice that would ensure that natural resources were available for future generations.

> "It is about being fair to the environment in terms of resources we use; and being fair and modest in terms of what we use and how we use it, and also not to ruin the environment, in a greater scheme of things with regards to global warming and other environmental crisis that is going on globally." (A2)

> "Treating the environment fairly and ensuring that resources are not widely used and not wasted, depending on the environment; plants, land, animals, sea creatures." (S13 FGD2)

Failure to protect the environment can deplete resources for generations of humans and non-humans to come (Washington et al., 2018). Adekunle (2017) further argued that when land, water and air are indiscriminately treated, not only wildlife suffers, but also human life. He said that deforestation of vast areas of land, droughts, pollution and industrialisation in the name of human progress has led to incalculable damage and depletion of natural resources that could sustain human health and well-being.

Furthermore, there is a dearth of adequate attention to eco-justice by South African universities and communities (Hill, 2016; Jacob et al., 2015; Paige et al., 2018). Academics and students who participated in this study stated that there is a limited understanding of eco-justice and its relevance to communities and health, as well as of sustainability. Lack of attention to eco issues has led to the benefit of the elite industrailists at the expense of society as a whole (Jacob et al., 2015).

### *Sub-theme 3: Upholding an ethic of care for the environment*

An ethic of care emerged as the third principle as follows:

> "People don't have the will to look after the environment ... it's not up to me. It's someone else's job and that's the attitude that actually needs to change.".(A1)

A personal ethics of care is crucial to ensuring a change in the notion that the environment is not only a collective responsibility, but is also a personal one. In this vein, Kulnieks et al. (2013) argued that environmental education should inspire communities, academics and students to develop an ethics of care and stewardship for their environment, so that there could be a deeper consideration of the environment in which they live.

### *Sub-theme 4: Preserving the ecosystem*

Participants said:

> "In the long run we might need the same plant and the same environment only to find out it is no longer there." (A6)

> "Eco-justice means the act of using the things in the ecosystem in a sustainable manner so that they can be used in future." (S24 FGD2)

> "Community people are not even concerned at all or don't even have a knowledge of the importance of preserving the environment, because it is a perishable resource. If it is not replenished through simple things that manage the environment better; recycling of basic commodities, not littering or understanding if you do plant, what kind of crops to plant, management of animals, without necessarily killing them." (A5)

Participants expressed that human beings have been contributing to pollution, damage to the ozone layer, extinction of animal and plant life and toxicity of oceans, atmosphere and soil erosion. They believed that it was important to preserve the environment by desisting from pollution. Taylor et al. (2019) argued for a drastic reduction in carbon emissions which

have the potential to cause asphyxia, in order to create a 50% reduction by 2030 and avoid devastating droughts, floods, extreme heatwaves and poverty. Adekunle (2017) added that African communities need to be aware of the impact on the environment of, for example, intensive use of water resources for industrialisation and intensive use of energy which is needed to power heavy farm machines or produce nitrogen based synthetic fertilisers, manufacture pesticides and transport food over long distances in order to preserve the environment.

## Theme 3: Eco-justice projects

Responses for projects were predominantly received from academics. Participants identified the following eco-justice projects:

*Recycling*

"Our students have a justice group among themselves, so they go out to do you know awareness programmes … in that sense they are engaging with the community as a university. We have a programme of recycling that we do and collect recyclable materials for our people … I think we can also take that to the community so in that sense we have the knowledge that by caring for the environment we are protecting, we are promoting eco-justice and share it with the community and the community can learn a little sensitivity and they can take care of the environment." (A11)

"I feel that we should work together with the communities and their schools, because their schools do projects, a lot of crafts, they do a lot of arts so maybe they can help. They can help us to recycle things and make crafts out of recycled material." (A6)

*Water purification in the rural communities (KwaZulu-Natal)*

"There is a need out there; we forget that people need to know and need information. A mother was getting her water from the river and making her feed and things, so I taught her how to purify the water." (A12)

*Planting crops to alleviate poverty and sustain health*

"I worked in a situation with homeless people, we were involved in making sure that those in the programme are taught skills and part of the skill was a garden to produce vegetables. We had other students from other universities to come and do community work, to actually work in the garden." (A11)

"I think when the community and the university work together it's not by only providing health education to the community but also to assist the community and show them how to, for example, how to plant. There is a high percentage of poverty in the community." (A3)

"They don't do anything to the land. So we started developing a food circle security … food farming where these people can grow their own in their backyard and it has been very successful with these people, a lot of the seeds are organic seeds which has gone into the market and they are doing a lot of farming in that part of the world." (A2)

> "I think we should encourage our communities regarding one home one vegetable garden, so we should also encourage and join communities to have projects like one home one garden." (S8 FGD1)

*Planting trees*

"One thing we can be doing is planting lot of trees to maintain the ecosystem." (A9)

*Cleaning the ocean*

> "You know in the past few weeks there have been studies of all kinds of sea fish and they're all full of plastic. There's 300 million tons of plastic going into the ocean. We're hanging on huge volumes of debt to future generations and we are hanging on to huge ecological problems to them and the population is likely to be higher. So, if you're a mathematician you would see a picture of doom unless there are big changes in communities, starting to clean beaches." (A8)

Support for these projects is also evident within the literature. Licen et al. (2017) argued for the planting of trees saying that this could lead to the development of productive community gardens, that would consequently enhance community empowerment and socio-economic development. They also suggested the use of a community theatre performance with local community members, saying that these actors could create awareness of the significance of environmental behaviours, namely promoting domestic seeds and organic farming whilst entertaining people (Licen et al., 2017).

## Conclusion

Findings of the study revealed that although participants had no formal knowledge of eco-justice as a concept, many had been including it in their practice. Both academics and students viewed eco-justice as a new concept; however, they were practising aspects of eco-justice as it was part of their faith-based and spiritual beliefs. This was in relation to respecting all of God's creation. Participants, mainly academics, in the present study, stated that there needed to be more workshops and seminars that expanded this knowledge and ultimately would promote eco-justice. This would create a deeper awareness of what projects could be promoted in South African communities and would give direction on how to drive such projects.

Several important principles that could support the eco-justice mandate emerged within the study, such as caring for the environment, upholding an ethics of care and striving towards preserving the environment. Moreover, the planting of trees and crops, recycling and cleaning the ocean were seen as important eco-justice projects that could enable preservation of the environment. These strategies reflect ways that communities can take control of their environment and reduce pollution and global warming which consequently will reduce the overuse of cultural commons and benefit human health and protect resources such as water, food, and quality of air and weather for future generations.

The current study has profound implications for Health Science academics, students and community as it recognises the ongoing damage to the ecosystems and how environmental damage affects health adversely. These findings confirm the need for more community awareness and community participation. It is recommended that higher education embraces community engagement as a tool to create community awareness on eco-justice issues. For this to be successful, it is recommended that community engagement be incorporated into Health Science modules in order to transform the Health Science curriculum. The findings of the study can serve as a guide for academics and students as they work in collaboration with their communities on eco-justice issues to reduce the resultant negative impact on health. There could also be transdisciplinary work between departments within Health Sciences. Universities have a role in developing undergraduate capabilities and should provide opportunities for undergraduate participation in community service-learning and volunteerism. In this way, universities will be contributing to community empowerment and be socially relevant as required by the White Paper on Transformation (Department of Education, 1997).

According to all participants, university students should act as eco-warriors to steer eco-justice. Students will receive transformative experiences through the application of discipline-specific knowledge, skills and community collaboration. Additionally, academics can gain enriched teaching and scholarship opportunities.

## Notes on Contributors and their Contributions

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## Percentage contribution

| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | Chandramohan | 50% |
| | Bhagwan | 50% |
| Data collection | Chandramohan | 50% |
| | Bhagwan | 50% |
| Analysis and interpretation | Chandramohan | 50% |
| | Bhagwan | 50% |
| Drafting the paper | Chandramohan | 50% |
| | Bhagwan | 50% |
| Critical review of paper | Chandramohan | 50% |
| | Bhagwan | 50% |

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# An Enlightened Common Sense Approach to Environmental Education, with Special Reference to Climate Change

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## Abstract

This article argues that, in order for humanity to act timeously to ameliorate threats such as climate change, we would do well to heed the central tenets of Roy Bhaskar's transcendental realism, which he also calls enlightened common sense. This is because transcendental realism is critical of the unnecessarily burdensome assumption allied with systems/complexity theory that statistical analyses and complex computer models are necessary and sufficient to deal with complex systems such as climate. To the contrary, from the perspective of transcendental realism, it is knowing 'how things work' – being enlightened – that is necessary, and often sufficient, to deal with complex systems. For example, in terms of climate change, knowing how the Greenhouse Effect works – that is, knowing how extra carbon dioxide in the atmosphere heats the Earth – makes it as simple to decide to act to reduce carbon dioxide as knowing how gravity works makes it simple to decide not to step off a high-rise building. This does not detract from the further need to (preferably democratically) consider different action options, for which computer models can be a helpful tool. Transcendental realism also has implications for how environmental educators define climate and climate change and it provides an antidote to certain challenges posed by climate change deniers. Much of the critique applied in this article to systems/complexity theory can also be applied to posthumanism.

***Keywords:*** *climate change education, Roy Bhaskar, climate scepticism, complex systems, posthumanism*

## Introduction

The Greenhouse Effect was first identified over a hundred years ago by Eunice Foote (1856). Since then, the problem has been extensively discussed, such as in Wallace Broecker's (1975) article *Climatic change: Are we on the brink of a pronounced global warming?* and Al Gore's (2006) book *An Inconvenient Truth*. The first Intergovernmental Panel on Climate Change (IPCC) report was published by Houghton, Jenkins and Ephraums in 1990 (Pain, 2009). Nevertheless, despite these warnings, we have been slow to act to protect ourselves from the Greenhouse Effect's heating of the Earth. It is often assumed that a large part of the reason for our lack of action is the powerful lobbying of individuals and


DOI 10.4314/sajee.v39.05
ISSN 2411–5959

organisations with interests in the fossil fuel industries (Grasso, 2019). Yet the question remains as to why these lobbyists were able to achieve their goal, which stands contrary to common sense? Kovaka (2021, p. 2356) perhaps begins to answer this question by drawing attention to "an important group of climate change deniers: those who say they are on the side of science while also rejecting what they know most climate scientists accept". These climate change deniers argue from the perspective of Karl Popper [1902-1994] that climate science cannot be considered to be a proper science because it misses out the initial scientific phase of inductive analysis of data and the final stage of carrying out falsifying experiments (Bratby, 2010). They also accuse Climate Change activists and organisations, such as the Intergovernmental Panel on Climate Change, of using models that have not been able to predict global warming (Bratby in Homewood, 2015; Koonin, 2014; Moore, 2021; Readfearn, 2022).

In this article, I argue that at least part of what gives these anti-climate change actors their competitive edge – allows them in theory to stay on the side of science – is that they take advantage of a philosophical error present in the positivist way that most scientists theorise science. I also explain that the way to remove the power of their argument is to take a non-positivist, enlightened common-sense[1] approach to science. Humans use this version of common sense all the time to avoid accidents and disasters, such as when we leave a house by the ground-floor door, not the second-floor window, because we understand – are enlightened about – the effect of gravity.[2] We do not need decades of measurements and statistically significant correlations to decide what to do in these contexts. This position is contrary to that of complexity theorists such as Ilya Prigogine (Prigogine & Stengers, 1997) who argued that the only way to understand complex systems is through statistical probabilities. This is not to say that correlations in the form of, for example, statistical analysis and complex computer models are not useful, but merely that they are neither necessary nor sufficient (Bhaskar, 2016). Correlations are not sufficient because we always need to add an explanation to them, that is, we always need to understand why the correlations exist to avoid errors such as the error of assuming that all correlations indicate causation (they do not). Correlations are not always necessary because we can sometimes obtain important knowledge which is not in the form of a correlation or based on big data, such as our knowledge of the Greenhouse Effect. This latter point is especially important in contexts, such as we have in climate science, where we cannot place our object of interest into a laboratory.

I therefore take the position advocated by ecologists Gunderson and Holling (2002, pp. 32-33) who argued that ecosystem managers can, for instance, "decide whether the caribou herd is increasing or decreasing in size, and gaining or losing health and fitness, without requiring an actual count of the population". That is, we can obtain such knowledge by using our understanding of 'how things work' along with information such as the condition of the individual caribou in the herd, their general behaviour and the general environmental conditions. Similarly, we can use certain rules of thumb to guide our decisions to protect people and planet, based on common sense understandings of how things work.

An example of such a rule of thumb would be that we should avoid adding excess carbon dioxide into the atmosphere based on our understanding of how the Greenhouse Effect works. One of the key concepts of this position, taken from the philosophy of Roy Bhaskar [1944-2014], is that reality is stratified, with lower and higher orders of being (see Table 1). Thus, it makes the ontological assumption that higher order structures and mechanisms – in this case the mechanism of the Greenhouse Effect as originally described by Foote (1856) – are real (Bhaskar, 2016). This approach is also called *transcendental realism* because these higher order structures and mechanisms 'transcend', that is, they are 'more than' the sum of the parts of the lower order things that we can measure and see in relation to each other. Whilst the assumption that the 'something more' is real – that is, while the assumption that the Greenhouse Effect is real – seems like common sense to most, it is, as I explain shortly, not an assumption present in mainstream science based on Popperian 'post-positivism'. I also explain shortly how it is also an assumption that, if it is not present, gives strategic advantages to climate change deniers and significantly slows down our ability to act timeously in the event of impending dangers such as climate change.

**Table 1:** *Levels of reality of climate change and Mediterranean climate, where structures and mechanisms are the transcendentally real parts of reality*

| | **Climate change** | **Mediterranean climate** |
|---|---|---|
| **Structure (real level)** | Overall disposition of the planets in the universe, in which their atmospheric characteristics influence their climatic conditions. | Overall tendency for areas of the Earth's surface to have particular climates due to their geographical locations and local geomorphological characteristics. |
| **Mechanism (real level)** | Carbon dioxide tends to absorb heat from a light source. We have named this mechanism the 'Greenhouse Effect' when it occurs on planets such as Earth. | Certain areas of the Earth, close to the coast, in latitudes 30 to 44 degrees north and south of the equator, tend to have an anticyclone over the ocean in summer, bringing subsiding air and attendant clear skies and high temperatures (no rain). In winter, the replacement of this anticyclone by frontal cyclones brings rain. |
| **Event (actual level)** | There is an actual pattern of events on Earth in which increased carbon dioxide is correlated with increased temperatures. | There is an actual pattern over decades in which areas described as having a Mediterranean climate have hot dry summers and cold wet winters. |
| **Measurable entity (empirical level)** | We can simulate the Greenhouse Effect in the laboratory and thus witness it on a small scale. We can measure the increased temperature of the Earth. | We can take temperature and precipitation measurements and thus witness the dry summers and wet winters. |

In this article, I therefore start by describing how mainstream positivist science is problematic because it lacks an ontology for transcendent things. I then briefly show how the post-structural and post-humanist challenge to positivism – including its inflection as

complexity theory – is flawed and, ultimately, remains with the same problems as positivism. This is because all these positions lack an ontology for transcendent reality. I then illustrate my argument by reference to the empiricist way that environmental educators currently define climate, arguing that transcendental structural definitions would be preferable. As such, I suggest that it would be better for environmental educators to refer to the *Greenhouse Effect*, thus focusing on the structural nature of the problem, rather than *climate change*, which focuses on the less reliable empirical nature of the problem. Such a focus would immunise environmental activists from certain climate change denial arguments, such as that climate change science is not proper science; and it would give them permission to act even in the event of a temporary hiatus in global warming, which empiricists can argue proves that climate change is not happening. That is, activists are justified to act in open-system contexts if the structures and mechanisms that will lead to a future problem exist, even if the effects of the structures and mechanisms have not yet shifted into the realm of the empirical.

## Some problems with mainstream positivist science

Bhaskar (2013) [1975] has summarised the problem with mainstream, positivist science as follows:

> … the world, which ought to be viewed as a multi-dimensional structure independent of man, came to be squashed into a flat surface whose characteristics, such as being constituted by atomistic facts, were determined by the needs of a particular concept of knowledge. This led to a barrage of problems and an impossible account of science. For from now on any structure, if it was allowed at all, had to be located in the human mind or the scientific community. (p. 35)

One could argue it is this 'impossible account' of science that most environmental educators use to explain climate change. Such an account follows Popper (1945, pp. 12-14), for whom science is not in the business of transcendent abstractions or definitions. Popper explained this scepticism in terms of puppies. He argued that we can only ever describe individual puppies, and hence science is not in the business of asking the transcendental question, 'What is a puppy?'. He wrote: "Thus the scientific view of the definition 'A puppy is a young dog' would be that it is an answer to the question 'What shall we call a young dog?' rather than an answer to the question 'What is a puppy?'. … In modern science, only nominalist definitions occur, that is to say, shorthand symbols or labels are introduced in order to cut a long story short. And we can at once see from this that definitions do not play any very important part in science". Similarly, for Popper (1972, p. 24), as for Immanuel Kant, the 'laws of nature' (or nature's regularities, constant conjunctions, correlations) are simply something that we humans impose on the world and therefore, "the regularities we try to impose are psychologically a priori … The need to try to impose such regularities upon our environment is, clearly, in-born, and based on drives, or instincts".[3] Both Popper and Kant therefore agreed with the positivist David Hume, who sceptically argues that there is no

such thing as causation, rather, ideas of causation are simply something that we humans impose on the world (Bhaskar, 2016).

From this perspective, all transcendent 'things', whether categories of puppies, or causes (underlying structures and mechanisms) of climate change, do not technically exist and our discourse about them is merely a psychological habit that helps us to order, or make sense of, empirical measurements (Bhaskar, 2016). Furthermore, this Popperian so-called post-positivist science assumes that the only causal laws that can be taken seriously are those that refer to predictable, measurable (that is, non-transcendent) constant conjunctions of atomistic events, which "implies that the world is uniform, flat and repetitive, undifferentiated, unstructured and unchanging, and it is evident that this is not the case" (Bhaskar, 2016, p. 6).

This denial of the transcendent by positivists means that scientist must face incommensurable problems in their theoretical positions, such as the problem of talking about puppies but not really believing that the category 'puppy' exists; or creating climate change models but not believing that the models are literally about something real (climate change). Furthermore, the positivists face a 'problem' that their models cannot be relied upon to predict future states. As Mitchell explained (2009, p. 224), "all models are wrong in some way" and models should not be taken too literally. The idea, fortunately questionable, that we should not take our climate change models 'too literally' plays directly into the hands of climate change deniers. However, rather than seeing the failure of models to predict things in open systems as a problem, from Bhaskar's perspective this is simply an expected outcome of the existence of the layers of reality. That is, the mechanisms identified at the level of the real cannot be expected to play out perfectly on the ground, so to speak, because of mediating circumstances in the open system of the world. An example of a 'mediating circumstance' is the way that dust from volcanic eruptions can reflect the sun's energy from the earth, thus cooling the atmosphere and temporarily counteracting the heating effect of greenhouse gases. The existence of these mediating circumstances means that prediction is not possible in open systems and there cannot be a one-to-one correspondence between the data and the models. "In general a statement can be empirical or universal but not both" (Bhaskar, 2016, p. 29). That is, the structures and mechanisms of climate are transcendent and universal – everywhere has climate which is explainable via structures and mechanisms based on general physical principles – but these structures and mechanisms are not the same thing as the empirical measurements and their actual networked relationships, and therefore they are not reducible to them. Thus, we cannot perfectly predict the weather at any particular time in a particular area despite having a good idea of the area's climate.

## Post-structural and post-humanist challenges to positivism are flawed

Roy Bhaskar was not the first to argue the failures of empiricist/positivist[4] science; in fact, one could say that it is usual for environmental educators to be committed to a critique of it, especially in terms of its reductive nature and its inability to deal with subjective,

hermeneutic meaning (see for example, Reed, 2022, p. 318). However, the current alternatives to positivism are themselves problematic and they do not challenge positivism per se; they are more likely to agree that positivism is adequate for the study of natural phenomenon, but that it is not adequate as a way to approach the knowledge in the social sciences, or indeed any of the sciences where human interpretations are important. For instance, when educators influenced by poststructuralism reach for their science interpretation amongst other interpretations – to create a polyphonic, non-absolutist story – they are usually reaching for an empiricist/positivist version of science (an example is provided by Lather and Smithies, 1997).

More recent posthuman 'new empiricisms' or 'new materialist' ontological approaches shift the post-structural emphasis from questions of language and stories "to questions of relational networks or assemblages of animate and inanimate 'affect' "(Hart et al., 2018, p. 80). However, both senses of the word 'affect' point to empiricism/positivism. On the one hand, the sense of 'affect' as 'feeling' reflects empiricism/positivism's focus on what is empirical/measurable since that which can be felt by a human is a subset of everything that can be measured. On the other hand, the sense of affect as 'cause and effect' reflects positivism's focus on constant conjunctions of events. Ironically, despite being, seemingly, polar opposites, *both* empiricist/positivists and post-humanists/post-structuralists are wary of transcendent theorisations, which Hart (2018, p. 80) calls the "bird's eye view of inquiry" (see also Braidotti, 2019a).

## Systems/complexity theory alternatives are also flawed

Many environmental educators also have an interest in the work of systems and complexity theorists which aims to move "beyond the traditional paradigm of reductionism" (Mitchell, 2009, p. xi). This interest marries well with the environmental educators' interest in the post-humanists, since the latter's position is commensurate with that of the complexity scientists (Braidotti & Bignall, 2018; Cudworth & Hobden, 2013;). We can see this commensurability in the posthumanist work of the radical empiricist Gilles Deleuze [1925-1995], who focuses on *actual* relations. He calls his position *transcendental empiricism,* although the nature of his position as transcendental is disputed Allen (2020, p. 355). The posthumanist Rosi Braidotti (2019b, p. 34) calls her position *embodied and embedded carnal empiricism* and she also focusses on relations, which she calls 'a web of relations' (Braidotti, 2009b, p. 34). Similarly, systems/complexity thinkers mention 'network thinking' which "means focusing on the relationship between entities rather than the entities themselves" (Mitchell, 2009, p. 233). This kind of relational thinking moves beyond empiricism to what Bhaskar calls actualism (2008, p. 219). This is because it acknowledges that there is more to the world than things that we can measure; there are also actual events, in the form of relationships.

Scientists who take this position see reality as flat in that they assume that reality includes only a) the *empirical* things that we can measure, and b) the *actual* complex interactions or relationships amongst the things that we can measure – relationships which are *events* in

time and space (see for example the early Holling, 1973). Authors who think that only empirical things exist are called *empiricists*. Authors, like the post-humanists and systems/complexity scientists, who go a step further to think not only that empirical things exist, but *also* that relations and events amongst empirical things exist, are called *actualists.* Such scientists therefore may go further than simply talking about the measurable entities and begin to talk about theories or 'models' that explain the entities and their relationships and patterns. Nevertheless, like the positivists already mentioned, they remain sceptical that their theories or 'models' have a real referent, or an ontology, not least because they cannot be used for prediction. For example, Braidotti (2009b, p. 33) describes how her position argues for "… a cartography", which is a "theoretically-based and politically-informed account of the present that aims at tracking the production of knowledge and subjectivity and to expose power both as entrapment … and as empowerment…". By emphasising the map (the cartography) over the actual territory we see her scepticism about the ontology underlying the theory.

To the contrary, Bhaskar's transcendental realism assumes that theories and models, such as models of climate and climate change, do have an ontology and therefore that they should be taken literally and thus seriously (Bhaskar & Singh, 2020). It therefore goes beyond empiricism and actualism to realism. This is because it assumes that theories and models are about reality and are not simply psychological projections onto the empirical level. From this realist perspective, the search for prediction in open systems is fundamentally misplaced because the theories about universal, transcendent reality do not describe the actual networked empirical data, but rather they describe a transcendent reality, *evidence* for which is provided by the networked empirical data.

I realise that my use of the words *transcendence, universal* and *enlightenment* will strike a discordant note with academics immersed in post structuralism and posthumanism, given the accusations levelled at the concepts, such as represented by Braidotti above. To justify my use of the words, I will on the one hand agree that there is a sense of these words to which I do not subscribe, which I think the posthumanists are correct to critique. Braidotti (2017, p. 22) calls it "the violence and the hierarchical thinking that result from human arrogance and the assumption of transcendental human exceptionalism". I think that Braidotti is here talking about the kind of transcendence/universal thinking/enlightenment that refers to knowledge about things outside of all that is, in other words, transcendent things such as the transcendent, disembodied human mind of Descartes or abstract universals – such as the abstract universal 'ideal woman' – which similarly do not exist. This way of thinking is also related to what Bhaskar (2016, p. 39) calls anthropocentrism, which he convincingly critiques; I would go so far as to say that a main aspect of Bhaskar's philosophy is that it is anti-anthropocentric. Because of the confusion between these kinds of transcendence – the materialist version to which I subscribe and the immaterialist version – it is perhaps better to talk about depth rather than transcendence. However, on the other hand, I continue to use the word *transcendence* because this is standard practice in philosophical discussions since Kant (1724 – 1804). I continue to use the term *enlightenment* to reconnect

our work to that of the enlightenment thinkers who, despite making errors that led to positivism, Kantianism, and poststructuralism amongst others, nevertheless led us away from superstition and slavery. To argue otherwise, to say that we do not need some way of identifying falsity, is not only philosophically problematic – since we rely on our enlightened knowledge, or knowing how things work, for just about everything we do – but threatens our ability to change things for the better on the planet. In the words of Bhaskar (1989, p. 1):

> My use of the phrase 'enlightened common-sense' is deliberate. In a capitalist world and a bourgeois society, socialism will never be simple sense. But what we can hope to aspire to is the dawning of a new enlightenment, a socialist enlightenment which will stand to some future order of things, as the eighteenth-century bourgeois enlightenment stood to the American Declaration of Independence, the French revolution and the overthrow of colonial slavery for which it helped to prepare the cultural ground.

In the section that follows, I illustrate the implications of transcendental realism in terms of the way that we define climate and climate change.

## Definitions of climate and climate change considered from the perspective of transcendental realism

Sadly, over time, it seems that we have become more, rather than less, committed to believing in a flat reality. For instance, let us consider some different definitions of climate and climate change. The following typical definition of climate was taken from an environmental education website. Note how this definition is couched in empirical language: readings, averages, and high-tech computer systems designed to deal with 'hundreds of measurements'. Its ontology assumes a flat reality in which what is real is limited to the generalisable pattern of these measurements over long periods of time:

> Climate is 'the general weather in one place over a long period of time'. So it's not what the weather is like today, it is the average weather conditions over a decades. Meteorologists (scientists who measure the weather) collect detailed information about the weather every day, often using high-tech satellite and computer systems. Hundreds of measurements are calculated and the results compared to previous readings. (Young People's Trust for the Environment, 2021)

Based on this definition, we would say that an area has a Mediterranean climate if meteorologists have collected thousands of measurements over several decades from that area, and these measurements have revealed weather conditions that generally follow a pattern of dry summers and wet winters. Consider this to be our first definition of a Mediterranean climate.

Next, consider a second definition of a Mediterranean climate, which assumes a layered ontology:

> Mediterranean climates are located between about 30° and 45° latitude north and south of the Equator and on the western sides of the continents. Poleward extension and expansion of the subtropical anticyclone over the oceans bring subsiding air to the region in summer, with clear skies and high temperatures. When the anticyclone moves Equator-ward in winter, it is replaced by traveling, frontal cyclones with their attendant precipitation. (Editors of Encyclopaedia Britannica, 2022)

The second definition of a Mediterranean climate gives the deeper layers – or structures – of reality that result in Mediterranean climates, while the first definition assumes a flat reality of empirical measurements and actual patterns. In the second definition we therefore have a layered ontology; we can say that climate is 'the structures and mechanisms' that underlie the weather patterns in a region. That is, the weather is real at the empirical and actual levels, while climate is real at structures and mechanisms level (see Table 1). From the perspective of this layered reality, a meteorologist *who has no access to daily weather records over decades* would be able to tell, from topographical features and latitude, whether an area has a Mediterranean climate. Note how the second definition does not need empirical language: it does not need readings, averages, or high-tech computer systems to deal with all the 'hundreds of measurements' to decide whether or not an area has a Mediterranean climate.

Of course, meteorologists have in the past usually described Mediterranean climates this way and some most likely continue to do so. Nevertheless, it is also the case that, because contemporary philosophy of science does not talk about a layered reality, there is an ever-present tendency for scientists, including climate scientists, to prefer flat descriptions of reality to depth descriptions. A depth description of climate, which, unlike the Young People's Trust for the Environment version, does not include 'average weather conditions over a decades' might be along the lines of:

> Climate is the overall tendency of an area to have certain weather conditions at certain times of the year, for reasons related to its geographical position on the globe and its characteristic topographical features.

The typical commitment to a flat ontology has led, unsurprisingly, to NASA's (2021) empiricist definition of climate change which emphasises average measurements over time:

> Climate change describes a change in the average conditions – such as temperature and rainfall – in a region over a long period of time. NASA scientists have observed Earth's surface is warming, and many of the warmest years on record have happened in the past 20 years.

Using NASA's definition, if temperatures do not increase for a few years, it would be hard to argue that climate change is still happening. Therefore, from the perspective of transcendental realism, I argue that environmental educators should talk about the

Greenhouse Effect rather than climate change to shift the focus to the structural problem that we are facing that is resulting in human-induced climate change.

## Advantages of transcendental realism to environmental educators

One of the advantages of transcendental realism for environmental educators is that it allows them to counter climate denial arguments, based on positivism, which suggest that theories of climate change are not proper science because climate models are not perfectly predictable and because the science has not involved replicable experiments aimed at falsification (Bratby, 2010; Bratby in Homewood, 2015; Koonin, 2014; Moore, 2021). Transcendental realism counters these arguments by suggesting that, contra positivism, knowledge about climate change *does not* require hypothesis-testing experiments to be known about (nevertheless the mechanism of the Greenhouse Effect has been demonstrated in laboratories, initially by Eunice Foote, and replicated often since then). It also suggests, contra positivism, that models do not have to be perfectly predictable for us to assume that, nevertheless, they are in principle correct. Indeed, we cannot expect such models to be fully predictive due to open system factors which, outside the laboratory, refuse the possibility of perfect correlations (predictability). That is, if there is a global warming hiatus in which the Earth does not warm – as there was between 1998 and 2012 (Medhaug et al., 2017; Meehl, 2014), this does not necessarily mean that climate change is not happening. The Greenhouse Effect is most likely still functioning to heat the Earth, but its structural effects may be countered by open system factors, such as unusually active volcanoes whose dust tends to reflect the sun's rays from the Earth and make it cooler.

In other words, millions of measurements are not always a good indication of what is going on in an open system (non-laboratory) context. We can know about the structural effect of adding extra carbon dioxide to the Earth's atmosphere, which we call the Greenhouse Effect, by the use of *retroduction* (Bhaskar, 2016), in which we think about 'what-must-have-been' to explain the evidence, and then compare the other existing 'what-must-have-been' theories that compete with each other with regard to this evidence. This logical comparison is called judgemental rationality (Bhaskar, 2016). The relevant competing 'what-must-have-been' theory (climate change denial) would be that the temperature changes and other evidence are the result of natural processes in which the Earth simply cycles between warmer and colder periods, and which have nothing to do with increasing carbon dioxide and human activity. However, we can prefer the 'human activity is warming the Earth due to the Greenhouse Effect theory' to the 'natural processes theory' because the latter does not explain certain other evidence, such as the extra carbon dioxide in the air and its heating effects. Thus, the Greenhouse Effect theory gives a more comprehensive explanation for the empirical measurements than the Natural Processes theory.

I would like to add that this advantage of transcendental realism is not solely applicable to questions of climate change; it has implications for social justice in general, and it

strengthens the critique for people who are oppressed. For example, think of a context, such as is still sadly common in parts of South Africa despite nearly 20 years post-Apartheid, which has tendencies towards racism, but the racism is unexpressed due to powerful policing. Thus, the structures of racism continue to exist as a real, ever-present potential (they exist transcendentally) even if they do not become manifest in actual, or empirical ways (there have recently been no racist events, whether empirically measurable or not). Nevertheless, many people, especially those who suffer from racism, will know that the racism is simply latent. This is because we are able to recognise the subtle signs of it, and/or acknowledge that it remains in existence because there is nothing to suggest it has changed; for instance, perhaps we still know of people who are secretly, perhaps even unconsciously, racist but who manage to maintain a façade of antiracism (O'Brien, 2000, p. 49). This is not unlike the problem that we have in terms of climate change activism, when, during the 2000s the Earth failed to warm significantly, and the activists were told that there was no substance to their fears or that they were scare-mongering (O'Keefe, 2000). Positivism's denial of transcendent reality thus works in the favour of the individuals or organisations who need to hide their questionable motives in order to maintain a discourse that suits their interests. One could argue that manipulating the empirical evidence, or at least how things look on the surface, is an important activity of oppressive regimes and it is powerfully enabled by positivism which places an embargo on theorising about what certain evidence may 'mean', or which, at the very least, reduces such theorisation to the lowly status of 'opinion' or 'cartography'. The commitment to surface, empirical things alone, and the lack of ontology for deeper theories, therefore, denies the possibility of social critique that can be taken seriously. Transcendental realism overcomes this problem by underlabouring for the 'masters of suspicion', which is a category that includes all theorising, uppity social activists. A well-known member of this category is Karl Marx (Bhaskar et al., 2017), whom Karl Popper (1962) accused of pseudoscience and soothsaying.

Transcendental realism therefore has practical implications for those people who are oppressed, as well as for environmental educators. The various alternatives to positivism – such as hermeneutics, post-structuralism and the new materialisms – give oppressed people the right to develop opinions (theories) and social critique even if they are not lab-coat-wearing laboratory scientists. However, these people's opinions tend to not be taken seriously as they assumed to have no basis in reality, a state of affairs which is called relativism, in which there is no way to judge better or worse opinions. To the contrary, transcendental realism not only gives oppressed people the right to have an opinion, but also to think that their opinion is more correct than the opinion of the oppressor if, using judgemental rationality, their opinion gives a more comprehensive explanation for the evidence. The emancipatory advantages of this resolution of the problem of relativism, which has paralysed activism for decades, cannot be overstated.

Another important advantage of transcendental realism is that it can help us to avoid delayed responses to existential threats. Currently, positivist-based science concentrates on the empirical level, and therefore it insists on 'big data' and experimental findings of

correlations to make decisions. This can take many years to obtain, and in the meantime, we have not acted to address the problem. Additionally, as I have already pointed out, it seems positivists will never take the kind of (retroductive) science that we *can* obtain about the world's climate seriously. Nevertheless, understandings of structures and mechanisms can be trustworthy – such as the understanding of the Greenhouse Effect which is in fact founded on repeatable laboratory-based knowledge (it is just not able to be tested in the context of the globe). Our action decisions, based on such research, can be sound. This is common sense; that is, it is the same way that the common people, which includes people from traditional contexts, find knowledge.[5] It is equivalent to the way that knowing about gravity can prevent one from stepping off a high-rise building; and it is why Bhaskar called this kind of common sense 'enlightened'. One does not need to read scientific papers correlating death with stepping off high-rise buildings to know that one should not do this if one wants to survive. Thus, despite the global warming hiatus often mentioned by climate change deniers, when millions of measurements over nearly two decades failed to suggest that the Earth was warming, our knowledge of the Greenhouse Effect suggests that we should still have reduced our carbon dioxide output during this period. That is, taking retroductive theories seriously means that we can act on them immediately. If, back in the early 1900s, mainstream science was of the transcendental sort that I advocate here, we would have been justified to act *then*. We would not have had to wait until it was perhaps too late, and the global warming signal had 'manifested itself in the data' (as described by Hoffert in Pattee, 2021, para. 5). Those environmental educators who advocated the need to reduce carbon dioxide output in the 80s and 90s were intuitively acting on the principle that I argue for here; that is, they were arguing that we need to act based on our understanding of how things work rather than waiting for the problem to occur before acting.

However, it should be noted that knowing *that* one should act is not the same as knowing *how* one should act; or knowing what the likely outcomes of our different action outcomes might have. For this, complex models of climate change are powerful tools, and therefore I am not denying a role for such models. Furthermore, just as transcendental realism allows us to take physical structures and mechanisms such as the Greenhouse Effect seriously, so it also allows us to take social structures and mechanisms seriously, such as the structures and mechanisms of neoliberalism. This potentially helps us to find non-instrumentalist, democratic ways to approach the 'how' question, although a full discussion of this is not possible here.

## Conclusion

In this article, I have argued that it is important for environmental educators to assume that reality is layered, rather than flat, when talking about climate change. This is because the 'flat-reality' definition of climate and climate change – based on empirical, actual measurements of temperature increases and the assumption that science is predictable – hampers our ability to act timeously and sets us up to lose the argument against climate change deniers.

For instance, during the event of the global warming hiatus between 1998 and 2012, it was difficult to argue that climate change was nevertheless still a problem that needed urgent attention. Thinking in terms of a layered reality, which includes structures and mechanisms, allows us to discuss how the Greenhouse Effect continues to act, in the background so to speak, even if its effects are temporarily mitigated by unpredictable events, such as extra atmospheric dust due to volcanic eruptions. Acknowledging the reality of structures and mechanisms makes the decision-making process that one might go through in terms of climate change mitigation – such as making the decision to resist the global tendencies that are leading to increased greenhouse gas emissions – as simple and as fast as the decision-making process that one might go through to take evasive action whilst driving, should one find oneself facing an impending collision. In putting forward this argument, my objective is to underlabour for our scientific discoveries, such as the discovery of the Greenhouse Effect, to allow us to take these discoveries more seriously. Although it is fair to say that I am critiquing the ontology of mainstream positivist science, my motive behind this critique is simply to strengthen the standing of important, 'most-likely-truthful' scientific theories which are a mainstay of positivist scientists' repertoire. Sadly, because these theories are not seen as having an ontology, they are too easily undermined by commentators with questionable motives.

## Notes on Contributor

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## Endnotes

1 Note that common sense here refers to the simple process of cognition common to all humans and indeed many non-human species. It is not the hegemonic, ideological 'common sense' critiqued by Antonio Gramsci (2000). I argue that Bhaskar's (2016) version of ***enlightened*** common sense is an antidote to hegemonic, ideological 'common sense'. Common sense in the absence of a genuine attempt to find the real reasons for things could well be a fair definition of superstition, the opposite of Bhaskar's (2016) 'enlightened common sense'.

2 This gravity-ignoring analogy originates in the work of Hume when he said that, since theories such as the theory of gravity are, he argued, meaningless, there is no scientific reason to avoid leaving a building from its upper windows rather than from its ground-floor doors. This analogy is quoted frequently by Bhaskar (see, for example, Bhaskar and Singh, 2020, p. 78; and Bhaskar, 2016, p. 2). Admittedly, in this article, I sometimes up the stakes, shifting the analogy from being about stepping off the second floor to stepping off a high-rise building, but given the current environmental crisis I feel justified in this. Here is a relevant example of the analogy, by Hume, as quoted by Bhaskar (2009, p. 22): "But the most poignant rebuttal of practical scepticism comes from the pen of Hume himself: 'Whether your scepticism be as absolute and sincere as you pretend we shall learn by and by, when the company breaks up; we shall then see whether you go out at the door or the window, and whether you doubt if your body has gravity or can be injured by its fall, according to popular opinion, derived from our senses and more fallacious experience'. When the company breaks up …we are all practicing (transcendental) realists". One way to think of this article is that it is a rebuttal of the practical scepticism present in climate change education.

3 The difference between Popper and Kant was that Popper thought we could be wrong about the inductive ideas that we impose on the world, that is, he argued that we can refute them but not prove them.

4 I talk about empiricist/positivist science because, whilst positivism is the best-known version of empiricism, if I use its name alone, I lose the important reference to the focus on the empirical that we find in empiricism. Bhaskar (2009, p. 155) called positivism "a limit form of empiricism" because it places limits on empiricist knowledge, in terms of the idea that we can only know for sure that something is false and in terms of what counts as science (for example, science should, from this perspective, be based on testable hypotheses). I talk about ***empiricism*** and ***empiricist science***, not empirical science, to indicate that it is fine for scientists to value empirical data, but they should not ***only*** value it (which would make them empiricists, followers of empiricism).

5 One anonymous reviewer was concerned that not all indigenous knowledge falls into this category of common sense, but any theorisation about the explanation behind some seemingly inexplicable event – even if it results in a theory that a deity or deities/ancestors caused the event – falls into the category of transcendental, retroductive theorisation, which is what I mean by common sense. Historically, before humans had developed the knowledge they have now, this kind of 'black box' theorisation was usual; although, as scientific explanations for things have become available, so the need for black box retroductive theories, such as 'the gods did it', has fallen away (Ecklund et al., 2016). That is, by using judgemental rationality, humans have tended to assume that scientific explanations explain more of the evidence than the idea of an intelligent supernatural force. However, it seems fair to say that we still do not fully understand all the processes of life; and many people, whether indigenous or not, and this includes many scientists (Ecklund et al., 2016, p. 5), use judgemental rationality to argue that, in the absence of a scientific

explanation, the best retroductive, transcendent theory to explain life is the existence of an intelligent God. Personally, I do not commit to the theory that an intelligent God exists, as such a theory has too many unknowns for me; I am holding out for further enlightenment. Nevertheless, my point here is simply to show the ubiquity of retroductive, transcendental theorisation; and thus, to justify its description as common sense. I am not suggesting that common sense is always right; to the contrary, I hold it to be unavoidably fallible, but it is nevertheless still good enough for the purpose of providing a method to identify ethical ways of acting based on science.

# From Being Literate about Health to Becoming Capable of Achieving Health: Health literacy capabilities of Zimbabwean school youth

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## Abstract

Food security is an enduring sustainability challenge in the Southern African region. Food availability, accessibility and affordability have profound health impacts and affect the quality of life of a substantial proportion of the world's population. This article aims to explore, together with students in educational settings, questions about the relationships between food and health, including the contextual conditions of food availability, accessibility and affordability. This provides opportunities to re-embody food by contextualising it as part of natural and built environments, thus engaging with how challenges of human health intersect with animal and environmental health. The research centres on co-creating knowledge with youth based on their valued beings and doings about health and considers how their health goals relate to food and the sustainability challenges of antimicrobial resistance (AMR). By considering how youths' understandings, evaluations and decisions regarding health, including setting health goals, intersect with the determinants of food, we come to consider their health literacy capabilities to achieve non-predetermined health goals that align with their valued beings and doings. As such, the implementation gap between knowing and doing is bridged through practices of health and well-being contextually grounded in the lives and experiences of the student youth.

***Keywords:*** *health literacy, health education, capabilities approach, antimicrobial resistance, knowledge co-creation*

## Introduction

Food is vital to life as the substance that, when taken by the body, provides the necessary materials to enable it to grow, replace worn-out and damaged parts, and support our everyday practices. Food choices may be affected by the conditions of the body, such as illness, chronic diseases, dental issues, famine and malnutrition. In addition, food choices are affected by determinants such as family income as well as food cost and may depend on knowledge sources regarding healthy eating, family eating habits, taste, cravings and


DOI 10.4314/sajee.v39.02
ISSN 2411–5959

easy access to junk food. These aspects link food and dietary habits to family culture, tradition, social interactions with friends and media platforms, norms, values and time to prepare food from home. Zimbabwean family food and diet habits can be considered in the light of an intersection of social, political and commercial determinants of health. For youth, food choices and dietary habits are further influenced by taste, cravings, religion, culture, education, tradition and access to information on nutrition and health. With such a range of factors affecting their food and dietary habits, there is a need for research exploring youth's health goals and food choices and how they experience social, political, and commercial determinants of health. This article responds to calls for engaging with knowledge co-production in health education and well-being by taking a praxeological approach (Mol, 2002). Focusing on youth's experiences and views as related to their health and food practices, the article explores how 'good' health emerges in the context of the youth's practices intersecting with contextual social, political and economic conditions (Entrena-Durán et al., 2021; Ehlert, 2021; Higgs & Ruddock, 2020; Robinson et al., 2013).

Exploring, together with students in educational settings, questions about the relationships between food and health, including the contextual conditions of food availability, accessibility and affordability, provides opportunities to 're-embody' food by contextualising it as part of natural and built environments (Hayes-Conroy & Hayes-Conroy, 2013). Thus, the article engages with how human health challenges intersect with animal and environmental health. As argued by Mingay et al. (2021), our relation to food and our practices with food do not emerge in individual isolation but are interwoven with our environments. We can address food security issues through the application of this kind of 'One Health' perspective in education. Food security impairs the quality of life of a substantial proportion of the world's population and is a present concern in the lives of many Zimbabwean students, as well as contributing to challenges in environmental health. This tension is especially due to efforts to secure animal-based food for a growing population, with antimicrobial resistance (AMR) being an emerging challenge at the One Health intersection (Fasina et al., 2022; Zinsstag, 2021). AMR can be described as a process resulting in microbes developing resistance to antimicrobials. The complexity of the sustainability challenge can be productively explored by considering the three-way relationship between microbes, pharmaceuticals and bodies, as well as the human, animal and environmental contexts (water and soil bodies) in which these meet, generate and spread resistance (Eleraky et al., 2020; Essack et al., 2017).

Resistance may emerge through over-prescription and over-use, and non-compliance to treatment regimes of antimicrobials in human and animal bodies, as well as the spreading of antimicrobials through environmental bodies such as rivers. The spread of resistant genes further exacerbates AMR through poor infection control in hospitals and clinics; lack of hygiene and sanitation results in the further spreading of microbial resistance throughout human, animal and environmental bodies (Palanco Lopez et al., 2020; Tompson et al., 2021). In these cases, there have been calls for a shift in efforts towards prevention to avoid spreading both antimicrobials and microbes, thus lessening the risks of exposure and

infection (Dixon et al., 2021). Central to these calls for prevention is building resilience to infection in humans through food and diet, creating (human) bodily environments conducive to beneficial relationships with microbes (Birgisdottir, 2021). This article presents research that created a space where youth, as part of educational situations, could explore a plurality of understandings of health and well-being and how such diversity can co-exist as part of situationally rational health and well-being practices. Consequently, there is an attempt to counter the marginalisation of local health knowledge and youth's health goals and experiences. As such, the research presented in this article centres on the educational process of co-creating knowledge with youth about their valued beings and doings about human, animal and environmental health and how these goals relate to food and the challenges of antimicrobial resistance (Essack et al., 2017; Tadesse et al., 2017).

AMR has emerged as a pressing sustainability challenge on a par with climate change as it poses threats to health care and impacts the interconnected health of humans, animals, and environments (Jasovský et al. 2016; White & Hughes, 2019). As such, AMR is a challenge facing future generations who will have to take responsibility for AMR and live with its consequences (Cars, 2014). As the sustainability challenge of AMR extends throughout society, impacting the lives of all citizens, including the young, AMR becomes relevant in education aiming to engage with sustainability at the intersection of human, animal and environmental health. Addressing this challenge includes reflecting on and engaging with the practices that drive resistance, including the use and prevalence of antimicrobials in human, animal and environmental bodies and practices that limit the need to introduce these pharmaceuticals into these bodies.

Furthermore, AMR emerges as a pressing topic for Zimbabwean school education in light of the emphasis on the role of education in the Zimbabwean AMR One Health National Action Plan (Zimbabwe AMR Core Group, 2017). In the plan, AMR is positioned as an essential One Health challenge that extends beyond hospitals and health care to the whole of Zimbabwean society and where education on all levels, including schooling, becomes the overarching effort in addressing this rising sustainability challenge. In addition, AMR becomes an anchor and a focus for allowing members of society, including youth, to explore and engage with the close connections between the health of humans, animals and environments. Given the One Health challenges of the country, AMR is presented in the National Action Plan as impacting on the lives of Zimbabweans, young and old, not only in terms of access to health care but also to food security and stable and healthy natural and built environments. AMR is a sustainability challenge that impacts all aspects of Zimbabwean youth's lives and their abilities to live the lives they have reason to value, making it a relevant topic and focus for education.

Through the use of health literacy capabilities theory and exploring the social, political and commercial determinants of food and health, this article aligns with previous research that goes beyond individualistic approaches (Block et al., 2011; Hedegaard, 2016; Mingay et al., 2021). Health is thus considered in terms of contextual conditions for youth to achieve their health-related valued beings and doings. This approach does not take away from

student youth's agency as individuals to explore and determine their health goals and how to achieve them. Rather, it provides opportunities for them to identify and engage with the social, political and economic contextual conditions that may affect their abilities to achieve health goals that align with their health-related valued beings and doings. A parallel can be made with climate change education and how environmental and sustainability education aims to develop student youth's abilities to engage with this sustainability challenge. While emphasising their agency, such efforts emphasise that these engagements happen under a range of social, political and economic contextual conditions that affect student youth's abilities to achieve their environmental-related valued beings and doings.

## Aim and research questions

The article aims to, together with youth, create knowledge regarding their relation to health, food choices, and how these can be expressions of their ability to achieve desired health-related goals. Three research questions have been formulated:

- How do the youth describe their health-related goals?
- What links are made between these health goals and food as well as AMR?
- How has the youth experienced encounters between commercial, political and social determinants for health and effects on their freedoms to achieve health goals?

## Theory

Health literacy capabilities (Pithara, 2020) are utilised as the principal theory informing the analysis as health literacy highlights the need for people to achieve competence beyond the immediate educational situation. This includes developing understandings and the ability to evaluate health information critically, as well as take action based on reflective health-related decision-making (Nutbeam, 2000; Sørensen et al., 2012; Veenker & Paans, 2016; Ward et al., 2019). As Van der Heide et al. (2013) illustrated, health literacy presents a conceptual avenue to explore the relationship between education and health and offers a way to bridge the 'implementation gap' between knowledge of health and health-promoting practices. As such, health literacy has emerged as an important educational goal, especially concerning youth becoming able to engage with the One Health sustainability challenges that impact their health, the health of their communities, local environments, and ecosystems. Meanwhile, there are calls for more significant consideration for individual agency and a less prescriptive element to health literacy through the operationalisation of the capabilities approach, encompassing critical conceptual understandings of health (Pithara, 2019; Ruger, 2010).

Both Pithara (2019) and Ruger (2010) illustrate that health literacy approaches have been limited in two ways relevant to educational efforts. Firstly, by predetermining the ways in which the student youth should become literate about health, there are risks of universalising certain lived experiences to the detriment of others. To achieve health equity,

what it means to become health literate and healthy needs to be characterised by plurality in terms of experiences, practices and contexts. Health literacy goals thus need to be part of an open-ended emergence rather than be seen as prescribed universalities. Secondly, health literacy development has often been approached as detached from the social, political and economic contextual conditions in which youth develop their health literacies.

The capability approach addresses these two limitations by shifting the educational focus towards creating conditions for student youth to develop opportunities to articulate their health literacies through an emergent plurality of health goals and with consideration for the determinants of food and health. These include social determinants such as housing and living environments, income distribution, stress, unemployment, social support, and food transportation, which are all challenges that require attention in order to achieve health goals.

Approaches to address social determinants include awareness, adjustment, assistance, alignment and advocacy (Blas et al., 2011; Dawes & Williams, 2020; Kickbusch & Franz, 2016; Ireland, 2021; World Health Organisation [WHO], 2013). In addition, political determinants encompass the impacts of human activities in both built and natural environments, such as a lack of healthy foods as well as poor ecological conditions. The structuring of relationships, how resources come to be distributed and how power is managed lie at the centre of the political determinants. Health states and outcomes of humans, animals and environments are thus significantly affected by both government action and inaction, especially in communities with limited access to resources. As such, political determinants affect all aspects of One Health (Hervey et al., 2021; Mayosi et al., 2014).

Finally, commercial determinants drive inequalities in income levels, education opportunities, occupation and employment status within a population (Blas et al., 2011). In addition, income levels shape the overall living conditions and the quality of diet in a family. Commercial health determinants are corporate actors' conditions, actions, and omissions that affect health arising in the provision of goods and services in commerce (Kickbusch, 2016; WHO, 2013). Research by Blas et al. (2011) complements what is reported in the WHO publication (2013) regarding ethics, equity and human rights, and public health programmes to complement food interventions in communities. Companies and industries manufacture commodities (food, alcohol and beverages), some of which are drivers of non-communicable diseases such as cardiovascular diseases, cancer, chronic respiratory diseases, pulmonary hypertension and occupational lung diseases, which could be related to the economy of the country (Rockström et al., 2021).

Drawing on the capabilities approach (Crocker & Robeyns, 2009; Kronlid, 2014; Sen, 2003), we can shift from health as individual skills and competencies to consider commercial, social and political determinants, which enable or inhibit youth's capability for health literacy. Health literacy principles are thus operationalised together with participating youth. Youth in the global south are disproportionately affected by health-related issues, such as food security, poor food choices and exacerbating health challenges such as cholera, TB and HIV/AIDS (Pithara, 2019, Ruger, 2010).

Within the chosen capabilities framework and applied to education engaging with health literacy, learning for health literacy capabilities is understood as enabling the conversion of resources giving youth agency and the freedom to achieve their health-related valued beings and doings (Walker, 2006; Walker & Uterhalter, 2010). There is a link between, on one hand, education and learning as capabilities and on the other hand, literacy, as the latter is informed by the prior enabling freedom and agency (Nussbaum, 2011). As such, education, learning and health are understood as crucial capabilities for well-being (Dreze et al, 2003). Nussbaum (2011) and McGarry (2014) have noted that the kind of education and learning is important as education and especially learning can be argued to be both a crucial capability in themselves, an important conversion factor, as well as 'fertile functioning', essential in developing other capabilities (Nussbaum, 2011). Consequently, learning as a transformational process becomes a pathway for comprehending, critically assessing, and even transcending new knowledge with the help of our own and others' health-related experiences (Dewey, 1997).

When discussing education and learning, Dewey (1997) argued that certain forms can arrest or distort further experience. As such, transformative education and learning aim at enabling learners' opportunity sets. Both learning and education can be seen as capabilities and as conversion factors depending on contextual conditions (Otto & Ziegler, 2006). Education can, in such situations, be understood as a condition for learning (Dirwai, 2013). Transformative learning as a capability focuses on widening the space of opportunities to realise what people value rather than for particular realisation. Knowledge thus becomes the result of practice-oriented (praxiological) co-production in which we draw on a range of knowledge sources as part of an epistemological ecology to enable ourselves to move our health and well-being practices forward (De Sousa Santos, 2007; Mol, 2002). These transformative learning processes are relational to persons, non-humans, artefacts, or collectives making such relationships potential conversion factors as opportunities for change (Grasso, 2007). As such, the article contributes insights regarding the necessity of knowledge co-creation as part of learning processes that aim to engage with the health-related valued beings and doings of student youth.

## Methodology

Group interviews combined with semi-structured participant observation were used as the data generation method, operationalised in face-to-face interactions with participating youth to explore questions as part of a knowledge co-creation process. The study explored how the dynamics between commercial, political and social determinants of health impact on students' food choices and, ultimately, their health.

The chosen method captured participants' attitudes, experiences, and meaning-making as part of interactions, enriching data validity (Patton, 2002). To create a comprehensive whole, the data generation sessions included the use of both a quantitative checklist and a qualitative observation schema. These were used to capture the frequency and content of participants' verbal and non-verbal communication as part of the data generation.

Consequently, the checklist was used to create a quantitative overview of where, when and how student youth engaged with food, health and AMR, while the observation schema centred on creating depth regarding these engagements. The focus for both the checklist and observation schema was primary participants' verbal and non-verbal interactions, what they said and how they said this. Using direct observation addresses the methodological memory problem of surveys since actions are observed in situ rather than remembered by the participants (Bryman, 2019). Throughout the data generation sessions we kept in mind the point made by Emerson et al. (1995; 2001) about note-taking as a selective endeavour where a selection occurs in terms of what aspects of the interactions come to the fore and thus inherently includes a degree of interpretation.

Participating student youth came from six upper secondary schools in Zimbabwe. The selected schools included both government and private schools. Four of the schools were government-run, with two schools in urban areas (a day school and boarding school) and two schools in high-density areas (day schools), while the two private schools were located in peri-urban areas and included a private school and a mission school (both day and boarding schools)

All the schools were located in the Midlands province and the district of Gweru in Zimbabwe, but each pair belonged to three different school clusters. The population of 120 students were purposively sampled with six focus groups from each school. Students were a mix of forms 5 and 6, ages ranging from 16 to 18 years-old, in groups of equal numbers of each gender. A pre-designed interview questionnaire was used in group interviews and for participant observation, with interview questions focused on health, food nutrition, food choices, sources of health knowledge and antibiotic and antimicrobial resistance. An observation schedule was used to support the semi-structured participatory observation, which created a systematic approach to the observations while still allowing for the recording of unexpected observations during the group interviews. Each observation in the six schools followed a shared method while creating the space for the participating youth as knowledge co-creators of contextual health goals and how these could be achieved. Each group interview lasted around 60 minutes. The interviews were moderated by two of the researchers. The data generated from the group interviews and accompanying observations focused on health goals, preferences and experiences of food consumption and how youth experienced commercial and social influences regarding their food choices.

## Ethical considerations

During the preparation phase before initial visits to the selected schools, clearance was sought and granted by the Ministry of Primary and Secondary Education in Zimbabwe regarding conducting research focused on food, health and AMR with student youth under the age of 18. During an initial visit to the schools, information was provided to potential participants regarding the purpose and content of the research, and they had opportunities to ask questions. Consent forms were distributed during these initial visits for the students to take home to parents and guardians. During subsequent data generation visits, we

provided additional opportunities for students to ask questions regarding the research and the subsequent process. After all questions had been addressed, we obtained written and signed consent from the students' parents and guardians as well as written assent from the youth themselves. No names of participants were recorded; instead, participant codes were used (TRUST, 2018).

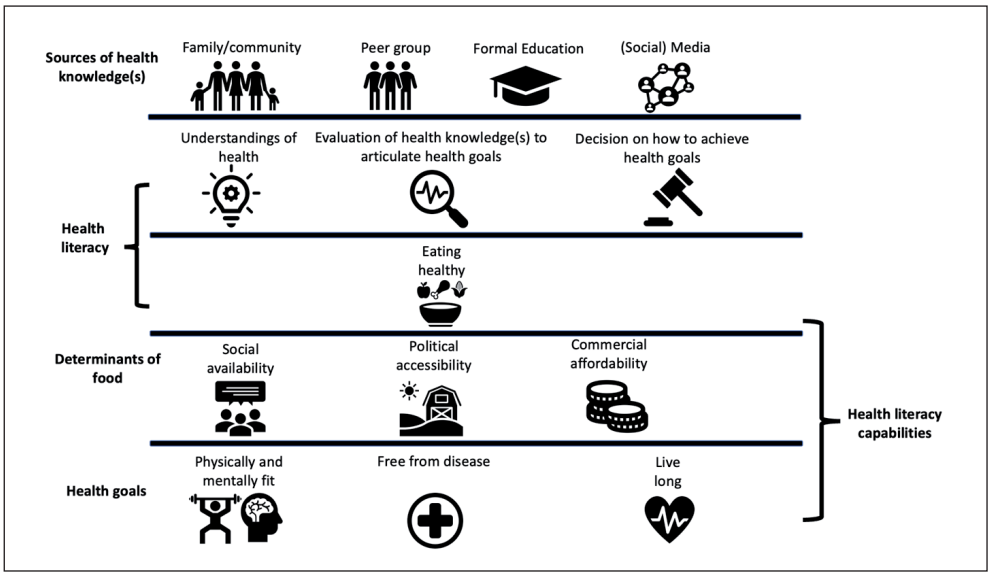
While the focus of the research was not on sensitive personal information regarding food, health and AMR, we were conscious of the challenge of dealing with questions about youth's understandings of diet and health and the need to avoid having students talk about their own personal health status. Throughout the data generation and discussions with the student youth, we made clear that our research interest pertained to their understandings of food, health and AMR on a more general level rather than their individual health conditions. At any point where the discussion moved towards touching on sensitive personal information, the researchers moderated the discussion towards more general conclusions.

During data analysis, attention was given to bringing out the student youth's views on food, health and AMR, especially with regard to how the contextual conditions of social, political and commercial determinants of food and health impacted these views. Furthermore, as part of presenting the research results, participant voices were included at key points to support and substantiate the findings.

## Findings

The findings are presented through several progressive themes, as outlined in Figure 1 below, starting with the sources of health knowledge identified by the youth.

**Figure 1:** *From being literate about health to becoming capable of achieving health*



In the empirical materials, youth sources of health knowledge broached the formal-informal education divide with the families and communities of youth along with peer groups and (social) media forming important sources of health knowledge in addition to formal schooling.

> "…health knowledge is widely discussed in Food and Nutrition, Biology and HIV and Aids subjects. However, food and nutrition is an important subject but it's rarely found in schools, very few schools offer it."
>
> "Biology and Food and Nutrition have more topics on health, however Food and Nutrition is not done in most schools because it is an expensive subject."

As illustrated by the quotes above from the youth, health knowledge in formal sources was distributed throughout the educational curriculum particularly in science subjects such as biology and combined science, food, nutrition, and agriculture. While these school subjects all dealt with health, youth noted that each subject differed in approach and focus. For example, in biology and combined science, health and diseases were at the centre, with youth learning about biomedically healthy living conditions and how to protect themselves from diseases. Agriculture focused on the production of 'healthy' farm produce free from diseases, pesticides and antibiotics, where antibiotics were often used for treating cattle, pigs, sheep, rabbits and poultry against diseases that would affect their health and productivity. In addition, as seen in the quotes below, the youth's discussions also addressed how improper use of antibiotics may drive antibiotic resistance, having the opposite intended effect on animal health and productivity, with considerations also extending to human health.

> "When people take antibiotics at home they are told by doctors to complete the course, but they throw away the antibiotics or just stop taking them once they feel they are ok."
>
> "We have a tendency of not finishing the course and if a family member gets sick we just give the remaining medication to the sick which does not make up a course and that will cause resistance."
>
> "Knowledge on antibiotics will help us not to eat animal meat which we buy on streets and not finishing courses when prescribed antibiotics by doctors."

The focus for food and nutrition was on eating a balanced diet for sustained health, while guidance and counselling considered social and economic conditions for healthy living. Finally, health knowledge in the history and heritage subject centred on the relationship to cultural and religious practices addressing questions of norms and values. These included clean and unclean food and when and how eating food is permitted or forbidden. During these discussions, a disagreement arose regarding the norms and values of various cultural and religious practices, as illustrated in the following quotes:

> "Eating eggs while pregnant is forbidden in certain Zimbabwean cultures since they say the child will be born with a bald head without hair."

> "Various totems are animals or animal body parts for example, the heart, legs, and people are discouraged or forbidden from taking your totem… they say you will have teeth problems."

Emerging in the examples is the role of totem animals that, in Zimbabwean culture, one is forbidden from eating (Titov, 2018). As such, while health knowledge was often presented in biomedical terms as part of formal schooling, it also extended to guidance and counselling, physical education, and history and heritage.

As part of the focus group discussions, the youth emphasised the importance of family, local community, peer groups and the church as seen in the quotes below:

> "Our families have a great influence on what we eat because we have no room to choose what we want to eat at home, we just eat what has been cooked at home."

> "Religion has an influence on what we eat at home, for example, […] we are taught at church that vegetarian diet is the best so that is what I believe in. I don't eat meat as a result of that teaching."

The youth's understanding of health was thus informed and these social groups provided them with guidance on health and food concerning cultural and religious values. In the findings, the youth emphasised how:

> "Health knowledge is found in many places like churches, schools, clinics, etc."

> "At our home nothing is talked about concerning health issues, but at school and clinics."

As such, the youth made use of sources of health knowledge not as separate but as combinations of family schools, church and health facilities. Together these combinations amounted to the majority of the youth's sources of health knowledge. The remainder of the youth's health knowledge was gathered from social media (WhatsApp, Facebook and Twitter), television and radio and internet sources. The emphasis on family and community as a source of health knowledge reflects what has been noted by Känsäkoski et al. (2021), and crucially, the findings showcase how each of these sources provided different forms of health knowledge(s) for the youth. While the knowledge source of formal education provided primarily biomedical forms of health knowledge, families provided health knowledge grounded in tradition and culture, and (social) media sources offered health knowledge based on peer and youth culture of the study participants. Formal education as a source of health knowledge can further be framed within the efforts by the Zimbabwean Ministry of Education and Culture to ensure the population is educated on the importance of a healthy nation (Maravanyika, 1990; Zwane et al., 2022). As such, the youth's health knowledge did not have a single source but was drawn from an array of sources, as noted by Logsdon et al. (2018), in which youth stressed the role of their formal education, after family and community, as sources for their understandings of health.

As highlighted in the quote below, the youth expressed that the school curriculum provided sources of health knowledge that could support them in contributing to and creating more meaningful solutions to their community problems, including identifying sustainable health challenges in their local communities.

> "At school we do topics like personal hygiene, meal planning, good grooming etc. Such knowledge will help us at personal level and as a community."

In addition, knowledge gathered from the school curriculum was seen as useful by youth in navigating their everyday life and societal problems related to health. These problems encompassed technical as well as social, political and ethical dimensions, such as resolving to eat a balanced diet from selected foods in their communities. Consequently, these different sources of knowledges, with sometimes competing health claims, created a picture of the epistemological ecology in which the question was not whether a source of knowledge was truer than another but rather how they could be used in practice (De Sousa Santos, 2007). When engaging with this knowledge ecology, the youth were more like navigators, drawing on all sources of knowledge for the purpose of finding their way to their destination rather than judges in a court deciding on true or false.

## Health literacy and ways to achieve health goals

Navigation by the youth comprised expressing an understanding of health knowledge on offer, evaluating this health knowledge to articulate health goals and thus arriving at a decision of how to act to achieve these health goals as illustrated in the following quotes:

> "Being healthy means one is physically fit, no mental problems and free from diseases."

> "Health is associated with mental wellness and free from diseases."

> "Free from stress and diseases."

Youth expressed physical fitness and mental well-being coupled with freedom from disease as central to their understanding of health. As a result, a shift emerged between their understanding of health and their articulated health goals, with freedom from disease emerging as prominent. As such, the youth expressed understandings of health and made evaluations of these understandings of health. Furthermore, these evaluations drew on more than the health knowledge provided in formal education as the youth also often referenced family and cultural community values as a basis for their health goals. Long life, coupled with freedom from disease, was articulated by the youth as the primary goals for good health. Physical fitness emerged often in the discussions on health goals but was curiously absent from the youth's understanding of health. A shift between the general understanding of health and the health goals of youth could also be seen in the importance given to peace of mind on a general level of comprehension of health compared to the youth's specific health goals. Furthermore, a comparison of interest could be made with what youth's families considered healthy living, where freedom from disease was

emphasised. According to the youth, families emphasised eating nutritious foods and a balanced diet and developing good personal hygiene as health goals, two less prominent areas in the discussions of the youth's own health goals. In terms of conditions for achieving their own and their family's health goals, the youth said the following:

> "Eating a balanced meal, however it's no possible due to poverty."
>
> "Avoiding the unavoidable so called junky foods."
>
> "Avoid drinking fizzy drinks and eating fresh chips and fried chicken often."

Thus, the youth emphasised eating a balanced diet and not eating junk food. The importance of food and diet emerged, especially in terms of traditional foods being a condition for freedom from disease. In the subsequent group interview, questions regarding enabling conditions for health goals shifted further into discussions on food and diet.

Health literacy, as the drawing on sources of health knowledge for health-based understandings, evaluations and decision making, is often presented as the purpose of health education, i.e., that youth should be able to make informed health decisions. Meanwhile, the empirical material and findings showcased that developing an understanding of health, articulating health goals, and how to achieve these goals were stopping short of the full learning process. Students identified health goals as being free from disease, living long lives, and being physically and mentally fit; they also acknowledged the role of food and diet as illustrated in the following quotes:

> "… if we are to live long we should have a balanced diet and exercise."
>
> "We should eat indigenous foods more often for us to live long though they are not appetising."
>
> "Living long and healthy lives we need to have peace of mind, good food and exercise."

The youths thus emphasised diet and eating healthily as conditions for achieving these health goals which where seldom straightforward.

## Determinants of food

The subsequent discussions with the students showed how various factors impacted on their freedom to eat healthily and thus achieve their health goals as illustrated in these quotes:

> "Some of the factors that impact our freedom to eat healthy are that we eat what is available and not what we need."
>
> "Our mothers don't give us freedom to plan the meals; we just eat what has been cooked due to lack of resources."
>
> "We have no room to teach our mothers what, when and how to cook certain foods, e.g. heavy meals like sadza should be eaten during the day and eat mashed potatoes at night because they are lighter than sadza."

We have, in the analysis, categorised these factors as determinants of food, including social availability, political accessibility and commercial affordability, the food policies of Zimbabwe, along with natural disasters such as drought, impact food production, food sourcing and deliveries (Dzvimbo et al., 2018). In the discussion, the youth added complexity to the practice of food consumption and health, as exemplified in these quotes:

> "Things like lack of money, cultural and religious values affect the food consumption negatively."

> "At times even if we have knowledge of what to eat and what not to eat we have no freedom to do the right thing as children you just eat what you have been given and what your parents believe in since us as children have no voice."

> "Almost everyone is now a farmer in this country because everyone has backyard garden, however, lack of money to buy fertilisers and pesticides is a big challenge since it will reduce the quantity of produce."

The youth noted that food consumption was also affected by the ability of both commercial and subsistence farmers to produce enough for the country. The youth posited knowledge of food nutrition as another condition affecting good health. The knowledge of what food to eat and not to eat, rooted in the cultural and religious practices of the community, was said to affect food practices and good health. As part of the subsequent discussions, as the youth expanded on their understanding of healthy and unhealthy food, tension emerged between their understandings of healthy foods and their stated food choices and preferences. On the one hand, specific food sources were highlighted in terms of healthiness as shown in this quote:

> "Foods that are healthy are the indigenous foods like fruits (matohwe, matamba, nyii, tsubvu etc.) and vegetables (nyeve, muboora, blackjack etc.), and unhealthy foods are fresh chips, burgers, fizzy drinks, processed foods etc."

Many youths identified fruits and vegetables, protein and vitamin-rich foods and traditional foods as healthy foods, while unhealthy foods were highlighted as sweet, fatty and fast/junk foods that cause disease and refined foods lacking nutrition. They expressed awareness of the benefits of eating habits and food choices on their ability to be healthy and achieve their health goals, such as preventing getting sick and keeping themselves healthy. On the other hand, the youth also self-reported food choices in line with the following examples:

> "I usually choose unhealthy foods like polished rice, roasted chicken, fresh chips, fizzy drinks etc. However on healthy foods I like paw paws, vegetable salad, brown rice etc."

> "My favourite foods are fresh chips, fish and potato salad, I don't like vegetables at all."

Consequently, choices included both 'healthy' and 'unhealthy' foods: rice, chicken, beef, sadza (maize meal), milk, fruit and vegetables, as valid choices for the youth as ice cream, sweetened yoghurt and fish and chips as well as soft drinks.

According to Herrero et al. (2021), food and eating habits that support one's body and its needs are crucial in achieving health goals. Meanwhile, dietary considerations among the youth also included eating food for 'fun', not necessarily for nutritional benefit, often informed by social media platforms that the youth identified as sources of health knowledge, following formal education and families. The youth linked such habits to what they recognised as unhealthy eating habits, as shown in the quote:

> "Unhealthy eating habits are: eating when not hungry, skipping meals, eating too fast, eating while standing, emotional eating, under or overeating food, eating foods that are low in fibre, food high in fat, salty foods and sugary foods."

> "For most people adding salt to the food on the table is now a habit because before one taste the food they just add salt, which is a bad habit."

In addition, as part of the discussions, the youth drew on indigenous cultural knowledge and values of traditional foods to achieve health goals. The traditional foods highlighted by the youth are all found specifically in local ecological areas, such as mopani worms, flying ants, crickets, and locusts. Set against what the youth described as their sources for information on food, a dynamic of social and commercial determinants of health emerges with the family with its cultural/traditional values representing the primary source of information on health matters.

Furthermore, while the social determinants informed the youth's food choices of family and community, their experienced ability to achieve health goals through their food choices was significantly influenced by food availability, accessibility and affordability. As such, social availability in terms of what was deemed socially preferable or permissible came to play a significant role in framing the youth's food choices and thus in their efforts to translate health literacy into practice. During these discussions, the youth also indicated that the factors influencing food choices were economic, as exemplified in these quotes:

> "Food choices are influenced by factors like affordability, majority cannot afford a basic decent meal due to high cost so people end up just eating what is available, as long as it fills the tummy."

> "On the issue of food policies at least the Government should make sure that all basic foods are subsidised so that people will afford to at least buy basics like meal, sugar, cooking oil, salt, flour etc."

> "Due to floods and droughts the greater part of Zimbabwe is affected by those so people will end up being moved from their homes which leads to food insecurity."

To this end, the youth identified commercial determinants of affordability, such as cost, income and food availability, food policies, droughts and floods. Furthermore, the youth highlighted the social determinants of availability in which food choices and eating habits shifted between locations and groups as salient since their self-reported diet changed when among family or with peers, as well as the skills and time it took to cook what they considered healthy food.

Consequently, in terms of the balance between having enough to eat and eating what students perceived as healthy food, they depended on food availability (social determinants), food accessibility (political determinants) and affordability (commercial determinants). According to the youth, food consumption at the community level depended on the food accessibility based on food deliveries and transport to various areas in Zimbabwe. The transportation of food also depends on fuel accessibility, with the youth suggesting that the government needed to provide an environment suitable for all stakeholders. All stakeholders should be able to access resources to provide food for the nation. Food consumption patterns are thus affected by the accessibility and affordability of food, in addition to social availability locally. These determinants needed to be considered to assess the youth's actual capabilities to realise their health literacy, i.e., making their understanding of health relevant to their life experiences and achieving the health goals and dietary and food practices they articulated.

## Health literacy capabilities

In the findings, youth expressed health literacy in terms of understanding health, evaluating health knowledge in setting health goals and deciding how to achieve these health goals. By expressing both their understanding of health and that of their families, they acknowledged that health can be interpreted in multiple ways. Furthermore, when articulating freedom from disease as a prominent health goal, the youth were not only expressing understandings of health but were evaluating health knowledge(s). This evaluation points towards a decision on how these health goals are to be achieved – through food practices, in which healthy eating was prominent in the youth's responses. This decision illustrates the impact of health knowledge from family and culture on the youth's evaluation of health knowledges into health goals, and the conditions necessary to achieve these, as the families' concept of health, in contrast to the youth's, emphasised diet and healthy eating. Food and healthy eating thus come to bridge the gap between, on the one hand, the understanding and evaluation of health knowledges, leading to health goals, and on the other, decisions and practices aimed at achieving these health goals.

As the youth discussed food and healthy eating during the focus group interviews, the Zimbabwean context came to the fore, in particular, how conditions in the country affected their freedoms and capabilities in terms of health. In this case, the youth's food capabilities emerged as linked to their overall health capabilities. This aligns with Mingay et al.'s (2021) argument for the need to acknowledge how food and health link us to people and places, as food culture and practice are more than individual concerns. Moving beyond

the recurring isolated efforts of individual behaviour change (Kobes et al., 2018; Thomas et al., 2019), this approach takes into consideration the impact of social, political and economic factors (Hedegaard, 2016). In this article, we have explored how food and health become a crucial part of our lived lives through the use of determinants of food. This shifts our attention in ways proposed by Block et al. (2011) towards capturing the social and cultural considerations regarding the role of food in our lives as well as towards engaging with health equity (Walker 2006; Walker & Uterhalter, 2010).

Therefore, the youth's ability and freedom to achieve their health literacies resulting from understanding, evaluation and decisions depended largely on the determinants of food in Zimbabwe. As we saw above, the contextual conditions in Zimbabwe can be sorted into the determinants of social availability of food, political accessibility of food, and commercial food affordability. All three determinants affect the youth's freedom to achieve their valued beings (being healthy) and doings (making healthy food choices). Expanding health education beyond health literacy to health literacy capabilities, as outlined in Figure 1, further enables us to address the tension identified in the findings between knowing and doing. This tension can be addressed by exploring how youth's understandings, evaluations and decisions about health, including setting health goals, intersect with the determinants of food. As such, we consider the youth's health literacy capabilities to achieve non-predetermined health goals that align with their valued beings and doings. The implementation gap between knowing and doing is thus bridged through practices of health and well-being that are contextually grounded in the lives and experiences of the student youth. This aligns with what Hayes-Conroy and Hayes-Conroy (2013) termed the need to re-embody food in our lives by contextualising it within and as part of natural and built environments. As such, food as a topic of education concerned with sustainability extends beyond human health, linking our health to the health of animals as well as the environmental health of ecosystems.

The fact that youth did not always, nor necessarily, choose food following their stated health goals emphasises the necessity to consider what freedoms they have to make healthy/unhealthy choices. Such considerations indicate that while the study focused on understanding health and health goals, the youth expressed additional valued beings and doings in addition to being healthy and making healthy choices that are part of living their lives, i.e., social belonging to a peer group.

## Health literacy capabilities and antimicrobial resistance

The dynamics of antimicrobial resistance (AMR) in the three-way relationship between microbes, pharmaceuticals and human bodies need to be considered within the health literacy capabilities of youth in AMR education (Pithara, 2020). As noted by Haenssgen et al. (2018), relying on awareness raising in addressing AMR has significant limitations pointing to the necessity for participatory educational efforts centred around knowledge co-creation as represented by the present article. Exploring, together with student youth, health literacy capabilities can potentially engage with what Haenssgen et al. (2018)

termed the weak and ambiguous link between awareness, attitudes and behaviour that affect and inform youth's relationship to antimicrobials and resistance (Bloom et al., 2015; Leventhal, 2008; Ribera, 2011; Ocan et al., 2015). The youth emphasised that their health goal of becoming free from disease would lessen their need to visit health clinics and the potential need for and use of antimicrobials. Such considerations can be understood in terms of how development due to microbial exposure and progression of Zimbabwe's most severe infectious diseases, which require treatment with antimicrobials (TB, HIV/AIDS and Malaria), is significantly affected by diet (Chigudu, 2021; Mnguni et al., 2016; Rotheram-Borus, 2009; Hausmann-Muela & Eckl, 2015). Simultaneously, the youth highlighted how the use of antimicrobials in food and animal production, for example, dairy cattle, affected the accessibility and affordability of milk as there was a period after administering antimicrobials in which milk could not to be used for food. As such, the health and AMR educational efforts need to engage with more than individual health literacies of youth and consider how these health literacies intersect with the social, political and commercial determinants to understand what freedoms and capabilities youth have in terms of health literacy. Only then can we explore and understand youth's situated rationalities regarding choices pertaining to health and antimicrobials. Furthermore, such an approach would form the basis for co-creation, together with youth and local communities, of social innovations addressing AMR as a sustainable health challenge.

## Conclusion

This article has illustrated how Zimbabwean student youth possess a deep understanding of what health can be, based on school educational background but also influenced by social determinants of health from family and community experiences and interactions. The students' and their families' definitions of health and health goals emphasised freedom from diseases, eating a balanced diet and physical fitness as key aspects of health. As such, the knowledge sources identified by the participating youth formed the basis for how they expressed understandings of health, evaluated health knowledge(s) to articulate health goals, and made decisions on achieving these health goals, i.e., health literacy. As the youth identified food as a significant condition for their health goals, the article detailed how the youth reasoned regarding healthy/unhealthy foods, their food choices and how these choices were affected by determinants of food. The family and local community, in particular, with their cultural norms and values, formed a significant social determinant and were a major source of health knowledge for the youth.

Throughout the discussions, the youth emphasised prioritisation and balance between having enough to eat and eating what was perceived as healthy food depending on the determinants of political accessibility in agricultural production and transport and commercial affordability of different foodstuffs. To this end, the article illustrated the necessity to engage health literacy as a capability in which students could set their own health goals, and address determinants of food as contextual conditions for achieving their

health goals, thus developing food and health practices that align with their valued beings and doings.

Furthermore, the youth linked AMR to their health goals through the importance of food. They acknowledged how food choices affect the risk of infection, disease and thus the need for medical care and potential usage of antimicrobials, and how the use of antibiotics in food production, such as dairy, would temporarily limit access to valuable sources of nutrition. By considering the social availability, political accessibility and commercial affordability of food in the lives of the participating youth, we have created knowledge regarding their health literacy capabilities to achieve their health-related valued beings and doings, including those relevant to addressing the emerging sustainability challenge of AMR.

From these results and discussions, a series of conclusions and recommendations can be drawn. First, there is a need to consider contextual conditions, as part of both built and natural environments, when engaging in educational efforts to develop student youth's health literacies. Without these kind of One Health considerations, the health we seek to be literate in becomes isolated from the people and social communities we share our lives with, and our health is detached from the environments we are part of and on whose health we depend. Furthermore, when addressing sustainability challenges such as AMR, education can take us further than awareness raising. It allows for the co-creation of knowledge, strengthening the often weak and ambiguous links from being aware and knowing, through developing attitudes and literacies, to establishing behaviours and engaging in a particular practice. In conclusion, when engaging with student youth, the findings support the recommendation of giving attention to the experiences, practices and values of the youth. By creating opportunities for youth to explore their valued beings and doings in relation to the intersection of food, health and AMR as topics for sustainability, there is room to move from being literate about health to becoming capable of achieving health.

## Acknowledgements

The authors would like to acknowledge the valued contributions of school youth to this research.

### Funding declaration

The analysis and write-up of the article for the corresponding author were funded by the Swedish Research Council through the project Living with Microbial Roommates: Health literacy capability in antimicrobial resistance education (Grant number: 2020-04567). Analysis and write-up of the article for co-authors were self-funded.

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## Percentage contribution

| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | Mickelsson | 50% |
| | Usai | 10% |
| | Chinofunga | 10% |
| | Oljans | 30% |
| Data collection | Mickelsson | 0% |
| | Usai | 50% |
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| | Oljans | 0% |
| Analysis and interpretation | Mickelsson | 40% |
| | Usai | 10% |
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| | Oljans | 40% |
| Drafting the paper | Mickelsson | 50% |
| | Usai | 10% |
| | Chinofunga | 10% |
| | Oljans | 30% |
| Critical review of paper | Mickelsson | 40% |
| | Usai | 10% |
| | Chinofunga | 10% |
| | Oljans | 40% |

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# Green Man You Owe Me: Surprises using puppetry with rural children in environmental education

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## Abstract

Wakkerstroom, Mpumalanga, is a rural South African village, set against the backdrop of a wetland, grasslands and rolling hills (Mpumalanga Information Directory, nd). Sadly, children that live here appear to have little concept of the beauty that surrounds them, and do not care for the natural environment. The reasons for this are that they are not exposed to the natural environment other than for available resources, parents are absent due to work commitments or have passed away, and most children here cannot swim, meaning visiting the wetland is dangerous. There are also no parks where they can play. Their view of the environment is litter-infested roads and streams, and informal dumps.

This article explores a single moment of clarity during an intervention using a puppet, that occurred during a programme in 2023 which aimed to reintroduce a group of 31 children between the ages of 11 to 15 from The Clay Educentre to the wonders of nature, using the arts, reflective practice, and immersion into the natural environment. Here I argue that puppetry, in informal environmental education, with reflective practice, has the capacity to be more transformative than other art forms, such as drawing, drama and dance.

***Keywords:*** *applied arts, reflexivity, stop moment, environmental education*

## Introduction: Situating the project

Social ills that were expected to be alleviated under new leadership in post-apartheid South Africa have remained. The Auditor General reported that "only 8% of the total municipalities [257 in South Africa] had a clean audit in the financial year 2017-2018, with irregular spending estimated to be R21.2 billion" (Mishu et al., 2022). Poor service delivery means that the state of littering and informal dumping in underserved areas have become the norm rather than the exception, and this is apparent in the village of Wakkerstroom.

As reported in 2022, the official statistic for unemployment is 38.4% in the Dr Pixley Ka Seme district, in which Wakkerstroom is located (Statistics South Africa, 2022). Child- and woman-headed households are common with 10% of these living in informal dwellings (ibid.). In their study on poverty in South Africa Bhorat and Kanbur (2006) noted that "poverty rates among the non-white population in Kwa-Zulu-Natal increased from 27 percent to 43 percent between 1993 and 1998. Furthermore … approximately


DOI 10.4314/sajee.v39.10
ISSN 2411–5959

70 percent of the poor may be dynamically so, unable to escape poverty". Wakkerstroom is situated on the KwaZulu-Natal border despite being in Mpumalanga, so these statistics apply to the village as well. Poorly maintained infrastructure and a system that cannot cope with new development means that water is available intermittently, with those living at higher lying areas having had little or no water since November 2022.

Having outlined the living conditions of the average residents of Wakkerstroom it is probable that basic survival needs take precedent over a clean and pleasant environment. Furthermore, while natural science and life skills curricula teach children about littering and waste in the environment, this is not followed through with action. The danger of causing eco-anxiety in children is real, where formal education teaches 'doom and gloom' and provides little opportunity for solving problems. Finally, even if children understand the concept of the impact of poor environmental behaviour through what they are taught in schools, their behaviour is shaped at home. This means that other methods of teaching are needed in order to change behaviour and to draw children back to an innate wonder of the environment.

## Access to green spaces

Steyn and Ballard (2013, p. 2) are of the opinion that "South Africa remains a deeply divided society, and even as the fault lines shift and reconfigure, some scholars argue that 'the spatial distribution of housing and communities in cities and towns, remains relatively unchanged other than in limited areas' (Foster, 2005)". This remains apparent in 2023 in Wakkerstroom. They stated too that "small towns offer an interesting site for the analysis of spatiality and identity because people are 'thrown together' more intimately, and there is less room for 'escape' from 'others' than in bigger towns or cities" (p. 3). This is certainly true of Wakkerstroom and eSizameleni, where the disparity of wealth and access to green space is glaringly obvious. Similarly, McConnachie and Shackleton (2010) wrote that "the more affluent suburbs, inhabited mainly by whites, have the lowest density of housing and the highest area of green space per capita" (paragraph four).

The only green space in Wakkerstroom is an immaculate lawn with trees and a rose garden forming the centre of the 'central business district' of the village surrounding the Dutch Reformed Church. This is fenced off. The only provision for children in Wakkerstroom is one broken swing next to the library. This is approximately three kilometres from the township meaning that children need to walk distances to play there. Since very few of the children can swim, playing near waterways unsupervised is not an option.

This means that in a circumference of approximately 25 kilometres there is not one safe, green space for children to experience the wonder of nature, due mostly to the lingering effects of colonialism and apartheid. This is particularly sad because, according to Munien et al. (2015), "there is a growing body of knowledge indicating that the use of green spaces is associated with positive impacts on health and well-being" (abstract; no page number), even more poignant in that Wakkerstroom is renowned for its beautiful nature and is an international birding hotspot.

### The Clay

The Clay Educentre was started by Charity Nsibande in 2015 when she identified a need to support children in reading and English. For a small monthly fee children attend the programme from Monday to Thursday, are given a hot meal, assisted with homework, and offered extra-curricular workshops by volunteers. Importantly too, children who are at risk due to absent parents, child-headed households, alcoholism, and other social problems, are identified and escalated to social workers.

The project that is the focus of this article took place through The Clay. Many research participants were sourced from The Clay for my doctoral study (Preston, 2021) which aimed to use the arts to bridge the gap between behaviour and knowledge regarding environmental behaviour, and it was clear that this could not be achieved in the timeframe of a doctoral study. Therefore, work needed to continue indefinitely once the fieldwork was completed, because without a continuation of interventions it would be impossible to establish if there was any change in environmental behaviour over a short period of time. Where there is legislation built into our national Constitution, and curricula included in formal education with regard to custodianship of the natural environment, poor environmental behaviour pervades. According to Day and Monroe (2000): "Knowledge alone doesn't harm or help the environment. Human attitudes don't harm or help the environment. Human behaviours, on the other hand, have greatly harmed, yet hold a great deal of hope for helping, the environment" (p. 3).

Planning for continued work meant accessing funding and this has not been forthcoming. Therefore, the question arose as to how the work could continue effectively without funding opportunities. This article describes part of a response to this question.

## Project outline

### Objectives

Questions that the project sought to address are:

- How may we reintroduce the wonder of nature to children who have lost this through poor formal education, a lack of opportunity to access nature, and fractured social home environments?
- Will the reintroduction to the wonder of nature create custodianship in children as they grow into adulthood?
- How may we do this with no funding?

### The innate wonder in children

Many authors are of the opinion that children around the world are born with an innate wonder that is fed by the natural environment. As early as 1956, Rachel Carson wrote: "A child's world is fresh and new and beautiful, full of wonder and excitement" (p. 42). Wilson (2010) was of the opinion that "we can count on wonder to enrich and ennoble

our lives" (p. 24). She claimed that wonder is found in children but that this is lost as they become adults (ibid.). We can see the joy in children when they encounter nature, not only in revelling in the moment but also in immersing their bodies in experience. This ability to engage with nature, for the most part, slowly disappears into adulthood.

### The loss of wonder

The structure that children experience in formal education does little to assist in nurturing wonder, since this fails to draw connections between children and the beauty of nature. As Van Boeckel (2013, p. 58) stated: "A major criticism of the kind of education about our natural environment as often practiced today is that it seems insufficiently capable of reaching the hearts and the minds of the learners (cf. Russell, 1999; Sobel, 1996, 2008)".

Randle (1999) stated that "what we want for our children is that they are able to develop their values in a context of reverence for the earth, and for all life, in a context that enables them to deal with their material environment and to make contact with the non-material realities" (p. 61). Considering the discussion above, the question that arises is: How may we do this? Randle suggested that teaching "can be done in an infinite number of places, by an almost infinite number of people, in an almost infinite number of ways" (p. 64). One of these ways is through the arts, and this project is based on the hope that by using the arts and reflective practice with the natural environment as overarching themes, a sense of wonder will be instilled in the children. Because the project is located within informal education it does not have to adhere to formal curricula structures, which means it has the capacity to be fluid, changeable as data emerges, with the children as driving forces. This means that through communicating with the children via their journals, it was possible to gauge what interventions had the best impact on them, ensuring that interest and excitement were maintained, which is not possible with formal pedagogical structures that are prescribed through curricula. This work has a bottom-up approach as opposed to the top-down approach of formal education.

A single moment of clarity during an intervention involving a puppet changed the trajectory of this project. While I do not suggest that formal curricula be replaced, I will show that the fluid nature of informal environmental education, using the arts, has a vital role to play in enhancing what is learnt in formal classrooms.

## Methodology

### Participants

The group was made up of 31 children between the ages of 11 and 15, and they attended either eSizameleni Primary School or Uthaka High School. Children were in grades six to nine, and only three of them were girls.

Interventions occurred once a week at the eSizameleni Primary School which is where The Clay runs from, for one hour from 4pm to 5pm after the formal activities of the aftercare programme.

## Interventions

My doctoral study incorporated many modalities within the arts in order to appeal to all children in some way, to triangulate data, and to adhere to a pedagogical bottom-up approach (Preston, 2021). Furthermore, according to Preston (2022, p. 110):

> In writing about the role of the arts in community-based social change, Etherton and Prentki (2006) argued for a bottom-up approach in which all participants are included. On multimodality, Archer and Newfield have stated that 'multimodal approaches have the potential to transcend, and embrace, multi-linguistic societies' (2014).

It is important that the work with the children of The Clay continues in this manner.

## Art

I have asked the same question that Van Boeckel (2013) has asked: "Can learners connect to nature in new ways through artmaking?" (p. 23). The children of the area have little exposure to the natural environment which is valued only for resources that it affords. My doctoral study revealed, however, that children respond well to the arts, where the interventions included drawing, music-making, and puppetry, among others.

Puppetry particularly is a form of performance that provides the introverted child the opportunity for expression since the 'one degree of separation' that a puppet affords means that it is the puppet speaking and not the child. And as Britts et al. (2016) have stated: "A puppet creates a space between itself and the puppeteer, the various roles can encourage even shy learners to become part of the social learning process" (p. 520); this is exactly what occurred in my work.

Furthermore, Britts et al. (2016, p. 519), whose work takes place within the formal education sector, referred to Keogh et al. (2008) in showing that "teachers who use puppetry noticed that it created the opportunity to present authentic problems rooted in children's everyday experience, enabling them to readily identify with the problem and with the puppet character". Puppetry has also been used extensively in informal education, as outlined in the writing of Kruger (2008), who listed numerous organisations that have, and still are, using puppetry in successfully disseminating knowledge on issues such as HIV/Aids, political and environmental issues. Kruger is of the opinion that the puppet's "combination of lifelessness and imagined life explains the puppet's extraordinary freedom, which allows it to touch on any social idea and convention" (p. 26), and herein lies the value of puppetry in both formal and informal education. It is the art-form of puppetry that provided the 'stop moment' that is the focus of this paper.

## Reflective practice

Since I believe that reflection in any form has the capacity to be transforming, this is an important aspect of the project. Despite knowing that journalling is not for everyone, it is important that it is taught to children so that they can learn that this is an option for

them. In this context the children were provided with books where they were encouraged to reflect on interventions either textually or graphically.

The children gave me permission to read their journals. Through this I could gauge their responses, and thus plan for future interventions, meaning that learning could remain fluid and unstructured. This cannot occur in formal education due to the constraints of a structured curriculum.

Using the arts as expression and as a means of reflective practice has many positive implications for me as facilitator: the children love the arts and this feeds into their innate sense of wonder mentioned above, and I could gain insight into perceptions that children have on the natural environment through this and through their journals.

## Structure of the interventions

If weather permits the children are taken outside the classroom. As much as this is not a natural environment, this does afford the opportunity for the children to be on grass, surrounded by some trees and views of domestic animals. This also enabled me to space the children out; in the classroom the children are often squashed three to a desk.

Warm-up exercises were followed by discussions on topics focussing on environmental themes. The topic chosen for the day was outlined by me, and this was followed by a facilitated discussion; these were fluid and led by the children themselves, and they were encouraged to voice opinions and discuss the topic between themselves. Often discussions began with a question, such as: Do you think that trees can think? Here it is important that the children's focus is drawn away from litter and dumping and towards the delicate and detail of nature, such as looking carefully at a tree, touching it and examining the textures of leaves and bark, as opposed to the waste dumped at the foot of the tree.

A period of quiet reflection formed the end of the interventions. Here the children sat by themselves and wrote or drew in their books. They were encouraged to respond in any way they chose. The intention here was to encourage personal thought that does not adhere to strict teaching, formal curriculum content or opinion of peers.

## Immersion in nature

I agree with Lehtonen et al. (2014), who referred to Snaza et al. (2014) when they claimed that "information becomes alive and meaningful, if we experience it with our bodies" (p. 351). It is for this reason that I endeavoured to take the children outside as much as possible. I hoped that the content of interventions could be experienced with all the senses, for example touching the bark of a tree, smelling the ground that the tree lives in, and listening to wind in branches. This is as opposed to the dry text-based information in the classroom which is generally what South African formal education affords. Van Boeckel went one step further saying that "it is nature that shows the way" (p. 84).

Returning to Wilson (2010):

> We provide opportunities for them to experience beauty; we draw attention to beautiful things; and we encourage children to create and represent beauty through the mediums of art, dance, and music. These efforts are based on the understanding that putting children in touch with beauty will enrich their lives and foster their sense of wonder… (p. 25)

The interventions in this research programme were based on these principles.

## The stop moment

### Green Man puppet story

Building on interventions where trees were discussed I used a rod puppet to tell a story about a baobab tree. The story tells of a child called Thandi who cannot speak, and is friendless in her village. However, she does have a friend in a giant baobab tree which she climbs every day and communicates with. One day the baobab tree sees a violent storm brewing and tells Thandi to warn the villages. Gesturing, she brings the villagers, including all their livestock, to the tree who opens his trunk thereby saving them all. However, because the tree was hit by lightning, the next morning he is dead. Thandi is inconsolable, but lying weeping at the foot of her friend her hand finds a seed. The voice of the tree tells her that if she plants the seed and tends it, he will return. The child does this with the help of the villagers but it is only generations later that children are able to climb the slow-growing tree.

**Figure 1:** *Green Man puppet*

Importantly, the rod puppet, named Green Man (see Figure 1), is presented as a character that also cannot speak, since he is a spiritual being who communicates with the puppeteer through gesture and emotion. It is thus the puppeteer who tells the story.

### Impact

Fels (2008), referring to Appelbaum regarding a moment of clarity when teaching children using the arts, described a stop moment in this way:

> Appelbaum (1995) calls a 'stop' a moment of risk, a moment of opportunity. A stop is a moment that calls us to attention. A stop signals a new awareness of possibility, a recognition of oneself in relation to others and one's location, as if for the first time. A stop reminds us – as individuals, as educators – how we are shaped by our habits of action, language, authority, location, and context. (p. 5)

For the first time since the beginning of the project the children were attentive, and engaged. When the story was finished, they burst into applause. Again for the first time, when tasked with reflection in their journals they were quiet, did not attempt to disrupt others in their work, and wrote for a comparatively long time. When they were all finished, I asked them what they were feeling. Some said they were sad, others that they felt happy, others that they loved Green Man.

When one boy indicated that he wanted to hold the puppet I said that if he was to hold it, he needed to tell a story. In the end three boys told stories of their own. Importantly, they all grasped the concept of the puppeteer being the story-teller with the puppet whispering the story in their ears. Furthermore, the stories were original and impromptu, all with environmental themes, such as a story about a boy whose best friend was a tree and who went to his teacher to ask for a seed after he discovered that his neighbour had chopped down the tree, and a story about how a child was raised by baboons who then needed to be respected. Finally, a boy who could not write and who was generally the most disruptive was able to tell a story and manipulate the puppet better than his peers. This experience was corroborated by a study on using puppetry in story-telling for learning in children undertaken by Syafii et al. (2021), who concluded that:

> ...the story-telling technique utilizing puppets is effective in progressing not only the speaking ability of the students in terms of telling a story (narrative texts) but also their participation in the teaching-learning process and their fun in learning English. The utility of medium (puppets) helped both the lecturer and the learners. (p. 338)

The Green Man puppet moment was transformative in the following ways:

- The puppet brought out communication skills in children that they were previously unable to articulate through the written or spoken word.
- Children created their own stories through the puppet; all stories that had environmental themes, which enabled me as researcher to gauge impact of prior interventions more effectively.

Because I was not following formal education curriculum it meant that I could change the trajectory of the planned interventions in a way to continue the learning that was happening.

Fels (2015) referred to a stop moment as "a potential call to action, an in-between space of engagement like the pause between exhalation and inhalation" (p. 478). More importantly for the moment that the Green Man performance afforded, and in the context of my work with the children, she continued thus:

> Noticing and attending to stop moments, through reflection, dialogue, writing, creating anew, invites new possible actions of choice. A stop moment offers awareness of possibility; through reflection, we come to consider new possible choices of action in interaction with our environment, context, relationships, ourselves, recreating the worlds we create. (ibid.)

From this stop moment I decided to focus entirely on puppetry. Over the course of the first semester the children were introduced to five rod puppets, each of whom had a story to tell that had either an environmental theme or a moral. For example, the puppet Gogo told a story of how she had rescued a jackal pup whereafter the mother jackal saved Gogo's sheep from being attacked by hyenas, and the puppet Goat Man recited a poem about twins who cleaned up litter from a river. The stop moment provided insight which changed the trajectory of the project, and led to a structure for interventions for the rest of the year where a puppet would tell a story, the children would use the puppet to tell their own stories, and then they would reflect on this in their journals. Included in this was puppet-making, manipulating and story-telling by the children themselves.

## Discussion

My doctoral study (Preston, 2021) showed that the arts have an important role to play in environmental education. I found that awareness can be raised in both children and adults through applied drama. The building on knowledge that I outlined was the bridging of the gap between legislation, and formal and informal curricula that do not consider implementation or follow through, and this gap was filled using the arts (ibid.). The moment described above shows how powerful puppetry can be in comparison to other art forms. Children that are unable to articulate in second language, both verbally and/or written, were able to not only make up a story confidently in the moment, but also tell the story through a puppet. This shows the power that the one degree of separation a puppet provides: it is the puppet that tells the story and not the child. Furthermore, in this context where the puppet character is unable to speak, the children were able to embrace this with ease. The children engaged with the puppet as it 'whispered in their ears' and then engaged with their audience as they told 'its' story.

The impact of the puppets was corroborated by the written and graphic responses of the children in their journals, and herein lies the value of reflective practice. Without these responses, which I was able to refer to at any time and reflect upon in my own journal, I would not have gained valuable insight into successes or failures of the work. Furthermore, I could change the trajectory of interventions if there was no indication of success. Regarding the Green Man story, the entries clearly showed that the children understood the story, the message, and the notion of a puppet that tells a story. Two boys wrote letters to Green Man; one rather poignantly wrote "Green Man, you owe me. Where can I see this giant baobab trees [sic]?" while the other boy wrote:

> Green Man I write you this letter because your story was great and that BioaBere tree and saved the people and got stroke by lightning it was very sad because the tree lived many years (where you at Thandi I feel very sorry for you) good by Green Man until we meet again. [sic]

Another child showed compassion for Thandi, saying:

> Green Man I like your story but I do not like that Thandi cannot talk. I like to have friend like Thandi have. I like to talk with the tree if I was Thandi I will give him a name I will call him Jack. [sic]

This entry was important as it showed the child had made a connection to an earlier discussion around the possibility that trees have feelings and the ability to communicate. It is often said that if we name something then we have to love it, and if this is true, it is even more meaningful that the boy wanted to give a name to his tree friend.

Some of the children chose graphic reflection, and these are discussed below.

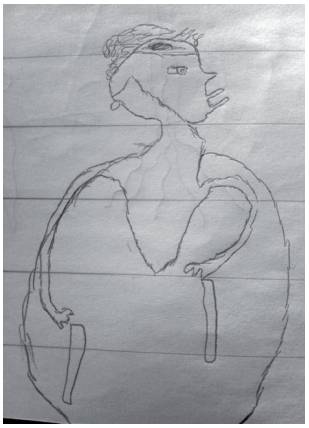

**Figure 2:** *Drawing 1 of Green Man puppet*

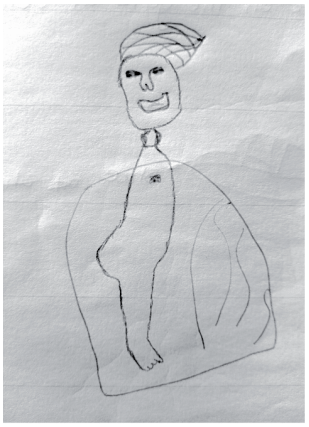

**Figure 3:** *Drawing 2 of Green Man puppet*

Figures 2 and 3 are images of the internal workings of the puppet. This indicates an interest to learn about the mechanism of puppet-making and manipulation.

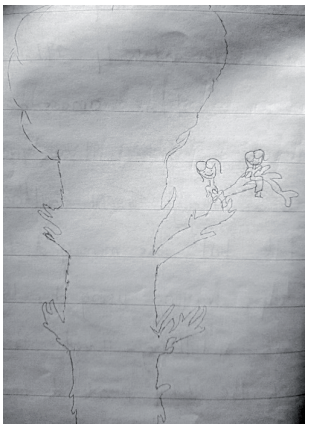

**Figure 4:** *The new baobab tree*

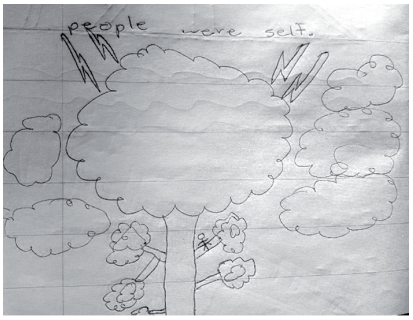


**Figure 5:** *Baobab being sruck by lightning*

Figure 4 is of the descendants of Thandi's village sitting in the new baobab tree.

Figure 5 shows the baobab, people taking shelter from the storm, and the lightning that killed it.

If we examine these in terms of the aims of this project, it is clear that a sense of wonder was instilled in the children through this intervention. This is both in the wonder that the puppet itself afforded, and in the content of the story. How does the puppet work? Can a baobab tree really be that big? Can a tree be a friend? These are questions that the children grappled with in post-intervention discussion and in their journals.

It is not possible to definitively make conclusions from the children's graphic and textual reflections to the story and the puppet. That the children embraced puppetry as a preferred art form over others cannot be disputed. Their reflection showed remarkable difference in structure, thought, articulation and ability when reflecting on the puppet compared to other interventions where entries were short, nonsensical, or mentioned other non-related topics. Their ability to reference the story and retain the message was apparent, reinforced by what was found in their journals. The physical reaction to the puppet was also completely different in that the children became attentive and engaged, and this did not abate when I continued to use puppetry after the stop moment. Whether this means that the children will become custodians of the natural environment in the future remains to be seen, but it is clear that small achievements can be made with no funding. Whether the children will actively take note of the beauty that surrounds them having been exposed to these interventions, specifically puppetry, and whether they take action to alleviate the littering and dumping that surrounds them also remains to be seen.

## Conclusions

In my work with the children of The Clay, where all art forms have a place in informal environmental education, puppetry has emerged as one of the strongest and most effective. Indeed, Brits et al. (2016) are of the opinion that "this resource [puppets] and pedagogy [puppetry] can be used in student-teacher education, teacher training, presentations for learners and community outreach projects" (p. 516). The use of puppets engages the children in ways that seem to transform their responses from apathy to excitement, and to enable them to tell their own stories, both with environmental and social content. It is for this reason that the interventions planned for 2023 changed, and will continue to do so as responses from the children emerge.

The importance of the stop moment cannot be underestimated. Here I argue that it is informal education using the arts, immersion into nature, and reinforcement of content through reflective practice that has the capacity to bridge the gap between knowledge and action, despite this only being visible in the years to come as they grow into adulthood. This, too, is why the work with the children of The Clay will continue indefinitely. Possibly more importantly though, is the fluidity that informal interventions afford, where children are the drivers of the process as opposed to top-down curricula that prescribe teaching in formal education.

## Notes on Contributor

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# Africanising Distributed Leadership in Environmental Education Curriculum Management

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## Abstract

Distributed leadership (DL) is a collaborative leadership approach that involves sharing decision-making and responsibilities among multiple individuals or groups within an organisation or institution. In the context of environmental education (EE) curriculum management, DL holds significant relevance and can bring several benefits to stakeholders. This article critically examines the concept of DL in EE curriculum management and argues for an Africanised approach. It is focused on but not limited to institutions of learning. Managing EE curricula shows minimal consideration of Africanised DL. Drawing on an African philosophy of ubuntu, the article argues that an Africanised approach to DL can better serve the needs of African communities and promote sustainability in the region. As a conceptual article, we explore relevant literature to advance the idea of DL from an African perspective. In an era of environmental crisis and degradation in South Africa and other parts of the continent, an Africanised DL on EE curriculum management has the potential to offer relevant solutions. The article concludes by reflecting on the Africanisation of DL and making recommendations for implementing an Africanised approach to DL in EE curriculum management.

***Keywords:*** *Africanised distributed leadership, distributed leadership, environmental education, environmental education curriculum management, ubuntu*

## Introduction and background

Environmental education (EE) is an essential component of modern educational systems as it equips learners with the knowledge and skills necessary to address the environmental challenges that our planet faces today. Distributed leadership (DL), which involves the sharing of leadership responsibilities across various stakeholders, is an effective approach to managing the EE curriculum (Harris, 2008; Shabalala, 2023). The critical role of educational leadership in Africa and globally is underscored by its profound impact on the overall success and effectiveness of educational institutions (Msila, 2014). In recent years, the concept of DL has gained prominence in educational management due to its distinctive features (Shava & Tlou, 2018). DL is characterised by a collaborative and decentralised approach to leadership, emphasising shared decision-making and responsibility among various stakeholders within an educational institution (Naicker & Mestry, 2011).


DOI 10.4314/sajee.v39.11
ISSN 2411–5959

Unlike traditional hierarchical leadership models, DL fosters a more inclusive and participatory environment (Galdames-Calderón, 2023). This approach has been associated with improved learning outcomes, as it leverages the collective expertise and contributions of individuals throughout the organisation (Shava & Tlou, 2018). In this light, DL offers a departure from the conventional top-down leadership style by promoting a more adaptive and responsive organisational structure that is better suited to the dynamic challenges in modern education. However, this leadership model lacks African perspectives to make it more suitable for unique cultural and societal contexts. In African cultures, leadership often embodies communal values, where decision-making is collaborative and involves various community members. Leadership can be viewed not solely as an individual endeavour but as a collective responsibility. Moreover, patriarchal structures have historically played a role in shaping leadership dynamics within African societies, influencing power distribution and decision-making processes.

To address these cultural differences, we propose an Africanised approach to DL that integrates these communal and patriarchal elements, not disregarding the critical role of the aunts that defy gender disparities, thus making the Africanised DL a fit within the transformational agenda. This adaptation seeks to align DL with the rich tapestry of African cultural values and societal structures, ensuring that the leadership model resonates with the diverse contexts in Africa. By incorporating African perspectives, DL can be more responsive to the cultural intricacies that shape leadership dynamics in the region. Such perspectives can also transform the corpus of literature on DL that is mainly oriented to Western contexts where cultural, social and environmental contexts are vastly different from those in Africa. For instance, studies by Harris (2013), Botha and Triegaardt (2014), Botha (2016), Northouse (2016), and Szeto and Cheng (2017) followed a Westernised approach to DL, even though some were conducted in South Africa. Moreover, these studies primarily focused on leadership dynamics within educational institutions but did not specifically address EE curriculum management. This approach often neglects the unique cultural, social, and contextual factors present in African settings. This observation is particularly pertinent in the realm of environmental issues and risks. Western-centric DL literature often focuses on environmental challenges and solutions within the context of Western societies, overlooking the unique dynamics present in African environments. When applied in an African context, a Westernised DL model may not adequately account for cultural differences, socio-economic factors and environmental dynamics.

The findings from the above studies vary. While some indicate positive outcomes from the implementation of DL, others highlight challenges in the adaptation of Westernised DL models to the South African context. Factors such as cultural differences, the need for a more contextually grounded leadership model, and considerations specific to the South African educational landscape were identified as influencing the effectiveness of DL. It is important to note that these studies did not specifically explore DL in the context of EE curriculum management. This has led to a gap in the literature regarding the application of DL in an African context. The identification of this gap is rooted in our comprehensive review

of existing studies. Our analysis revealed that these studies, while contributing valuable insights, predominantly followed a Westernised approach to DL, and the findings may not be fully transferable to the unique cultural, social, and environmental contexts of African nations. Our current work builds upon this foundation by examining the application of DL principles specifically within the realm of EE curriculum management in South Africa. We aim to contribute insights into the challenges and opportunities unique to this domain, considering both the successes and limitations observed in the broader studies cited.

In the African context, environmental issues are intricately tied to cultural and socio-economic factors, and the approach to addressing these challenges requires a deep understanding of local perspectives. For instance, the issues of poverty, pollution, climate change, etc are some of the challenges facing societies in Africa. Therefore, our work aims to bridge this gap by contextualising DL within the African environmental landscape, considering the distinctive challenges and opportunities present in the region.

Additionally, the lack of studies specifically investigating DL in the context of EE curriculum management in Africa became evident during our literature review. The few existing studies on DL in educational settings in Africa often did not cover the specific challenges and opportunities posed by the environmental and cultural diversity of the continent. Therefore, the identified gap arises from a synthesis of findings that collectively underscore the need for research that directly explores the application of DL principles within the context of African educational systems, particularly in the context of EE curriculum management. Our current work seeks to address this gap by providing a focused examination of DL in the African context, contributing to a more nuanced understanding of its potential impact and challenges in this unique setting. Thus, this article critically examines the concept of DL in EE curriculum management and argues for an Africanised approach. The focus is on but not limited to the learning institutions. Equally, leadership is not limited to educators and heads of institutions.

Louw (2010) describes Africanisation as a renewed focus on Africa – reclaiming what has been taken from Africa – and the emergence of a new sense of pride. In the context of this article, Africanisation refers to a deliberate effort to infuse African cultural perspectives, values, and indigenous knowledge into the framework of EE curriculum management and its leadership. What has been taken, in this context, pertains to the historical underrepresentation and marginalisation of African perspectives in the design and implementation of EE curriculum management. Traditional Westernised approaches may not fully capture the rich diversity of African environmental knowledge and practices. This gap in representation has implications for effective leadership in EE curriculum management, as it may not resonate with the cultural variations and environmental challenges unique to Africa. Africanisation, as advocated in this article, involves reclaiming and integrating indigenous African knowledge systems into EE curriculum management, fostering a renewed sense of pride in local environmental practices. By doing so, we aim to contribute to a more culturally responsive and contextually grounded leadership approach that aligns with the distinctive needs of African educational settings.

Sankofa Youth Movement (n.d) defines Africanisation as embracing African people's heritage and developing a sense of loyalty towards the Motherland – Africa. In the context of EE curriculum management processes, Africanisation signifies a transformative approach to curriculum design, implementation, and leadership that is grounded in African cultural values, knowledge systems, and environmental practices. Specifically, the integration of Africanisation into EE curriculum management involves the inclusion of African perspectives, indigenous knowledge, and cultural elements within the EE curriculum content to reflect the diverse environmental practices and values of African communities; adoption of teaching and learning methods that align with African learning styles, which incorporate storytelling, experiential learning, and community-based approaches to engage learners in environmental education; and fostering a leadership approach that recognises and values African cultural heritage, promotes inclusivity and acknowledges the importance of community involvement in decision-making processes related to EE curriculum management.

We relate Africanisation to a multifaceted movement with social, political, and cultural dimensions, all aimed at promoting African identity, values, and interests in the environment. In the social context, Africanisation involves a collective effort by individuals and communities to reclaim and celebrate their cultural heritage, fostering a sense of unity and pride. This aspect emphasises community engagement, grassroots initiatives, and social mobilisation to integrate African perspectives into various aspects of life, including environmental consciousness. From a political standpoint, Africanisation signifies advocacy for policies and strategies that recognise and prioritise African values in environmental decision-making. This dimension involves engaging with governmental bodies, policymakers, and institutions to influence legislation and governance structures that reflect and respect the unique environmental perspectives of African communities. In the cultural sphere, Africanisation manifests as a revival and promotion of traditional knowledge systems, rituals, and practices related to the environment. It seeks to embed cultural values into EE and management, ensuring that these practices are considered and respected in the broader discourse on sustainability and conservation. Collectively, these dimensions constitute a dynamic movement that seeks to bridge the gap between global environmental ideals and the diverse, culturally rich context of Africa. By incorporating social, political, and cultural elements into the discourse on Africanisation, we aim to contribute to a more holistic understanding of its implications for promoting African identity, values, and interests in the environmental domain.

The call for community involvement and participation in EE programmes is rooted in the broader context of Africanisation, emphasising the social, cultural, and political dimensions. It represents a tangible step towards promoting sustainable development outcomes by integrating African perspectives into environmental education and decision-making processes. Community involvement and participation ensure that EE programmes are culturally appropriate, relevant, and sustainable in the long run. A study by Zikargae et al. (2022) in Ethiopia focussed on empowering rural society through non-formal EE and

showed that the skills and knowledge imparted through EE were important for implementing community projects, helping to improve community participation in raising environmental quality, thus improving environmental performance, farming methods, and livelihood situations.

In this article, an African community refers to a group of people living in Africa, who share common cultural, social, and environmental contexts. Though African communities are diverse and unique (Idang, 2015), there are common lifestyles, practices, knowledge and skills that are framed in 'ubuntu'. Ubuntu, in the sense of DL and EE, addresses the need for people to work together in addressing environmental issues for the benefit of all. While both ubuntu and DL emphasise collaboration and collective action, they differ in their underlying principles and application. Ubuntu is a philosophical and ethical concept rooted in African communalism. It emphasises interconnectedness, shared humanity, and the well-being of the community. In the context of addressing environmental issues, ubuntu calls for a sense of collective responsibility, where individuals work together harmoniously to address environmental challenges. The focus is on the shared benefits and interconnectedness of all living beings and the environment. DL, on the other hand, is a leadership model that distributes leadership responsibilities and decision-making throughout an organisation or community. It involves the empowerment of individuals at various levels to contribute to leadership functions. In the context of EE, DL may manifest as collaborative decision-making among teachers, learners, and community members in designing and implementing EE programmes. While ubuntu underscores the communal and ethical dimensions of working together for the greater good, DL focuses on the distribution of leadership roles and responsibilities within a structured framework. In the context of addressing environmental issues, both concepts advocate for collaboration, but ubuntu is more rooted in ethical principles, while DL is a specific leadership model that can be applied within various frameworks.

Leadership in African communities is guided by a communal lifestyle and approach toward activities that are enshrined in ubuntu (Murove, 2019). We found the Tswana proverb, *kgetsi ya tsie e kgonwa ke go tshwaraganelwa* (work is easier when people work together) which highlights an element of DL, suitable to frame this study. This is premised on the fact that community involvement, support and participation are essential for the success of EE programmes (Kinyata & Abiodun, 2020). We believe that DL is well expressed through this proverb. EE curriculum management that aims to promote sustainable development must suit the cultural and societal contexts of the local community. It must consider the unique characteristics of the community concerned to provide relevant solutions (Chinyamurindi, 2019). DL, also known as shared leadership – *tshwaraganelwa* (work together) – refers to a leadership approach that involves multiple individuals sharing leadership responsibilities and decision-making processes.

We argue that DL can be Africanised to take the form of an ubuntu-based *letsema* (social corporate) that gels well with *kgetsi ya tsie e kgonwa ke go tshwaraganelwa*. In this context, ubuntu introduces unique values and principles that serve as a significant value that adds

to the conceptualisation and enactment of DL in the African context. The value that ubuntu brings to the conceptualisation and enactment of DL lies in its ability to infuse communal ethos, ethical foundations, and a holistic approach. Ubuntu, rooted in a communal ethos, emphasises the interconnectedness of individuals and the importance of collective well-being. By integrating ubuntu into DL, the leadership model becomes infused with a sense of shared responsibility and collaboration, aligning more closely with the African cultural and social fabric. In addition, ubuntu places a strong emphasis on ethical considerations, moral values, and the inherent dignity of individuals. Infusing DL within ubuntu values adds an ethical foundation to leadership practices, promoting fairness, inclusivity, and a genuine concern for the welfare of the community and lastly, Ubuntu encourages a holistic approach to problem-solving, considering the broader impact on the community and the environment. This holistic perspective aligns with the sustainable and interconnected view of leadership required in addressing environmental issues, complementing the objectives of *Kgetsi ya tsie e kgonwa ke go tshwaraganelwa*. This, we argue, enhances the adaptability and effectiveness of DL within the African context, particularly in the realm of environmental leadership. The ubuntu philosophy believes in group solidarity, which is central to the survival of African communities (Mbigi & Maree, 2005). It is associated with DL because DL promotes distribution of roles which is an element of solidarity to achieve a specific objective.

The Africanisation of DL in EE curriculum management is essential for promoting contextually relevant education that responds to the unique needs of African communities. This idea supports UNESCO's (2015) emphasis on the need for education to be culturally relevant and sensitive to local contexts. EE is not simply about transferring knowledge; it also involves shaping attitudes and values toward the environment, which can have a significant impact on sustainable development outcomes (Tidball & Krasny, 2010). Africanising DL has the potential of infusing the leadership model with African cultural values, communal ethos, and collaborative principles. DL, in essence, is characterised by the distribution of leadership responsibilities and decision-making throughout an organisation or community. In the context of EE, Africanising DL adds value in several key ways such as through cultural alignment, respect for indigenous knowledge and community collaboration. While participatory community-based action research may already embody certain principles of Africanised DL, explicitly incorporating African cultural values into DL frameworks ensures a more intentional and focused effort to align leadership practices with the unique context of African communities. This will ensure that the values and practices that are developed are consistent with local cultural norms and practices to enhance their effectiveness and sustainability (Jones et al., 2019).

Therefore, there is a need to study the Africanisation of DL for EE curriculum management. This study draws on relevant literature and case studies to explore how DL can be adapted to suit the cultural and societal contexts of African communities while still maintaining its effectiveness in promoting sustainable EE. Therefore, there is a need to

review literature on EE curriculum management, Western models of distributed leadership, African philosophy, and community and Africanising DL for EE curriculum management.

## EE in a secondary school context

EE plays a pivotal role in shaping the mindset, knowledge, and behaviours of learners towards environmental issues and sustainability (Boca & Saraçlı, 2019; Mashaba et al., 2022; Fang et al., 2023). By integrating EE into the curriculum, educational institutions have the unique opportunity to equip learners with the necessary skills and values to become active stewards of the environment (Potter, 2009). Carr and Plevyak (2020) emphasised that EE in schools catalyses developing ecological literacy, promoting a deep understanding of the interconnections between humans and their environment. We opine that EE goes beyond traditional subject matter by providing learners with the knowledge and tools to analyse complex environmental challenges, such as climate change, biodiversity loss, and resource depletion. By engaging learners in real-world problem-solving and critical thinking, EE can cultivate a sense of responsibility and agency, empowering them to act for a more sustainable future (Singh-Pillay, 2023).

To maximise the impact of EE, its integration into the school curriculum is crucial. Hence, EE was integrated into all school subjects (Damoah & Adu, 2019) in South Africa to offer an interdisciplinary approach which is supported by the White Paper on Education and Training (1995). The approach enhances learners' understanding of environmental concepts (Hoang, 2021). Incorporating environmental themes into diverse academic subjects helps learners grasp the complexities of environmental issues from multiple perspectives (Buckingham & Turner, 2008). This integration also facilitates critical thinking, problem-solving, and the ability to appreciate the interdependence of environmental factors (Winther et al., 2010).

Environmental issues are intricately connected with social and economic aspects of society. Through an interdisciplinary approach, learners can recognise how environmental degradation impacts human societies and economic systems (Ardoin et al., 2020). Research has shown that understanding these connections fosters a sense of responsibility towards sustainable practices and encourages active participation in environmental conservation (Wang et al., 2020). By studying the social and economic implications of environmental issues, learners can become better advocates for positive change in their communities (Winther et al., 2010).

In secondary schools, however, learners mostly learn within classrooms (Shabalala, 2019); teachers and school administrators encounter challenges when integrating outdoor education in schools (Patchen et al., 2022). Challenges include limited opportunities presented to teachers to take learners outside; logistical issues such transportation, safety concerns, and supervision; curriculum and standardised testing, etc. Indoor learning denies learners their actual interaction with the environment and experiential learning which is a critical teaching strategy in indigenous communities considering that such communities live close to nature – nature is their 'motherland'. Experiential learning can play a vital role in deepening learners' connection with nature and strengthening their engagement in EE.

Field trips to natural habitats, outdoor activities, and hands-on projects provide learners with direct experiences of the environment, which enhances their emotional and cognitive connection to nature (Whitburn et al., 2023). Such immersive experiences have been shown to improve learners' attitudes towards environmental issues and boost their motivation to participate in environmental conservation initiatives (Fang et al., 2022). However, once-off trips may not be effective. Regular outdoor teaching, even on a school campus, can fulfil experiential learning.

## EE curriculum management

EE curriculum management refers to the planning, implementation, and evaluation of educational programmes aimed at promoting environmental awareness, knowledge, and skills (UNESCO, 1994). It involves the development of curricular materials, selection of appropriate teaching methods, assessment of learners' learning, and continuous improvement of the programme over time. One of the key challenges teachers face in EE curriculum management, however, is the need to address the interdisciplinary nature of environmental issues. As noted by Winther et al. (2010), environmental problems require an understanding of scientific concepts and an appreciation of social, economic, and political factors. Therefore, EE programmes must incorporate a variety of disciplinary perspectives to provide learners with a comprehensive understanding of environmental issues.

Another challenge for teachers in EE curriculum management is the need to align curriculum goals and objectives with educational standards. This challenge primarily pertains to aligning with education standards, which encompass overarching guidelines set by national educational authorities. These standards may include general educational goals, competencies, and outcomes that cut across various subjects and disciplines. Additionally, subject-specific learning outcomes within the broader framework of national education standards pose a specific challenge. Teachers must navigate the intricacies of aligning EE curriculum goals with subject-specific objectives related to EE. This involves considering the knowledge, skills, and attitudes that learners are expected to develop in the context of EE within the broader subject-specific curriculum. Therefore, the challenge extends beyond aligning solely with subject learning outcomes to encompass a broader alignment with national education standards. Navigating both layers of standards is essential for ensuring that EE curriculum objectives not only meet the specific goals of EE but also align with the broader educational framework set by the Department of Basic Education (DBE). This requires careful consideration of the knowledge, skills, and attitudes that learners should develop through the programme, and the most appropriate methods for assessing their achievement.

Effective EE curriculum management, as discussed, involves ongoing evaluation of the programme to identify strengths and weaknesses and make improvements over time. This statement primarily refers to EE programmes that are integrated into the formal school curriculum. The evaluation process includes assessing the effectiveness of curricular materials, teaching methods, and the overall impact of the programme on

learners' environmental awareness, knowledge, and skills. While the focus is on formal school curriculum integration, it is important to note that similar principles of ongoing evaluation can be applied to extracurricular EE programmes. In both contexts, the goal is to continuously assess and enhance the quality and impact of EE initiatives. The specific methods and criteria for evaluation may vary between formal curriculum-based programmes and extracurricular activities, but the underlying principle of ongoing improvement remains fundamental. Evaluation can take many forms, including learner assessments, surveys of programme participants, and analyses of programme outcomes. According to Gough (2016), evaluation can help to ensure that EE programmes meet their intended goals and can inform decisions about future programme development.

Overall, effective EE curriculum management requires a coordinated effort among teachers, administrators, policymakers, learners, and communities by incorporating multiple disciplinary perspectives, aligning curriculum with educational standards, and evaluating programme effectiveness. Outdoor teaching can make teachers and learners connect and partner with communities. However, Western models of DL limit this possible collaboration. While it is assumed that collaboration already exists, it is essential to consider the potential limitations or cultural differences within the existing collaboration, which may have been influenced by Western models. The call for Africanisation is rooted in the recognition that, despite existing collaboration, there may be aspects of the current approach that do not fully align with the cultural, social, and environmental contexts of African communities. Africanisation seeks to enhance collaboration by infusing African cultural values, perspectives, and community-oriented approaches into the collaborative processes of EE curriculum management. This intentional shift aims to foster a more inclusive, culturally relevant, and effective collaboration among stakeholders.

## Western models of distributed leadership

Western models of DL have been developed to provide a theoretical framework for understanding how leadership can be distributed among different individuals or groups in organisations. Spillane's model (2005) outlines a Western approach to DL that is commonly enacted in organisational and educational settings. In Western contexts, DL is often enacted through a structure that disperses leadership responsibilities across various levels of an organisation (Spillane, 2005). Formal leaders such as administrators and department heads collaborate with informal leaders, including teachers or team leaders, to collectively contribute to decision-making and organisational goals. Enactment of Spillane's (2005) model involves shared decision-making processes. Formal leaders are encouraged to involve other stakeholders in decision-making, seeking input and feedback from individuals at different levels of the organisation. This shared decision-making fosters a sense of collective responsibility and a more inclusive leadership culture. Spillane's (2005) model emphasises the importance of coordination and communication among leaders at different levels to achieve organisational goals.

Gronn (2002) proposed that leadership is not solely the domain of individuals in formal leadership positions, but rather is distributed across individuals and groups in an organisation. Gronn's model emphasises the importance of leadership practices such as empowerment, collaboration, and shared decision-making (Gronn, 2002). Harris's (2008) proposal was that DL can be understood as a process of interaction among individuals and groups in an organisation. Harris's (2008) model emphasised the importance of social relationships and communication in the distribution of leadership and highlights the role of trust and shared values in effective leadership practices. Bolden's (2011) four-fold model proposed that leadership is distributed across four domains, which are individual, team, organisational, and societal. Bolden's model emphasised the importance of recognising and valuing leadership practices at each of these levels and highlighted the need for a holistic approach to leadership development. Even though the Western models of DL have proven to be successful in certain organisations, they have not escaped criticism.

There are distinct differences between the Western DL approaches and ubuntu-based DL. Gronn, Harris and Bolden's models are rooted in Western organisational and educational philosophies, emphasising concepts such as empowerment, collaboration, shared decision-making, and a holistic approach to leadership. Ubuntu-based DL is grounded in African philosophy, particularly the ubuntu philosophy, which emphasises interconnectedness, communal relationships, and a collective orientation. Ubuntu-based DL places a strong emphasis on shared humanity, empathy, and the interconnected well-being of individuals and the community. Western DL focuses on values such as trust, collaboration, and shared decision-making. These models prioritise individual empowerment and the recognition of leadership practices across different levels. Ubuntu-based DL places a significant emphasis on communal values, interdependence, and consensus-building. It values the contributions of each member in the community, fostering a sense of collective responsibility and shared leadership.

## Criticism of Western models of DL and their potential implications for practice

Western models have tended to focus on the distribution of formal leadership roles and responsibilities, rather than exploring the potential for informal leadership practices (Gronn, 2002). Over the years, there has been a growing recognition of the importance of informal leadership practices within DL frameworks. Leino (2022) claimed that informal leadership has received increasing attention in the last two decades. Scholars and practitioners have increasingly acknowledged the significant contributions of informal leaders, recognising that leadership is not confined to formal roles but can emerge organically at various levels of an organisation. Leino (2022) attested to the multi-level nature of informal leadership that is centred on knowledge, change-orientation, action, communication, group and influence.

It should be noted that Western models of DL may not be relevant to different cultural contexts (Dorfman et al., 2012). While these models suggest that leadership should be a collective process, collaboration and shared decision-making be encouraged and valued,

and it thrives on communication and coordination among leaders at different levels of an organisation, practitioners should be aware of their potential limitations and cultural considerations (Sergiovanni, 2015). Sergiovanni's (2015) cautionary note draws attention to potential challenges that may arise in the implementation of collective leadership models, especially in the aspects of collaboration and shared decision-making.

We believe that these Western leadership models provide a useful theoretical framework for understanding how leadership can be distributed among individuals and groups in organisations by emphasising the importance of collaborative and inclusive leadership practices. They inspire Africanisation of DL by aligning with key principles such as collective decision-making, recognition of diverse perspectives, adaptability, and cultural sensitivity. The emphasis on these aspects within the theoretical framework of DL provides a foundation for integrating African perspectives into leadership practices. Currently, the puzzle of the DL model of EE curriculum management is incomplete without its Africanisation flavour. Africanisation brings a cultural lens to the DL model, ensuring that leadership practices are not only effective but also culturally relevant within the diverse contexts of African societies. This involves incorporating cultural norms, values, and traditions that resonate with local communities, thereby enhancing the contextualisation of the DL model. Africanisation adds a strong emphasis on community involvement and participation. In the context of EE curriculum management, this means actively engaging local communities in decision-making processes, aligning educational goals with community needs, and fostering a sense of ownership and collaboration. This participatory approach enhances the effectiveness of the DL model within the African educational landscape.

Msila (2014) mentioned that African culture is at best ignored or at worst viewed as a negative obstacle to 'good' leadership. In many instances, African culture may be subject to stereotypes or biases that depict it as incompatible with conventional leadership norms. Stereotypes might include assumptions about communication styles, decision-making processes, or hierarchical structures that are inconsistent with Western-centric leadership paradigms. These biases can contribute to the marginalisation of African cultural elements in leadership discussions. Msila's (2014) observation may be linked to the historical legacy of colonialism, during which Western values and structures were imposed on African societies. The remnants of this colonial mindset can manifest in the perception that Western models of leadership are superior, while African cultural elements are deemed as hindrances to effective leadership. Exploring the colonial legacy helps contextualise the challenges African culture faces in leadership discourse. When African culture is ignored or viewed negatively in discussions on leadership, there are implications for leadership development initiatives. This may lead to a lack of representation of diverse leadership styles, limiting the opportunities for individuals to embrace and leverage their cultural strengths. This, in turn, can hinder the development of inclusive and culturally competent leaders. Its marginalisation can be attributed to the absence of consideration on alternative contexts in the current conception of DL.

It should be noted that whilst the African models do share certain qualities with the Western models of leadership and management, each is unique and is informed by context. There are some shared qualities between Western and African models. Both Western and African leadership models may share a commitment to inclusivity, albeit with different manifestations. While Western models emphasise diversity and inclusion, African leadership models often prioritise communal and collective decision-making, reflecting a shared value for involving various perspectives. The need for adaptability is a common thread. Both Western and African contexts recognise the importance of leaders being responsive to change. However, the interpretation and application of adaptability may differ, with Western models often focusing on organisational agility and African models incorporating flexibility in communal decision-making.

Even though there are similarities between Western and African models, there are differences as well. African leadership models, informed by ubuntu philosophy, emphasise interconnectedness, collective well-being, and shared humanity. This differs from Western individualism, highlighting a unique approach that prioritises community relationships. African models often place a strong emphasis on communal decision-making, where leaders collaborate with community members to reach consensus. This stands in contrast to certain Western models that may involve more hierarchical decision-making structures. African leadership is deeply entrenched in cultural contexts, drawing on traditional values, rituals, and customs. The influence of cultural elements, such as storytelling, symbolism, and oral traditions, distinguishes African models from their Western counterparts.

Contextual factors also distinguish the two (Western and African) models. The historical context plays a significant role. Western leadership models have evolved within a history shaped by industrialisation, capitalism and individual rights, while African models are influenced by diverse histories, including pre-colonial, colonial and post-colonial periods. The structures of societies differ between Western and African contexts. Western models may navigate through more formalised and bureaucratic structures, while African models may engage with more community-centric and relational structures. Economic systems and challenges also contribute to variations. Western leadership may be influenced by market-driven economies, while African leadership often addresses complex economic challenges, such as sustainable development, poverty alleviation, and resource management. To understand this uniqueness, the African philosophy toward leadership would broaden the understanding of DL and the importance of advocating the Africanisation of DL in teaching-learning.

## African philosophy of ubuntu-based community

Community is a central value in African cultures that emphasises the importance of collective responsibility and collaboration (Nwosimiri, 2021). Ubuntu, on which many African communities are premised, emphasises the interconnectedness of individuals and the importance of relationships (Mbiti, 1990). This leads to an African philosophy of ubuntu which is central to many African societies and has influenced both traditional and modern

African thought (Gade, 2012; Mbigi & Maree, 1995). Ubuntu is commonly translated as "humanity towards others" or "I am because we are" (Tutu, 1999). It emphasises the interconnectedness and interdependence of people in a community. It advances the ideals of *kgetsi ya tsie e kgonwa ke go tshwaraganelwa* and *letsema*.

The philosophy of ubuntu is deeply rooted in African traditional beliefs and values, and it has been expressed in various ways by African cultures. For instance, the Yoruba people of Nigeria have a concept of *omoluabi* which means "a person of good character", which emphasises the importance of contributing to the well-being of the community (Falola & Heaton, 2008). Similarly, the Akan people of Ghana have a concept of *nto nso* which means "sacred community", which emphasises the importance of living in harmony with others and the natural environment (Wiredu, 1996). These expressions attest to *tshwaraganela* in realising that "I am because we are" as opposed to "I am without we are".

Ubuntu has been the subject of philosophical inquiry and has been interpreted in various ways by African scholars. For instance, Metz (2007) argued that ubuntu is a moral theory that emphasises the importance of relationships between individuals and the community, a way of life that interconnects people in a community. Similarly, Ramose (1999) wrote that ubuntu is a political philosophy that emphasises the importance of collective decision-making and the well-being of the community. One of the key features of ubuntu is its emphasis on communalism and the importance of the community over the individual. This is reflected in the African proverb "I am because we are, and since we are, therefore I am" (Mbigi & Maree, 1995, p. 23). This proverb emphasises the interconnectedness of individuals and their dependence on the community for their well-being. In typical African indigenous communities, leadership is modelled through a collective decision-making model in which each has a chance to contribute (*tshwaraganela kgetsi ya tsie*). Ubuntu also emphasises the importance of empathy, compassion, and respect for others, which are necessary for building and maintaining harmonious relationships within the community (Tutu, 1999). By embracing these values, ubuntu promotes a sense of unity and collective responsibility, where individuals contribute to the greater good of the community. DL, in practice, often involves the distribution of leadership responsibilities and decision-making across multiple individuals or teams within an organisation. It recognises that leadership is not confined to a single hierarchical position but can be distributed among various stakeholders. While DL emphasises shared leadership, there may be variations in how inclusive decision-making processes are across different contexts. In some instances, the involvement of all individuals in decision-making may not be as explicitly structured as ubuntu's collective decision-making model, where each person has a chance to contribute. The explicit emphasis on empathy, compassion, and the promotion of unity and collective responsibility, as highlighted in Ubuntu, may not be explicitly outlined in all DL practices. DL might focus more on task distribution and collaboration, potentially overlooking the explicit nurturing of harmonious relationships.

Incorporating ubuntu principles into DL can enhance the inclusivity of decision-making processes. Ubuntu's emphasis on providing each individual with an opportunity

to contribute aligns with the participatory nature of DL but underscores the importance of explicit mechanisms for inclusivity. The ubuntu principles have the potential to contribute to the cultivation of empathy, compassion, and a sense of unity within DL practices. Explicitly incorporating these values can foster a more holistic approach to leadership, nurturing not only task efficiency but also the well-being and unity of the collective. Ubuntu's emphasis on collective responsibility aligns with DL's distributed nature. However, articulating the principles of ubuntu within DL can reinforce the sense of shared responsibility, emphasising that every individual's contribution is integral to the collective success of the organisation. All this can be realised if DL in EE curriculum management by considering the African model.

Community, therefore, conceptualised from the African philosophy of ubuntu, has important implications for EE curriculum management. It emphasises the interconnectedness of people and their environment, and the importance of community in promoting sustainable development (Van Norren, 2022; Metz, 2007). This interconnectedness is expressed by tied relationships between human beings, environment and spirituality. Incorporating this philosophy into EE curriculum management can help promote a holistic approach to EE that emphasises the interdependence of people and the environment, and the importance of community involvement in promoting sustainable development (Metz, 2011).

One way in which ubuntu can be incorporated into EE curriculum management is through the promotion of community-based approaches to EE. This approach emphasises the importance of involving communities in the design, implementation, and evaluation of EE programmes. The community-based approaches to EE involve a collaborative effort among diverse stakeholders, including residents (community members), teachers, learners, community leaders, and external organisations. The integration of EE programmes into the school curriculum can take various forms, from subject integration to extracurricular activities, depending on the specific context and goals of the community. It recognises that communities have unique knowledge and perspectives about their environment and can play an important role in promoting sustainable development (Tilbury, 2004; Blair, 2008). The community-based approaches to EE also help build community ownership and support for EE programmes, which can lead to more sustainable outcomes (Tilbury, 2004). EE programmes should thus not be confined to schools only.

Another way in which an African philosophy of community and ubuntu can be incorporated into EE curriculum management is through promotion of values-based approaches to EE (Tosam, 2019). This approach emphasises the importance of values such as respect for nature, interdependence, and community, which are central to African philosophies of community and ubuntu (Ayayia, 2022; Chemhuru, 2019; Tosam, 2019; Velempini et al., 2018). Incorporating an African philosophy of ubuntu-based community into EE curriculum management can also help promote a more holistic and integrated approach to EE (Masoga & Shokane, 2019). This approach recognises that EE is not only about the environment, but also about people and their relationship with the environment.

It further recognises the importance of promoting sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Chimakonam, 2018).

Therefore, an African philosophy of ubuntu-based community has important implications for EE curriculum management. This leads to a need to Africanise DL.

## Africanising DL

Adopting an Africanised approach to DL would prioritise collective responsibility and collaboration among stakeholders and emphasise the importance of relationships and interconnectedness. This approach would involve the delegation of responsibilities and decision-making power to multiple individuals or groups (*letsema/tshwaraganela kgetsi ya tsie*), with an emphasis on collaboration and the sharing of expertise. This would corroborate with Spillane's (2012) idea about distributing leadership responsibilities among multiple individuals rather than solely relying on the traditional hierarchy of authority. Additionally, an African approach to DL would prioritise the needs and perspectives of African communities and promote sustainability in the region. It would allow flexibility, adaptability, and collective decision-making (Gronn, 2002).

Africanising DL involves tailoring it to the unique cultural, social, and political contexts of Africa. It is based on the premise that African societies have unique leadership practices based on ubuntu, which emphasise collectivism, community, and interdependence (Mbigi & Maree, 1995). Therefore, Africanising DL involves integrating African cultural values, beliefs, and practices into DL models to make them more relevant and effective in African contexts. As mentioned in the preceding statements, in the African context, communal decision-making is a prevalent cultural value. Africanising DL for EE involves structuring decision-making processes to be more inclusive and participatory. This ensures that stakeholders at various levels, including community members, teachers and learners, have opportunities to contribute to the design and implementation of EE initiatives. Embracing the ubuntu philosophy emphasises interconnectedness, empathy, and collective responsibility. This can be integrated into DL models for EE by fostering a sense of shared purpose and emphasising the impact of environmental actions on the community. Collaborative efforts driven by a collective responsibility for the environment align with ubuntu principles. African cultures often possess rich indigenous knowledge about the environment.

Africanising DL in EE curriculum management involves recognising and incorporating this indigenous knowledge into educational practices. This can enhance the content and methods used in EE programmes, making them more culturally relevant and resonant with local communities. African cultural practices often emphasise the importance of community engagement. In the context of DL for EE, this involves actively involving local communities in the development, implementation, and evaluation of EE initiatives. This collaborative approach ensures that EE programmes align with the needs and values of the community. Some African cultures incorporate ceremonial practices related to environmental conservation. Africanising DL in EE may involve incorporating such practices into the

curriculum, fostering a deeper connection between learners and the environment through meaningful rituals.

One way to Africanise DL is by incorporating community participation in decision-making – *tshwaraganela kgetsi*. In African cultures, community decision-making is a common practice, and leaders are expected to consult with their constituents before making decisions (Mawere et al., 2021). This is where *kgetsi ya tsie e kgonwa ke go tshwaraganelwa* is valued greatly. Another way to Africanise DL is by embracing collective responsibility. In African cultures, leadership is viewed as a collective responsibility, and leaders are accountable to their communities (Mbigi & Maree, 1995). Therefore, DL models in African contexts should emphasise collective responsibility and accountability rather than individual accountability. Consultation, collaboration and consultation could make the Africanised DL realisable in the EE curriculum management in a school context.

Furthermore, Africanising DL involves recognising and embracing the diversity of African cultures. Africa is a diverse continent with over 2000 languages and various cultural practices (Mbigi & Maree, 1995). Therefore, DL models in African contexts should recognise and embrace this diversity to ensure that leadership practices are inclusive and representative of all communities. However, the adaptation of DL to these African contexts should consider commonalities highlighted earlier, as well as the underlying philosophy of ubuntu. Africanising DL could enhance organisational leadership in African contexts by ensuring that leadership practices are inclusive, representative, and aligned with African cultural values and practices. Through its accommodative nature, ubuntu can enable the connection between Western models of DL and African alternatives. In learning, both indigenous and non-indigenous learners can enrich each other's cultural lenses on EE.

## Implications for EE management

Africanising DL in EE management can offer a more culturally sensitive approach to leadership that recognises and values the cultural diversity of African communities. The Africanisation approach can promote greater community engagement and participation in EE initiatives, leading to more sustainable and effective environmental management practices. It can create strong partnerships between communities and schools. This means engaging local communities in the design, implementation, and evaluation of EE programmes. By involving communities, programmes can be tailored to suit their unique cultural and societal contexts, ensuring that they are relevant, effective, and sustainable in the long run. Africanising DL should therefore promote collective responsibility and accountability in EE management to ensure sustainability. Leaders should view their roles as part of a broader collective effort rather than seeing themselves with individual responsibilities. In this context, leaders are school principals, head of departments, subject advisors, school governing body members and teachers. This approach aligns with the African philosophy of ubuntu, emphasising the interconnectedness and interdependence of individuals in a community and partnerships which are expressed through *kgetsi ya tsie e kgonwa ke go tshwaraganelwa* and *letsema*.

An Africanised approach should integrate African cultural values, beliefs, and practices into the DL model. This could involve promoting values such as respect for nature, interdependence, and community, which are central to an African philosophy of community and ubuntu. An Africanised approach should emphasise collaboration and effective communication among leaders and stakeholders. This promotes a sense of unity and cooperation in addressing environmental challenges, leading to better decision-making and outcomes.

In addition, an Africanised approach should consider the diverse cultural, social, and environmental contexts of African communities. EE curricula should be contextualised to suit the specific needs and challenges faced by different communities. Also, an Africanised approach should promote community-based approaches to EE. By involving communities in the decision-making process, EE programmes can be more relevant and effective in addressing local environmental issues. Learners should not be taught for performance and certification only but should be capacitated for sustainability and working with their communities. Performance and certification-focused education often emphasises memorisation and exam-oriented learning, while capacitating learners for sustainability involves a broader skill set. This might include critical thinking, problem-solving, communication, collaboration, and a deep understanding of real-world issues. These skills go beyond exam performance and contribute to overall personal and professional development.

An Africanised approach should prioritise sustainability in EE management. This means promoting practices and values that ensure the well-being of current and future generations, in line with the African philosophy of ubuntu and the interconnectedness of all living beings. The practices referred to in this context are community-centred learning, ethical and social responsibility, environmental sustainability, cultural awareness and inclusivity, empathy and compassion, etc., that align with the principles of well-being, sustainability, and interconnectedness as influenced by the African philosophy of ubuntu. Furthermore, an Africanised approach should emphasise the continuous evaluation and improvement of the EE programmes. Regular assessments of programme effectiveness, stakeholder feedback, and learning outcomes can lead to better-informed decisions and more impactful programmes.

Africanising DL should encourage a holistic approach to EE management. This involves recognising the interdependence of environmental issues with social, economic, and political aspects, and integrating these perspectives into the curriculum. Finally, an Africanised approach should address specific environmental challenges faced by African communities. By focusing on contextually relevant solutions, EE can have a more meaningful impact on sustainable development in the region.

## Conclusion

Africanising DL in EE management can contribute to a more inclusive and contextually relevant approach to leadership. By incorporating the principles of ubuntu, collective responsibility, and community participation, this approach emphasises the importance of collaboration and interconnectedness in addressing environmental challenges. Through community-based approaches and values-based education, EE programmes can be tailored to suit the unique needs of African communities and promote sustainable development. In institutions of learning, therefore, educators must be trained to make programmes and teaching relevant to African communities' contexts.

Africanising DL challenges traditional Western models and encourages a shift towards more culturally sensitive and community-driven leadership practices. Also, there is a room to make Africanised and Western models benefit from each other. By acknowledging and embracing the diversity and commonalities of African cultures, EE management can foster a deeper understanding of the interdependence between people and their environment.

As the African continent faces various environmental challenges, it is crucial to empower communities with the knowledge, skills, and values needed to address these issues sustainably. Africanising DL can play a pivotal role in empowering African communities to become active stewards of the environment and contribute to a more sustainable future. However, Africanising DL comes with challenges. Implementing this approach requires a nuanced understanding of cultural contexts, effective communication, and collaboration among stakeholders. Overcoming the potential obstacles will require continuous evaluation, feedback, and learning from experiences to refine and improve the application of Africanised leadership in EE management.

In conclusion, embracing the philosophy of *ubuntu* and African cultural values in DL can lead to more meaningful and effective EE management in Africa. By fostering a sense of unity, collective responsibility, and appreciation for the environment, this approach has the potential to positively impact not only the present but also future generations, creating a sustainable legacy for African communities. *Kgetsi ya tsie e kgonwa ke go tshwaraganelwa* can drive this kind of approach to DL. As we move forward, further research and practical applications are essential to unlock the full potential of Africanised DL and promote a more sustainable and harmonious relationship between people and the environment.

## Acknowledgements

The lead author would like to acknowledge and thank the National Institute of Humanities and Social Sciences (NIHSS) for financial support throughout her doctoral study.

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### Percentage contribution

| Areas of contribution | Author | % Contribution per area, per author (each area = 100%) |
|---|---|---|
| Conception or design of the paper, theory or key argument | Shabalala | 60% |
| | Gumbo | 40% |
| Data collection | Shabalala | 60% |
| | Gumbo | 40% |
| Analysis and interpretation | Shabalala | 60% |
| | Gumbo | 40% |
| Drafting the paper | Shabalala | 70% |
| | Gumbo | 30% |
| Critical review of paper | Shabalala | 30% |
| | Gumbo | 70% |

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