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Learning Pathways for Sustainable Development, the National Qualifications Framework (NQF), and Lifelong Learning in South Africa



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The papers in this Bulletin were developed from SAQA-Rhodes University Partnership Research into *Understanding learning pathways and systems of work and learning across the NQF landscape*, led by Professor Heila Lotz-Sisitka and Dr Presha Ramsarup working with Ms Nthabiseng Mohanoe, Mr Andani Maphinyane, Ms Katherine Fourie and Ms Margaret Burger, with additional support from Dr Lausanne Olvitt. The papers have been blind peer reviewed. The Bulletin was compiled by Dr Heidi Bolton, with inputs from Ms Renay Pillay, Dr Letitia Adaken, Ms Yuraisha Chetty, Mr Lefa Lenka (SAQA Research Directorate), Dr Julie Reddy (SAQA's Deputy Chief Executive Officer [DCEO]), and Mr Joe Samuels (SAQA's CEO). It was typeset by Mr Phathutshedzo Nenzhelele (Graphic Designer, SAQA).

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Foreword

This SAQA Bulletin presents a collection of the eight papers developed as part of the SAQA-Rhodes University partnership project "*Change-oriented Workplace Learning and Sustainable Development Practices Part 2: Understanding Learning Pathways and Systems of Work and Learning Across the NQF Landscape*".

Both the initial and second parts of SAQA-Rhodes partnership research sought to strengthen the efficacy of the National Qualifications Framework (NQF) to contribute to lifelong learning programmes in academic, vocational and professional education and training contexts, as well as to sustainable development practices in workplaces. The research is located at the intersection of two dynamics, namely, *work and learning*, and *sustainable development*. These two dynamics are related, in that sustainable development cannot happen without effective, change-oriented work and learning. And sustainable development practices are increasingly necessary in every context – for trade and production opportunities, and for quality of life.

In Phase 1 of the research, the primary focus was on change-oriented workplace learning and sustainable development practices, and on the related wider *systems of skills provisioning*. Phase 2 sought to investigate the interface between work and learning needed for and in workplaces in the NQF context, by focusing on *systems of work integrated learning* that support *change oriented learning and sustainable development practices*. The main research question guiding this cluster of studies was, "What are the quality and articulation issues that arise in learning pathways relevant to sustainable development, particularly in boundary zones between qualifications pathways that cross *the NQF Sub-Frameworks?*"

Understanding what comprises 'a learning pathway' and 'articulation' was key when the research commenced. The findings, that articulation can be 'systemic' (comprising linked qualifications and other elements of learning and work), or specific (inter-institutional), or can be achieved through supporting individuals as they follow their learning and work pathways, and seek to negotiatiate and cross the boundaries they encounter – have been useful for the NQF community.

Firstly, the papers in this Bulletin serve to share knowledge of change-oriented work and learning and sustainable development practices, and implications for *quality* course and curriculum design. The articles also provide insights into structure-agency processes in learning pathways, and structure-agency processes that constrain or enable work integrated learning – and what this means for quality, integration and articulation within and across NQF structures. Third, the papers develop the conceptual frameworks and research methods for understanding change-oriented work and learning *processes* and qualifications, *programmes, systems, and learning pathways* in the context of the NQF. The focus on learning pathways provides insight into progression, particularly where occupations and their learning pathways have been studied from a systems and articulation perspective. Fourth, the papers illuminate the institutional processes necessary to ensure effective systems of work and learning (quality, articulation, learning pathways) for selected occupations that are linked to sustainable development practices such as energy efficiency, the sustainable use of natural resources, and water management.

Above all, the papers contribute more broadly to social learning for sustainability, and transformation in education and training – in ways that are in line with the National Development Plan (NDP), White Paper for Post-School Education and Training (PSET), and the implementation of the NQF. I want to urge the NQF Community to engage with the ideas in these papers and draw on the insights gained to improve their own practice.

Joe Samuels Chief Executive Officer South African Qualifications Authority

Introduction: Researching Sustainable Development Learning Pathways Towards Progression in Learning and Work

Professor Heila Lotz-Sisitka, Dr Presha Ramsarup, Dr Heidi Bolton

BACKGROUND

The importance of an environment and sustainable development focus

Environment and sustainable development issues are increasingly seen as complex, multi-faceted and integral to social and economic development, as can be seen from the recently proclaimed sustainable development goals (www.globalgoals.org¹). As societies grapple with the rapid and catastrophic effects of environmental degradation, anthropogenic earth system change and a long history of unsustainable development, educational systems have had to attempt to comprehend meaningfully, the implications. Within post-*apartheid* South Africa, these challenges are markedly more complex. In a country facing fundamental national transformation on every front, the environment and sustainable development discourses are raising significant new challenges for work and learning systems.

Clear policy frameworks that prioritise and raise the importance of the environment and sustainable development agenda have emerged rapidly in post-*apartheid* South Africa. All these (relatively new) environment and sustainable development policies² and the country's recent commitment to the international Sustainable Development Goals (SDGs) place additional responsibilities on government organisations at all levels³, parastatal and non-governmental environmental implementing organisations, private enterprises, and civil

¹ The Sustainable Development Goals (SDGs) are a set of 17 globally agreed development goals oriented towards addressing social-ecological and social justice concerns (www.globalgoals.org).

² Examples are: the National Environmental Act of 1998 (Republic of South Africa [RSA], 1998) and its associated legislation; the National Climate Change Response White Paper of 2011 (RSA, 2011b); there are many other related policies (Ramsarup, 2017) which have emerged as South Africa's NQF system has also been emerging in postapartheid South Africa.

³ National, provincial and local government levels.

society to ensure they meet and exceed minimum standards related to each expanding policy mandate. The National Development Plan (NDP) of South Africa (Republic of South Africa [RSA], 2011) recognises the importance of dealing with climate change and sustainable development concerns, especially the impacts on health, livelihoods, water and food, and disproportionately affecting the poor, in particular poor women and children. The NDP notes that "While adapting to these changes, industries and households have to reduce their negative impact on the environment. This will require far-reaching changes to the way people live and work" (*Ibid*.:23, author emphasis).

Need for environment and sustainable development knowledge and skills

Environment and sustainable development practitioners need a broad range of (new) inter-disciplinary and emerging skills (including resource economics; modelling and forecasting; as well as 'mainstreaming' environment into development; stakeholder engagement and advocacy). Additionally practitioners in a wider range of more mainstream or established occupations need to re-orient their practices to incorporate environment and sustainable development priorities. For example, Mine Managers in the mining value chain (Rosenberg *et al* 2015; Maphinyane, 2014), Accounting Officers, and Supply and Distribution Managers in the public procurement value chain (Ward *et al* 2016), or Abbatoir Managers and Agricultural Engineers in the agricultural value chain (Cobban & Visser, 2017). Thus the challenge lies not only in skills development for new green jobs and occupations, but also in greening existing occupations. This is therefore a transversal concern affecting all sectors of South African society and all sectors of the education and training system. This requires sophisticated *inter-sectoral*, as well as *sector specific educational planning* (Department of Environmental Affairs [DEA], 2010a; Human Sciences Research Council [HRSC], 2009).

In a study on the Green Skills in South Africa's economy, the International Labour Organisation (ILO) noted that "new skills and retraining needs for the greening sector should filter successfully through the 'demand and supply' process" (ILO, 2010:19). However, despite the National Qualifications Framework (NQF) commitment to responsive skills development and lifelong learning, several recent studies (including DEA, 2010a; HSRC, 2009; GreenMatter, 2012; Rosenberg *et al* 2016) have highlighted many skills and competence issues associated within environmental provisioning. While there are

skills development and environmental policies in South Africa, there is little articulated alignment between the two policy focus areas (ILO, 2010:19).

Following in-depth country studies in 2011, the ILO conducted a review to assess the policy coherence between the environmental policy and skills development policies in 21 countries (ILO, 2011). The findings, as illustrated in graph below, extracted from the ILO report, illustrate how South Africa featured. From the graph it is clear that in South Africa there is an inadequate match between environmental policies on one hand, and skills development policies and structures on the other. This same finding was reported in the first South African Environmental Sector Skills Plan (DEA, 2010a), which reported a reactive skills system in the environmental sector. This Plan recommended the need to transform this system towards more proactive engagement with environment and sustainable development skills in South Africa.



Figure 1: Diagram illustrating coherence between skills-related and environmental policies (ILO, 2011:33)

Within South Africa, environmental skills development and planning are mainly happening in pockets of praxis, but uptake and upscaling into the skills development landscape is limited (DEA, 2010a; Rosenberg *et al* 2016). Two national studies investigating these issues (DEA, 2010a; HSRC, 2009) show that the broad and cross-cutting environmental 'sector' has neither a dedicated Sector Education and Training Authority (SETA) nor

organised industry bodies to drive skills development. As a cross-sectoral concern, environmental skills planning is best integrated across all SETAs (DEA, 2010a; DEA, 2010b).

A short study by Lotz-Sisitka, Malema and Olvitt (2004), involving a desktop review of five SETA Sector Skills Plans (SSPs), highlighted that SSPs were being developed without giving adequate attention to the skills requirements associated with sustainable development policy and legislation relevant to the sector. In this study it was also found that there were varying interpretations of environment and sustainability issues in the SSPs that were not consistent with those in the National Environmental Management Act of 1998. A more recent review of SSPs in the study of Ramsarup (2017) shows that although SETAs are starting to recognise environment and sustainable development issues as drivers, there is still little evidence of planning for the future demand for 'Green Skills'⁴ and very little evidence of supported Green Skill interventions.

There is however increased recognition of green occupations as being occupations in high demand. Some SETAs have commissioned research into Green Skills (eg. Rosenberg *et al*, 2015; Ward *et al* 2016). There are currently only a few significant learning interventions that are emerging from these research interventions. Most recently, the United Nations Framework Convention on Climate Change (UNFCC)'s third national communication for South Africa shows substantive gaps between climate change policy and education sector policy (DEA, in press; Lotz-Sisitka & Gumede, 2017).

Proactive approach regarding environment and sustainable development skills

Central to developing a more proactive approach to environment and sustainable development skills planning in South Africa is the need to "develop a comprehensive and coordinated approach" (ILO, 2011:40). There is an increased emphasis on quantifying potential green jobs related to the emerging Green Economy (eg. Maia *et al* [2011] project a possible 462 000 green jobs in the longer term – see also Table 1 in Paper 7, in this Bulletin), and there are some insights into skills demands in the public environmental sector (DEA, 2010a) which show significant vacancies in critical occupations (especially

⁴ The phrase 'Green Skills' is increasingly being used as a shorter way of referring to environment and sustainable development skills (see www.greenskills.co.za).

in scientific and technical occupations). Further evidence of the rapidly emerging demand for environment and sustainable development skills in South Africa, is illustrated by the increasing number of Green Scarce Skills (30% of the Scarce Skills List of the Department of Higher Education and Training [DHET], 2014), which reflects especially a demand for green professionals; green technicians and associated professionals.

Currently, the following are applicable.

- Green Economy development is being hampered by scarce skills (eg. renewable energy technical skills; clean coal technology development; rehabilitation practices *etcetera*), which creates 'lost opportunities' (Eastern Cape Premier's Office Green Skills Forum, 2016).
- The Structural Integrated Projects (SIPs) of government are being hampered by scarce Green Skills especially environmental engineers and environmental managers amongst others (DHET, 2013a; Paper 6, in this Bulletin; Ramsarup, 2017).
- Sustainable development and associated service delivery for water, waste, energy, biodiversity management, climate resilience *etcetera* at local level, especially in municipalities, are being hampered by the inadequate development of environment and sustainable development competences and skills (Mohanoe, 2014) (see also the recent Green Economy Learning Assessment for South Africa, PAGE, 2016).
- The potential for the development of Green Jobs and Small, Medium, and Micro Enterprises (SMMEs) in the environmentally oriented Expanded Public Works Programmes (EPWPs) is being hampered by lack of clear learning pathways into the Green Economy. A new study being developed by the Department of Public Works (DPW) and the ILO is currently mapping out a green jobs roadmap for the EPWP with significant implications for coherent green skills learning pathways, planning and development (DPW-ILO-EPWP, 2017).

While the demand side picture is becoming increasingly clear, especially within a more macro-landscape perspective, we are only beginning to learn more about the types of studies that need to be undertaken to develop more fully, in-depth insights into demand

analysis at the meso and micro levels of the system (Rosenberg *et al* 2015, 2016; Ward *et al* 2016; Cobban & Visser, 2017; PAGE, 2016). Here it is clear that much more still needs to be done to develop a more refined perspective on green skills demand, especially as green skills demand is sector- and even product value chain specific (Rosenberg *et al* 2015, 2016; Ward *et al* 2016; Cobban & Visser, 2017; www.greenskills.co.za).

Additionally, more insight is needed into the implementation mechanisms such as available education and training opportunities, and accessible learning pathways, which could improve skills provisioning for greening the economy and wider sustainable development. This is additionally challenging as it requires understanding of these concerns *via transversal engagement with the NQF structures within a wider systems perspective*, as environment and sustainable development learning pathways and provisioning cross the General and Further Education and Training Sub-Framework (GFETQSF), Higher Education Qualifications Sub-Framework (HEQSF), Occupational Qualifications Sub-Framework (OQSF) and Professional Body contexts. We note here the commitments of the National Development Plan (RSA, 2011) are that by 2030, South Africa's transition to an environmentally sustainable, climate change resilient, low carbon economy and society will be well under way. Without giving adequate attention to the learning pathways required for this transition, such an objective will be difficult to obtain.

Thus, to address this challenging context, there is a need to develop adequate insight into environment and sustainable development occupations and how learning pathways into these occupations are emerging. Underlying this, is the need to understand issues of access into, and articulation and quality associated with these learning pathways. This was the focus of the SAQA/ Rhodes University Research Partnership that is reported in this Bulletin.

LEARNING PATHWAYS – POLICY METAPHOR IN SOUTH AFRICA TODAY

Learning pathways for lifelong learning and work

An effective and coherent system for education, training, skills development, and professional learning is critical for transforming the country and economy, which are characterised by levels of unemployment, poverty, income inequality and historical disadvantage. This broader transformational intent is, in South Africa, today, coupled with a

drive to reduce the serious skills shortages in some occupations and employment sectors, such as those identified in the environmental sector (DEA, 2010a). Other occupational and employment sector skills crises have also been documented, such as the shortage of engineers and artisans (Kraak, 2008). Against this 'continuous and seamless pathways of learning' (MHET, 2013) have been emphasised to enable progression from learning into employment. This policy position was further stressed at the launch of the Quality Council for Trades and Occupations (QCTO) in February 2010, where the Minister of Higher Education and Training (MHET), committed the DHET to improving 'entry points into and pathways through, the learning system' (DHET, 2013). The Minister further emphasised to proceed to the skills development system and the workplace seamlessly, with 'easy pathways across the different learning sites' (*Ibid*).

The DHET, a relatively new institution of government, formed in 2010 to integrate education and training, in its Strategic Plan 2010-2015 also stressed the commitment to '*meaningful learning pathways* ... across institutional and workplace education and training' and committed the DHET to:

... [creating] pathways for moving 'up and down' (eg. between universities and colleges) in order to find meaningful progressive pathways, as well as pathways to transfer between institutions at similar levels, and also 'sideways' between SETAs and learning institutions (DHET, 2010c:63).

Policies that support learning pathways

The Articulation Policy (MHET, 2017:30) gazetted in January 2017, has since recognised that the current system is 'not geared to allow students to find multiple pathways to success'. This Policy argues that articulation is both systemic and specific and that the Policy must ensure that students are able to 'take multiple pathways to reach their prefered learning and work pathways' (*Ibid*.:30).

Muller (2000:96), commenting on the NQF under the SAQA Act of 1995, stated that, "the purpose of the National Qualifications Framework is to make it possible for all candidates to achieve national qualifications through a wide variety of mechanisms and a multiple delivery system". He further noted that it was anticipated that the NQF (under the SAQA Act) would generate coherence across the traditional divides of education and training, and allow articulation between the currently fragmented and divided sectors and institutions, an objective that still pertains. The original (1995) assumption was that the NQF would promote access and maximise progress or enable flexible and meaningful learning pathways. While studies show that access has been enhanced steadily since the promulgation of the SAQA Act (see for example, SAQA, 2017), articulated learning and work pathways have taken longer to forge. The differentiated system with three articulated NQF Sub-Frameworks under the NQF Act (RSA, 2008) is linked to an increased focus on learning pathways and articulation (see also the White Paper for Post-School Education and Training [PSET], MHET, 2013) and increasing numbers of articulation initiatives (see for example SAQA-Durban University of Technology [DUT], 2017).

Within the National Skills Development Strategy III (DHET, 2011), learning pathways are not deliberately mentioned but the objectives and priorities of NSDS III support the intent of coherent learning pathways – an emphasis continued in the new White Paper for PSET (MHET, 2013). Thus, the South African policy context currently supports the ideology of *coherent learning pathways*, an approach enabled by the differentiated and differentiating structures of the three NQF Sub-Frameworks. Moving beyond policy intent has required empirical engagement. Before the SAQA-Rhodes partnership research, empirical research that illuminated the facets and dynamics of the notion of a 'seamless learning pathway' in South Africa were scarce; and little or no research had been done in this regard, in the environment and sustainable development sector, beyond research that identified a need for such studies (Lotz-Sisitka, 2011; DEA, 2010a).

Research into learning pathways

Empirical research focusing on learning pathways may, for example, focus on the individual 'gaps' which are unique and different from each other through learning pathways; but may equally focus on learning pathway issues related to the 'collective gap'. These gaps differ, and different remedies may be needed. In our initial research we identified that learning pathways research was generally bifurcated, offering a *dualistic path of either* researching individual career stories, or researching system-based policy concerns and processes (see Papers 1, 2, 3 in this Bulletin).

We were, however interested in developing a *dialectical methodology* which takes account of the *relations between* the individual learning pathway(s); and the system(s) of learning pathway provisioning, *and how this relation may be placed under scrutiny in empirical*

work (see Papers 1-8 in this Bulletin). This Bulletin therefore shares the story of how we developed such a methodological framework for sustainable development learning pathways as educational and occupational progression, with due recognition of the wider social-material (social-ecological) shaping influences on such learning pathways.

RESEARCH PROGRAMME ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT LEARNING PATHWAYS

SAQA-Rhodes University Partnership Research

This SAQA-Rhodes Partnership Phase 2 Programme on environment and sustainable development learning pathways reported in this Bulletin, was a SAQA funded project. The programme provided support for one PhD study (Ramsarup, 2017) and four full-time Masters studies (Mohanoe, 2014; Maphinyane, 2014; Fourie, 2017; Burger, 2017). The intention was to support research capacity development in NQF research in general, and in learning pathways research in particular, while also researching a new and complex phenomenon of significance for the South African NQF landscape.

The SAQA-Rhodes partnership did not focus on large-scale studies; the research reported here is based mostly on the post-graduate studies noted. The papers in this Bulletin reflect some of the methodological processes and outcomes of these studies. It was not possible to reflect in this Bulletin, on the full scope of the research undertaken within the SAQA-Rhodes partnership. The papers are drawn mainly from the Ramsarup (2017) and Mohanoe (2014) studies with some reference made to the other studies. The Bulletin focuses on sharing insights into the development of the systemic dialectical methodology that we developed for learning pathways research⁵.

The Phase 2 research built on the Phase 1 studies, which focused more on changeoriented workplace learning in the context of sustainable development practices (briefly reported on in Paper 1, in this Bulletin). The Phase 1 research took place between 2008 and 2010. This research, together with the wider system-based studies at the time (DEA,

⁵ Further papers will be produced from the specific case studies in the future. Three such papers have already been produced by Ramsarup (2016), Rosenberg, Ramsarup, Lotz-Sisitka and Gumede (2016), Ramsarup and Lotz-Sisitka (2017). For those wanting to keep up to date with the published outcomes of the project, regular updates on new publications are available on the national Green Skills website (<u>www.greenskills.co.za</u>), which was also an 'outflow' of the SAQA-Rhodes research programme, effectively constituting a Phase 3 of the programme, as work on environment, sustainable development, and work and learning research in South Africa, now more colloquially referred to as 'green skills' research, continues.

2010b; HSRC, 2009; South African National Biodiversity Institute (SANBI)-Lewis, 2010) raised the concern that change-oriented workplace learning associated with environment and sustainable development practices cannot be adequately supported without giving attention to a systemic view of learning pathways, hence the Phase 2 research, which focused on the systemic view of learning pathways (Lotz-Sisitka, 2011; see also Paper 1, this Bulletin).

The Phase 2 research programme involved:

- 1. **contextual research** to understand the wider context and rationale for sustainable development learning pathways development;
- 2. **methodological development** as it was found that almost no research into learning pathways had taken place in South Africa at the time, especially in the

field of sustainable development where many of the learning pathways were/ are new or 'under construction';

- 3. **conceptual development** to understand some of the key conceptual concerns relevant to learning pathways research; and
- 4. the development of **contextually rich case studies** into a selected range of scarce skill occupations or occupations that were identified in earlier research to be significant for sustainable development, but marginalised in the education and training skills provisioning system (see more detail below).

As already noted, environment and sustainable development related occupations are emerging as new 'green jobs' but also involve the greening of existing occupations (ie. where responding to environment and sustainability concerns, become critical skills needs, in existing occupations). The focus of the cases in the SAQA-Rhodes research was on both of these dimensions.

Case studies in the SAQA-Rhodes University research

To develop the case studies, we needed to develop occupational case study criteria so as to select further sites for field-based data collection. We chose to focus on scarce skill occupations and marginalised occupations in the environmental sector that had particularly important implications for sustainable development, as identified in national documentation and studies. The occupations selected for further empirical work were as follows.

- Local government occupations, as these had been identified as being critical for service delivery and sustainable development at local level, and had also been identified as being 'marginalised' in the system of education and training provisioning from a sustainable development/ environment perspective in the National Environmental Sector Skills Plan (ESSP) (DEA, 2010a). The ESSP study (*Ibid.*) identified that there were over 30 000 people employed in environmental practices occupations in municipalities in South Africa, yet there was very little evidence of actualised environmental practices training, or available sustainable development learning pathways for workers and professionals (supervisors and managers in diverse departments) (Wigley & Sisitka, 2011). These occupations (sustainable development context formed the focus of the in-depth case study Masters-level research of Mohanoe (2014) in the SAQA-Rhodes programme.
- Rehabilitation practices (located within different categories of mining sector occupations), as these had been identified as priority skills for biodiversity in the HSRC (2009) study. It was identified in the HSRC 2009 study that over 3000 biodiversity professionals are employed in the mining sector, and it was noted that most of these people were engaged in rehabilitation practices work, yet little was known about rehabilitation training provisioning, or learning pathways into rehabilitation practices work in different mining occupations. Learning pathways addressing this 'critical skill' in the mining sector formed the focus of the Masters (half thesis) research of Maphinyane (2014) in the SAQA-Rhodes programme.
- Environmental Engineering has been identified repeatedly as a 'scarce skill' affecting a diverse range of environment and sustainable developmentrelated functions in South Africa including water management, biodiversity management, general environmental management, sustainable design and urban development, sustainable construction and production systems design, and more. The shortage of these professionals has also been identified as a

transformation issue (ie. there are too few black and women professionals entering these occupations). In addition, a shortage of 300 Environmental Engineers was identified in the Strategic Integrated Projects (SIPs), indicating the importance of this occupation for sustainable development in South Africa (DHET, 2013b). This occupation formed the focus of one of the in-depth case studies of environmental learning pathways construction in the PhD study of Ramsarup (2017) in the SAQA-Rhodes programme.

- Environmental Scientists have also repeatedly been identified as a 'scarce skill' affecting a diverse range of environment and sustainable development functions in South Africa, especially biodiversity management, coastal zone management, fisheries management, sustainable development planning, and climate resilient development (amongst others). The shortage of these professionals has also been identified as a transformation issue (again too few black and women professionals are being trained in these occupations) (South African National Biodiversity Institute [SANBI] Lewis, 2010; DEA, 2010a; GreenMatter, 2012). This occupation formed the focus of one of the substantive case studies of environmental learning pathways construction in the PhD study of Ramsarup (2017).
- Expanded Public Works Programme (EPWP) elementary occupation learning pathways into Green Economy jobs in the natural resource management sector were identified in the DEA (2010b) study as lacking a 'sustainability framework' for the accredited training being offered in the EPWP programmes.

The EPWP programmes are a large-scale poverty reduction and employment creation initiative of government, and recent research by the Department of Public Works (DPW) and the International Labour Organisation (ILO) (DPW-ILO, 2017) shows that potential exists for many new Green Economy job opportunities at this level of occupational development (it is reported that to date 968 303 green work opportunities have been created by the environment and culture programmes of EPWP, with approximately 12.9% categorised as 'green jobs'). The same research projects future green skills areas in the EPWP in sustainable land-based livelihoods, coastal management, waste management, road infrastructure, renewable energy and energy efficiency, water conservation and treatment infrastructure, food security and sustainable farming and gardening,

green buildings (public sector and social housing focus), non-motorised transport and ecomobility, disaster reduction measures, environmental education, and healthy and sustainable communities (*Ibid*.). This growth is an important current and future focus for learning pathways research.

Sustainable learning pathways from the EPWP programme are therefore an important national area for education/training articulation and transformation to emerge. The DEA in 2010 suggested that research needs to be undertaken to understand how existing investment in training in the EPWP could lead to learning pathways into Green Economy jobs. Natural resource management jobs at the elementary occupation level have been identified as potential new green jobs in the green jobs study of Maia *et al* (2011), but little is known of how learning pathways are constructed for these potential new green jobs. Sustainable development practices in learning pathways to the SMME Manager role in the Working for Ecosystems programme in the Ethekweni Municipality formed the focus of the Masters study by Burger (2017) in the SAQA-Rhodes project. The capabilities developed in/through an Environmental Learning Skills Programme for learning pathways into green jobs formed the focus of the Masters study of reserved to green jobs formed the focus of the Masters study of green jobs formed the focus of the Masters study by Burger (2017) in the SAQA-Rhodes project. The capabilities developed in/through an Environmental Learning Skills Programme for learning pathways into green jobs formed the focus of the Masters study of reserved the focus of the Masters study of reserved the focus of the focus of the Masters study into green jobs formed the focus of the Masters study of reserved the focus of the focus

Given that the SAQA-Rhodes research was an exploratory initiative designed to develop methodologies and models for researching learning pathways into environment and sustainable development practices and jobs, we were only able to develop a small number of in-depth case studies which explored learning pathways associated with the above-mentioned occupations. There is clearly much more that could be done to examine the wide array of learning pathways into a range of environment and sustainable development occupations. Of concern to us at the start of the research programme was the fact that the research methodology for such research was underdeveloped, and hence the case studies were designed to provide useful empirical insights into the occupations described above. In addition, the case studies helped to develop adequate research methodology for learning pathways research in the environment and sustainable development sector. This work is the focus of this Bulletin. We think that from this work, useful methodological perspectives can be gained for expanding the dialectical research approach to larger scale learning pathways studies that take occupational and educational progression into account.

THE FOCUS OF THIS BULLETIN

In this Bulletin we share some of the insights gained from the case study research into learning pathways into green occupations, or associated with critical skills associated with the greening of occupations. Our primary purpose is to share insight into *researching* learning pathways as education and occupational progression.

The papers in the Bulletin illustrate that putting pathways at the centre of an education and training – and professional development – system helps to bring many parts of the system into direct relationship with each other. The careful work of investigating the elements of pathways as analytically separate but systemically whole, helps to raise questions on the alignments and misalignments that exist, and how qualifications and curriculum provide for educational articulation and progression. The investigation process illustrates how one might undertake research into a systemic approach to articulation (Wheelahan, 2009; Ramsarup, 2017). The empirical data, and theoretical and philosophical perspectives in the case studies show that investigating the nature of sustainable development learning pathways helps to provide transformative leverage points that can create better flow within education and training, improved connections between education/training and work, and the improved development and use of skills at work.

The Bulletin shares lessons derived from across the cases and offers methodological insights into some of the following.

- Environment and sustainable development learning pathways need to be viewed as complex phenomena that emerge in open systems and are constituted by dialectically interdependent forces.
- A deeper understanding of learning pathways is driven by both educational and occupational progression, and is shaped additionally by wider social-ecological contextual factors in a systemic 'whole'.
- Conceptualising pathways as 'laminated systems'⁶ and analysing them as analytically separate but systemically whole, with Critical Realist lenses, enables learning pathways research to engage the macro-micro dualism/split actively.

⁶ See Paper 8 for a detailed explanation of 'Laminated Systems'.

It also helps to provide a solid theoretical foundation for this work, addressing the critique that learning pathways research is 'bi-furcated' into studies that are micro-level only, or macro-level only.

 Environment and sustainable learning pathways are 'transversal' and cross all NQF Sub-Frameworks and sub-sectors of the NQF. There are many challenges in how the current PSET system is responding to this complex and relatively new transversal concern which is integral for the sustainable development of society, and the country.

The insights from the eight papers are enriched by the international specialist paper chosen for this Bulletin. Paper 9 by Mukute and Pesanayi *shows how* the climate change education/training needs of Park Managers, Ecologists, and Community Development Officers in Southern African Development Community (SADC) Transfrontier Conservation Areas (TFCAs) were established through 'contextual profiling'. The paper goes on to discuss how a curriculum that was developed through contextual profiling, was *recontextualised* in the implementation context. The authors agree that the paper has potential value for educators/trainers interested in (a) 'increasing the relevance' of the learning involved, and (b) enhancing its 'congruence to learners' realities'. The ideas in Paper 9 are valuable for learning pathways research and development in that they focus on the *type of collaborative curriculum development* needed in the forging of learning pathways, which simultaneously needs to look both to contextual relevance, 'past, present and future', and to relevance for the learners living the pathways.

The papers in this Bulletin, and how they relate to each other

The various papers in the Bulletin are described in brief below, showing how they relate to each other in a developing argument for a dialectical methodology for learning pathways research oriented towards transformative praxis in the NQF system.

- Paper 1 focuses on the unit of analysis in learning pathways research, and argues for a focus on *educational and occupational progression as the unit of analysis*, with implications for viewing articulation from a systemic perspective.
- Paper 2 focuses on conceptualising differentiation and boundary crossing as a critical factor in learning pathways research conceptualised as educational and

occupational progression within a systemic perspective. It argues, however, for an in-depth approach to *understanding mechanisms that hold boundaries* in place.

- Paper 3 focuses in on an *extensive literature review* of approaches to learning pathways research, noting the general tendency towards bifurcation and dualism in learning pathways research which focuses either on (a) the individual career story, or (b) systemic and policy oriented studies. This paper introduces the importance of focusing on *transitioning* in learning pathways research at the empirical and actual levels in learning pathways construction.
- Paper 4 seeks to 'pilot test' a dialectical methodology for working with career stories to explore how such a methodological approach (drawing on Bhaskar's 1993, 2010 Critical Realist dialectic) can help to address the bifurcation noted in the bullet immediately above, and offer a systemic approach that is also oriented to transformative praxis. Here absence is noted as being an important category for analysis as 'absenting absences' (by drawing on 'presences' that may exist in other contexts) within a wider totality, provides the 'dialectic' for change, and points to agentive (action-oriented) possibilities for transformative praxis.
- Paper 5 provides further *insights into the processes of boundary crossing*, noting that boundaries are social-material in their constitution and in their effects. Paper 5 draws on data from Mohanoe's (2014) Masters study to illustrate existing boundaries in the educational and occupational learning pathway progression of workers, supervisors and managers in a local government context. The paper points not only to the boundaries, but also to boundary-making processes (ie: the making of the boundaries), and to absences, and thus begins to point to the possibilities for transformative praxis in learning pathways research conceptualised as educational and occupational progression in a systemic articulation framework.
- Paper 6 provides an example of in-depth case study research which addresses the micro-macro divide in learning pathways research, pointing to a combination of research processes which begin by unfolding the learning pathways experiences of people who have managed to create Environmental Engineering learning pathways despite an absence of adequate qualifications into this

specialist route. The paper goes on to examine the work and job environment which creates a demand for this occupation, and how the PSET system is/is not responding to this emerging demand. Paper 6 also considers the wider macrosystemic 'whole', especially the environment and sustainable development challenges (ie. the social-ecological context) that is influencing both the demand for, and the experiences of, Environmental Engineers. The paper shows that these levels of the system are dynamic, emergent and transitioning. It points to significant absences in the transitioning systems of education and training provision, and the professional recognition of Environmental Engineers, and to a pattern of extended transitioning, which could be reduced via more proactive approaches to skills system development for this occupation.

- Paper 7 considers educational, training and occupational support system elements and their emergence in response to changing social-ecological dynamics and the emerging demand for 'Green Skills' and for the 'greening of occupations'. It points out the various studies that have been done to begin to quantify the environment and sustainable development skills demand, and notes that little 'matching' research is being done to analyse the skills system response to this emerging demand. It then hones in on some of the supply side system elements and how these elements are emerging to respond to this new demand in the education and training landscape. The paper looks at the 'Green Skills responsiveness' in existing gualifications, in the Organising Framework for Occupations (OFO), and in career orientation, as all of these aspects were found to have a significant impact on emerging green occupations and learning pathways into these. The paper points to emerging developments within these system elements, but also to significant 'absences' that require attention if 'seamless' learning pathways for environment and sustainable development occupations are to become possible in South Africa. It points to the possibilities for further emergence in this part of the transitioning system.
- Paper 8 provides a 'synthesis' perspective on the methodological work that is developed over the set of papers (from Paper 1 to 7), and proposes a 'laminated systems perspective' for learning pathways research which allows for dialectical engagement at various levels of emergence within an interconnected and relational transitioning system including, (1) the level of the transitioning professional, (2) the level of the transitioning workplace/job environment, (3)

the level of the transitioning PSET system, and (4) the level of the transitioning social-ecological context. All of these levels are related to each other, so careful research is required, which allows for the generation of empirical data and theoretical work that recognises this relationality. Such data should not only focus on the positive (ie. what is there) but also on absences or non-identity (ie. that which is not [yet] there), as this provides possibilities for conceptualising transformative praxis to enhance environment and sustainable development learning pathways as educational and occupational progression in a dynamic transitioning system that is moving towards sustainability and social-ecological justice.

- Paper 9, the international paper, provides a detailed example of the type of 'contextual profiling' and recontextualisation needed in the collaborative curriculum design and delivery that enables learning-and-work pathways, in the environment and sustainable development field, and elsewhere. The paper presents a robust practical example of how the macro- and micro-level aspects of learning pathways can be integrated.
- The Bulletin ends with an Editorial Post-Script which provides a SAQA reflection on the generative potential of the insights of the SAQA-Rhodes Partnership Research, for the further development of articulated learning pathways in the system for education, training, development and work in South Africa, and the NQF in general.

IN CLOSING THE INTRODUCTORY COMMENTS

In summary, the contribution of the papers offered in this Bulletin is as follows. The methodological proposals for learning pathways research undertake (a) 'career story' research, and (b) system elements analysis, but (c) subject these career stories and systems perspectives to Critical Realist dialectical analysis, in order to (d) identify 'absences that need absenting' at system level, and then (e) establish the manner in which the NQF as a differentiated system may be (better) able to respond to the absences identified.

In our view, this provides a substantive approach for learning pathways research. Absences identified in individual learners' learning pathways/career stories are not neglected or 'given material form' in only a career story, or in only a systems-based analysis of learning pathways. Readers will see from the collection of papers included, that this approach was not an easy trajectory to open up; it required in-depth engagement with philosophical and research methodological perspectives⁷ as well as with the context of practice.

Given the emphasis on the need for systemic understanding of learning pathways as educational and occupational progression in a transitioning system, our research probed the *concept of 'articulation' from the perspective of a system being 'joined up'*. Early on, we noted that the word 'articulation' can carry different meanings – eg. following a structured learning pathway with credit accumulation and progression in qualifications; articulation as learning in-and-out of practice; and/or articulation and learning pathways embedded in subject formation (see Paper 1, in this Bulletin). Through our research and methodology development, an additional perspective on articulation was outlined and explored, namely articulation as a significant 'relational element' within a systems approach to learning pathways development. We think that such a framing helps to begin to develop a wider systems perspective on the notion of articulation.

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⁷ This required the dominance of either positivist and/or hermeneutic research orientations, and led us to Critical Realist research orientations which allow for the recognition of transitive (epistemologically constructed) and intransitive (ontologically grounded) realities after Bhaskar (1993). To escape the either/or/of micro- or macro- level research into learning pathways, and to develop laminated system possibilities for transformative praxis from our research, we drew on Bhaskar's (1993; 2010) Dialectical Critical Realist methodology and laminated system framework, as will be seen across the pages of this Bulletin.

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PAPER 1
Learning Pathways and Articulation: Early Conceptual Explorations and Implications for Research Design(s)

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BACKGROUND AND INTRODUCTION

This paper is an introductory, exploratory paper which opened up the terrain for a second phase of the South African Qualifications Authority (SAQA)-Rhodes University research partnership focusing on *change-oriented workplace learning and sustainability practices, with an emphasis on learning pathways* (the main period being 2011-2013, ongoing until 2016). The paper reviews early conceptual explorations of learning pathways and articulation questions, as these relate to a transversal issue⁸ in the National Qualifications Framework (NQF), namely environment and sustainable development.

Environment and sustainable development issues have few sectoral boundaries. Environment is the basis of multiple forms of life and provides resources for many ecological, social and economic activities. Environmental degradation and associated unsustainable patterns of development are increasingly affecting a wide variety of social practices, including workplace practices. In response, various sustainable development practices are emerging in workplaces not only in South Africa, but globally, which have relevance in a range of different education and training sectors. They cross industrial, social and public goods sectors and permeate the interrelated home, market, state and commons economies (Raworth, 2017).

The issues are by their nature 'boundary crossing' and thus raise interesting articulation and differentiation questions. For example, at a conceptual or practical level, it is possible to ask to what extent sustainable development education and training programmes differ or articulate with regard to, for example, the way in which they reflect sustainable

⁸ The aspects of environment and sustainable development cut across all fields, all sectors, and all three NQF Sub-Framework contexts.

consumption and production or Green Economy principles⁹ even though they are offered in different education and training contexts (occupationally directed; in the General and Further Education and Training (GENFET) context, or the Higher Education context). Articulation issues associated with education and training for sustainable development are also influenced by different 'drivers' which include the environmental condition itself, for example climate change, (new) legislation and compliance demands (eg. the National Environmental Management Act No. 107 of 1998), resource efficiency and cost saving, opportunities associated with the Green Economy, and historical and contemporary political economies surrounding resource flows and control. The issues are therefore both social justice issues, as well as economic and environmental *at the same time*, but may play out with different emphases or ideological commitments in different settings.

The Phase 1 Research

In Phase 1 of the SAQA-Rhodes research programme, the focus was directly on understanding how change-oriented learning related to sustainable development practices takes place in workplaces. Working with Cultural Historical Activity Theory (CHAT) (Engestrom, 1987; 2001), the programme examined how tensions and contradictions that emerge in workplaces provide opportunities for expansive learning (Mukute, 2010; Masara, 2011; Olvitt, 2012; Mukute & Lotz-Sisitka, 2012). The programme highlighted that expansive social learning in workplaces occurs also at the interface of interacting activity systems. The first phase of the programme raised various articulation guestions related to the existing nature of work through either the need for new 'green jobs'/occupations or new knowledge and capabilities in existing job contexts. For example, studies found that orange farmers had to change to more sustainable practices as international trade regulations changed to incorporate environmental elements (Downsborough, 2007); local government employees had to change roles to accommodate new approaches to waste management which was recently legislated (South Africa, Department of Environmental Affairs [DEA], 2010); and forest managers had to learn new water conservation and wetland management practices given the context of water scarcity in South Africa (Lindley, 2014).

The Phase 1 research findings also noted that sustainability practices are contested and complex, as they require a balancing of economy, ecology, and societal interests, and

⁹ The Green Economy is an economy that aims at reducing environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment.

inevitably involve trade-offs. For example, agricultural practices that favour mono-cultures may be more economically viable, but they are ecologically destructive, and displace small-scale farmers and the poor. In other words, while sustainable agricultural practices are better at ensuring ecological integrity and social participation, they are not (yet) fully economically viable as they require new economic support systems which are only recently starting to gain ground (Mukute, 2010). This makes for an interesting, contested learning 'object' (*Ibid*.). The Phase 1 research findings indicated that while these realities are the case, the forms of knowledge required to engage with sustainable development do not necessarily exist in workplaces, and that workplace learning processes oriented to sustainable development require:

- recognition of, and engagement with, existing knowledges that circulate in workplaces (which differ and may include: tacit, explicit, technical, sociological, marginalised, dominant, formal, informal, non-formal, and other forms of knowledge); and
- **expanding knowledge and practice** through introducing new knowledge through 'double stimulation', meaning via the introduction of new learning stimuli.

In all the Phase 1 case studies (Lotz-Sisitka, 2011), researchers identified the significant role played by trainers or extension workers in the different activity systems¹⁰, as they bring the 'new cultural capital' of sustainability issues and realities into existing activity systems. However, all of the researchers also identified significant problems with providing subjects (actors) in the activity systems appropriate learning materials, and access to appropriate learning pathways (training programmes and new learning opportunities) to further the objectives of the sustainability practices being introduced.

For example, in a small and medium enterprise (SMME) case study focusing on the commercialisation of beekeeping, training was being offered by NQF-accredited trainers, but the training was in English and it did not recognise or give credence to existing historically and culturally constituted beekeeping traditions and practices (Masara, 2011).

¹⁰ An activity system is a group of people who share a common object and motive over time. They share cultural and other tools (eg. language symbols, artefacts) to act on their common object.

In another instance of an SMME agricultural case study, it was found that no qualifications existed for sustainable agriculture in the formal system of learning (Mukute, 2010); and in a local government case, it was found that workplace training in the form of a learnership was 'provider and qualification driven' rather than being workplace-relevant or occupationally-centred learning (Olvitt, 2012). Wider analysis towards the end of The Phase 1 research in the form of a national environmental sector skills planning study undertaken for the environmental sector, revealed that the wider system of education and training provision for workplace learning and sustainability practices is largely reactive, rather than being proactively engaged with environment and sustainability as a transversal concern (DEA, 2010).

The key problem raised at the end of The Phase 1 research, which led to the conceptualisation of Phase 2 of this research programme focusing on learning pathways, was the finding that environment and sustainability formal training programmes and gualifications were not well articulated with workplace developments and challenges regarding sustainability. The training tended to follow a model of 'designing down'11 rather than expansive learning, where the latter learning is a longitudinal process in which participants analyse the tensions and contradictions in their activities, and implement new and revised processes that expand the object/outcomes/goals and improve the learning activity and possibilities for action. It also seemed that training, where it was being offered, was mainly oriented towards meeting unit standard-based quality criteria, which did not allow for enough flexibility to adapt to the rapidly changing environment and sustainability arena, or to the complexity and diversity of environment and sustainability concerns in workplaces. It was further found that at the macro level of the NQF system, there were many system elements that required more engagement for a new transversal concern such as sustainable development to be fully accommodated in the national system of skills planning and provisioning. Phase 1 of the research programme had raised a number of issues that related to relevance, articulation and learning pathways.

^{11 &#}x27;Designing down' refers to developing training programmes from pre-determined outcomes, and relating them to context.

The Phase 2 Research

Initial engagement with questions of articulation and defining a unit of analysis for learning pathways research

We started Phase 2 of the research programme by seeking insight into ways of engaging the issues raised in Phase 1, at a wider systems level, that is, we needed to focus beyond interacting workplace activity systems. Here we were interested in developing insight into *how learning pathways articulated* with the need for learning new environment and sustainability orientated workplace practices. We needed to understand how environment and sustainable development learning pathways were being constituted in the South African NQF system.

Early on, we found a number of questions arising as we began to set up the research programme, one of which was how to establish an appropriate unit of analysis for systemsbased research that focuses on learning pathways and articulation issues.

We identified the following possibilities for the unit of analysis for studies on learning pathways and articulation issues relevant to the transversal issue of environment and sustainable development in the NQF context:

- 1. learning in the activity system itself in the workplace (as in Phase 1);
- 2. *interacting systems of workplace learning and training* (also explored to some extent in Phase 1); or
- the system of providing for training that is meant to be workplace-oriented (eg. unit standards based, occupationally directed, etcetera.) and its differentiated sub-systems within this wider system the General and Further Education and Training Qualifications Sub-Framework (GFETQSF), Higher Education Qualifications Sub-Framework (HEQSF), and Occupational Qualifications Sub-Framework (OQSF) constituting the NQF¹² and the interface between them.

¹² The NQF in South Africa comprises three articulated NQF Sub-Frameworks, namely (1) the General and Further Education and Training Qualifications Sub-Framework (GFETQSF) overseen by Umalusi, Council for Quality Assurance in General and Further Education and Training, (2) the Higher Education Qualifications Sub-Framework (HEQSF) overseen by the Council on Higher Education (CHE), and (3) the Occupational Qualifications Sub-Framework (OQSF) overseen by the Quality Council for Trades and Occupations (QCTO). The South African Qualifications Authority (SAQA) coordinates the three NQF Sub-Frameworks (See the NQF Act No. 67 of 2008).

From the exploration around the unit of analysis, it was possible to see that learning pathways and articulation-related research could be conceptualised in different ways, depending on the way in which the unit of analysis is framed. Additionally, there are similar decisions to be made in relation to *learning pathways research*, as one may well ask what the unit of analysis is for a learning pathway. Is it the structured learning pathway set up through formal learning opportunities as conceptualised through the traditional notion of an 'academic trajectory', or is it a much more complex phenomenon which combines formal and informal learning? In other words, is it an educational learning pathway, an occupational learning pathway, or an *educational and occupational learning pathway?*

Example of an environmental/sustainable development learning pathway

In the early exploratory research, findings from the field indicated that the latter – the educational and occupational learning route - was the way in which most people responded when asked about their learning pathways. Examples here include an Environmental Education Masters student who studied Mining Geology, but who was wanting to specialise in rehabilitation training. This student noted that his learning pathway included formal schooling with Science, Geography and Mathematics subjects and university degrees specialising in Mining Geology up to Honours level¹³. However, informal learning influences, such as a holiday job with a cousin involved in environmental impact assessments, and a winter school focusing on national science and sustainability programme and seeking to attract graduates from multiple disciplines into sustainability sciences during the final year of his studies, changed the learning pathway direction of this young scholar. Social commitment to injustices surrounding borrow pits in his local community context also formed a learning pathway influence that has since taken this learner into specialising in the social aspects of sustainability and rehabilitation training in the mining industry. This involved a 'switch' to social sciences and interdisciplinary studies. From an education and training system perspective, articulation in this case would reside at the interface of formal (Umalusi and CHE) accredited education and training programmes, and informal education and training experiences. The informal experiences included work-based experience and short course training, which (in the case of this learner) included short courses focusing on rehabilitation practices (QCTOaccredited training) (Maphinyane, 2014).

¹³ In South Africa the first degree in this field is a Bachelor of Science, or Bachelor of Engineering, degree, which can be followed by an Honours degree.

This example shows that a unit of analysis focusing on the 'cross overs' in learning pathways research can provide a rich picture of learning pathways¹⁴. Such a unit of analysis potentially provides an interesting way of understanding articulation in the context of learning pathways, albeit in a more complex than standard way of thinking about articulation within an educational learning pathway which is defined by credit transfers and qualification matching.

The meaning of 'articulation'

It is also important to pause to consider the meaning of 'articulation'. While written in a very different but related context, Hall (1985:113-114) from a platform of cultural studies, defined articulation as:

By the term, 'articulation', I mean a connection or link which is not necessarily given in all cases, as a law or fact of life, but which requires particular conditions of existence to appear at all, which has to be positively sustained by specific processes, which is not 'eternal' but has constantly to be renewed, which can under some circumstances disappear or be overthrown, leading to the old linkages being dissolved and new connections – re-articulations – being forged. It is also important that an articulation between different practices does not mean that they become identical or that one is dissolved into the other. However, once an articulation is made, the two practices can function together as 'distinctions within a unity'.

As explained by Slack (1996:113), "theoretically, articulation can be understood as a way of characterising a social formation without falling into the twin traps of reductionism and essentialism". She noted further that,

... articulation works at additional levels: at the levels of the epistemological, the political and the strategic. Epistemologically, articulation is a way of thinking the structures of what we know as a play of correspondences, non-correspondences and contradictions, as fragments in the constitution of what we take to be unities. Politically, articulation is a way of foregrounding the structure and play of power that entail in relations of dominance and subordination. Strategically, articulation provides a mechanism for shaping intervention within a particular social formation, conjuncture or context (*Ibid*.)

¹⁴ This forms the foundation of one of the half-thesis Masters studies which was part of the SAQA-Rhodes research programme (Maphinyane, 2012).

The Slack quotation above resonates with the more recent SAQA-Durban University of Technology, DUT (2017) and Minister of Higher Education and Training (MHET) (2017) definitions of articulation, which refer to 'vertical', 'horizontal' and 'diagonal' articulation that can occur within or between the NQF Sub-Frameworks. In this understanding, there are also 'systemic' and 'specific' articulation, and articulation through the support of individual learning pathways. Systemic articulation involves 'joined up qualifications and/ or professional development'; specific articulation is that achieved by formal/informal arrangements between institutions. Individuals are supported in their learning pathways through practices such as career advice and Flexible Learning and Teaching Provision (FLTP) that enables learners to recognise, navigate, and cross, boundaries encountered (SAQA, 2017).

For a research programme seeking to understand 'learning pathways that articulate', it is therefore helpful to think about articulation as working at different levels, and involving the 'forging of re-articulations' (*Ibid.*)¹⁵. Commenting on the importance of understanding articulation issues, Hoppers (2009:68, emphasis added) offers another useful perspective:

The principle that makes an integrated system come to life for the benefits of all learners is that of *articulation* (i.e. the actual connections between different learning pathways at the horizontal level, and the transitions from one level to the next in vertical terms). These are the 'bridges' and 'ladders' that allow people to move through the system in accordance with their (changing) circumstances and needs ... Effective articulation within an integrated system enables parallel and second chance learning pathways to emerge ...

The SAQA (2017) and MHET (2017) conceptualisations of articulation, which this research programme contributed to, highlight that central to a unifying definition of articulation is the recognition of systemic articulation, which involves the joined up systems incorporating qualifications, professional designations and other elements central to work and learning pathways.

Thus it is also helpful to recognise that articulation within a learning pathways frame cannot be abstracted from the historically and geographically specific but interconnected processes, material conditions, forms of power, and processes of subject (actor) formation.

¹⁵ This construction of articulation has been said to open up new possibilities for non-reductionist understandings that go far beyond notions of 'intersectionality'.

With this in mind, it is possible to constitute research into this question using three different units of analysis, each with different knowledge production consequences.

Articulation as following a structured learning pathway from General Education and Training (GET) to Further Education and Training (FET) to Higher Education and Training (HET) to workplace.

Understanding articulation as structured learning pathways makes it possible to investigate learning pathways from the perspective of *structural, epistemological, and practice centred articulations,* amongst others. Drawing on the same case outlined above, one might ask to what extent the young employee/scholar was exposed to the foundational concepts relevant to sustainable development and rehabilitation practices (his current interest in the mining sector). One could also ask to what extent his HET degree (focusing specifically on Mining Geology) prepared him for understanding sustainability practices in the mining industry through formal courses on either sustainable development and/or rehabilitation in the mining industry. Further one could ask where and how he could further his knowledge of such practices in ongoing QCTO accredited programmes; whether short courses on rehabilitation in the mining industry exist, and if so, where. This question may also be 'bounced back' into the system of rehabilitation practices, and one may question whether workers employed in the mining industry are being offered training on these issues, and/ or whether the Technical and Vocational Education and Training (TVET) College system makes provision for such training.

While these questions may seem to be centred on the learning pathway of one individual, they gain further significance in the context of the Human Sciences Research Council (HSRC) (2009) study that identified some 3000 employees involved in mine rehabilitation in South Africa. A potentially interesting research project focusing on how the different education and training institutions and qualifications levels articulate to provide for such occupational specialisation was therefore possible.

Articulation as learning in-and-out of practice:

Enquiries into articulation and learning pathways using 'articulation as learning in-andout of practice as the unit of analysis would raise different types of questions and thus influence knowledge construction in the research programme. Here one could pursue the line of enquiry into learning pathways associated with mine rehabilitation practices through questions about:

- the ways in which employees (eg. the Mining Geologist) draw on knowledge offered in formal training contexts (eg. the university Mining Geology course) in new environments (eg. the environment of mine rehabilitation and social justice practices associated with mine rehabilitation, in practical mining contexts), and
- how the forms of knowledge change as they articulate (or not) in-and-out of practice.

This brings the questions of knowledge articulations and knowledge-practice articulations to the fore, which have traditionally been dealt with in discourses that separate formal explicit knowledge from tacit knowledge. This unit of analysis brings the *learning* in a learning pathway more to the fore in relation to the way epistemologies and encounters with different epistemologies influence and shape learning pathways. Such research may be useful to inform curriculum design for work-integrated learning, which has now become a significant feature of the education and training system in South Africa. The Phase 1 research processes have engaged to some extent with this notion of articulation, but more at the level of cognition within the learning process (Mukute, 2010), rather than as a question of *articulation* within the notion of learning pathways.

Articulation and learning pathways embedded in subject formation

A research agenda on learning pathways and articulation would encompass consideration of the way in which learning opportunities 'articulate' within processes of subject formation¹⁶; thus taking account of societal structures, agentive capabilities, and power relations amongst other 'structuring' factors.

However, there appears to be yet another possible unit of analysis, which could be constituted separately or in addition to the above mentioned units of analysis, for understanding articulation issues in the context of learning pathways.

Articulation as a significant 'relational element' within a systems approach to learning pathways development

Articulation as a 'relational element' was revealed by some early empirical 'windows' into the articulation issue in the Phase 2 research programme. This perspective on articulation

¹⁶ Here, subject refers to actors, with identities, in activity systems.

was raised through initial pilot research into the learning pathways of municipal workers conducted in five municipalities (Wigley & Sisitka, 2011)¹⁷, conducted at the start of Phase 2 of this research programme. Here it was generally agreed that the actual practices, particularly at the 'operations' level have been neglected in the training landscape, and that environmental practices training is much needed in local government contexts to improve (a) the management of service delivery, and (b) the knowledge and capacity of workers responsible for 'on the ground' practices (see also DEA, 2010).

The main reason why the needed training was not happening is because it does not exist, nor can it be planned for because the structure of the Workplace Skills Plan used in local government contexts does not allow for the inclusion of environmental practice skills programmes. This indicates that there are articulation issues between the environment where certain new forms of training are needed, and that the education and training system is not 'geared' to offer such training for various reasons. These reasons appear to be related to both system blockages, and the inability or lack of capacity to adjust to changing environmental conditions.

A small-scale case study investigating one aspect of the education and training system related to this problem is included in Box 1 below, which captures a short paper produced by Ramsarup (2011). This case study provides further perspective on the notion of articulation as an *important relational element* within a system of education and training. The study (*Ibid.*) shows that for environmental practitioners working at occupational-based NQF Levels 2 and 3 in the local governments surveyed in the pilot study, their occupational categories did not exist in the Occupational Codes that are used to frame education and training in the relevant Sector Education and Training Authority (SETA) context. The closest occupation was an 'Environmental Practices Inspector'.

While this omission may seem trivial in the context of learning pathways research, it gains significance when seen in the light of the DEA (2010) study which identified up to 30 000 workers employed in South Africa's municipalities who are involved in basic environmental practices activities such as waste collection, parks and garden maintenance, water and sanitation management, and biodiversity management. These functions are critical for improved service delivery, and the DEA (2010) research found that while qualifications exist and are registered for Environmental Practices Training at Levels 2 to 5 on the NQF,

¹⁷ This research forms the foundation of one of the M.Ed studies in the Phase 2 research programme (Mohanoe, 2012).

these had hardly been used, and worker training at these levels remained neglected. Articulation between workplace demands, societal context needs, and the education and training system in this case was not functioning well.

Box 1: Occupations and Environmental Learning Pathways: Snapshot

[Source: Ramsarup, 2011]

Learning pathways have colloquially been regarded as the way we navigate and sequence our learning, skills development, education and training to attain competency towards a qualification or part-qualification within an occupational [or academic] context. These pathways are numerous, multifaceted and inherently unique to each individual. Enabling a seamless learning pathway is complex and dependent upon a number of interdependent systems, including schooling, career guidance, post-school opportunities, training opportunities, workplace learning and work experience as well as the formal system of skills provisioning. My research interest lies in uncovering all of these dynamics.

To begin probing this issue, I [the researcher] asked 12 professionals how their learning pathways into the environmental sector had been constituted. They all reported a struggle to find relevant study options. Most striking was the fact that they entered their fields from a broad array of study disciplines such as Science (most dominant), Arts, Commerce and Education (amongst others). The participants reflected uncertainty and struggle with career paths within their occupations and even a lack of recognition of their occupations.

Underpinning clear learning and occupational development pathways is a system of how occupations are constituted. This framing influences education and training provisioning; career path development and the like. All occupations in South Africa are represented within the Organising Framework for Occupations (OFO), which is a coded occupational classification system. It is a key tool for identifying, reporting and monitoring skills supply and demand in the South African labour market, and it enables us to connect macro-level skills development issues (scarce and critical skills tracking; supply and demand data) to micro-level skills issues (training programmes for individuals, skills gaps, and workplace skills planning). Within the OFO, certain jobs are so similar that they can be clustered together into occupations. These occupations are articulated with an occupational descriptor and occupational tasks that define the knowledge, skills and workplace experience needed to deliver the products and services linked to a particular occupation

Due to relative newness, as well as the lack of a co-ordinated approach, there is very little knowledge available on the profile of environmental occupations and the systemic integration of these into broad occupational frameworks. This has resulted in considerable contextual variance in occupational titles, tasks, entrance requirements and general sectoral knowledge of an occupation, making it difficult to find a common language or reference framework for the discussion of employment trends and statistics in the sector. It is no wonder that professionals struggle to establish learning pathways and occupational development pathways in the sustainable development field.

Early insights into working with the OFO system in South Africa show a disjuncture between local and international occupational framings. For example, some Park Rangers work with a (school) Grade 10 qualification, although internationally, this is framed as a professional occupation. OFO research in general shows that environmental learning pathways are poorly represented, and are often discontinuous. Significant gaps exist, environmental learning pathways are scattered, and clear scaffolded pathways are not visible across levels of skill. At scientist/professional levels, for instance, a range of career options exist, while at technical/technician levels, there is generally just one option. Environmental Practice Inspector (requiring NQF Level 2 qualification) is mapped to Environmental Manager (NQF Level 5), without any intermediary options.

Knowledge of coupled social-ecological issues has rapidly increased over the past fifteen years. There is also wide recognition that we need integrated responses to these social-ecological issues. However, the South African skills development system seems ill equipped for this. Many environmentally linked occupations on the South African OFO system require learning pathways that include Physical Science. Occupations linked to Community Conservation, Social Ecology, Stewardship and Rural Development are not represented. This restricts movement for students with a Social Science or Arts pathway; and will have the effect of not enabling integrated responses to complex social-ecological issues.

Additionally, most entry points for occupations are at professional levels, typically requiring postgraduate qualifications. The sector needs to explore greater representation of entry-level environmental occupations to enable better access into the sector at artisan and technical skill levels. This would have implications for Further Education and Training/TVET pathways to enable better artisan-linked environmental education and training opportunities. There is a widely recognised national shortage of such skills in South Africa today. To make matters worse, new occupations (eg. Climate Change Modelers) are not captured in the OFO system, and there is no adequate mechanism to do so. This will lead to reactive, *ad hoc* skills provisioning unless a more co-ordinated approach to occupational development in the environmental sector is followed.

The National Skills Development Strategy III (DHET, 2011) lays the foundation for a more strategic and coherent approach to skills development. It requires Sector Education and Training Authorities (SETAs) to ensure that they address the skills needs within their sectors. But SETAs will not be able to fulfil their mandates if they do not articulate skills development requirements with occupations. If the occupations are not captured in the OFO system, SETAs cannot provide for them. This in turn affects the release of funding for new occupationally directed training provided for through the QCTO. A key starting point for addressing the everburgeoning demand for skills in the environmental sector seems to lie with a comprehensive representation of environmental occupations in the OFO system. Without this, coherent learning pathways cannot materialise¹⁸.

¹⁸ This work is expanded upon in Paper 5 of this Bulletin and in Ramsarup (2017).

From Box 1, it is possible to note the multi-layered and multi-facetted articulation issues that require investigation in learning pathways research. These initial sets of data used to inform the development of the studies in the programme (Wigley & Sisitka, 2011; Ramsarup, 2011 as cited in Box 1) thus raised the following multi-layered articulation issues.

- Articulation issue 1: A CONTEXTUAL issue involving time on task, absenteeism, training time, and the immediate service delivery crisis. This issue was related to the problems of sending workers on training programmes given the demand for their time on task, the phenomenon of high levels of absenteeism that characterises the local government workplace in the face of HIV/AIDS challenges, and the immediate service delivery crisis pressures.
- 2. Articulation issue 2: A TRAINING AND QUALIFICATIONS DESIGN issue. This issue was related to a mismatch between the training on offer (or not) and the standards developed (which existed but were not being used, or which were poorly designed for the occupational needs), and between the standards developed and occupational practices (such as the time allocations for acquiring the standards and workplace demands); and between all of these and the concepts of change-oriented learning (the conditions in which learning needs to take place and the ideals of the training programmes and standards).
- 3. **Articulation issue 3:** A SYSTEM OPPORTUNITIES issue. This issue was related to the lack of training-based learning pathways for workers engaged in environment and sustainability issues at occupational level, which leaves only the more generic, internally constituted workplace learning pathway with little/ no mentoring available for the learning of new practices.
- 4. Articulation issue 4: A SYSTEM STRUCTURES issue. This issue is more deeply systemic. As explained, there are missing occupations in the OFO 'code system'; inaccurate or outdated occupational descriptors; and implementing agents (eg. SETAs) and municipal training divisions (workplace skills planning) that are disconnected from the demands for sustainability oriented training.

Conceptualising the Phase 2 research

All of the issues noted thus far raised two important questions for the conceptualisation of the Phase 2 research programme. First, was it necessary to understand articulation from these multi-dimensional vantage points? And if so, why? And to what end or purpose? And how do all of these aspects align with the policy intentions articulated in the NQF policy suite and White Paper for Post-School education and Training (PSET), and their structural forms and particular objectives? Secondly, how can articulation issues be researched if they represent a 'complex object' that has more dimensions than initially assumed when the research question for the programme was being developed?

Hence the Phase 2 was conceptualised with the following questions:

MAIN RESEARCH QUESTION:

• What are the quality and articulation issues that arise in learning pathways relevant to sustainable development, particularly in boundary zones between qualifications pathways that cross the Sub-Frameworks of the NQF?

SUB-QUESTIONS:

- What learning pathways exist, and/or are needed to enable sustainable development practices in workplaces (eg. for Solar Water Heater Installation), especially for scarce skills (eg. Environmental Engineering), critical skills (eg. Rehabilitation Practice skills in mining), and skills areas that appear to be marginalised from a skills development point of view, yet are critical for sustainable development (eg. environmental practices amongst workers in local government)?
- What quality and articulation issues arise in the contexts investigated?
- What methodological approaches and insights provide best insight into these issues and can these methods be more broadly deployed in for example the NQF impact study context?
- What are some of the transfer-related barriers and what needs to be done?

In these research questions, the isue of articulation is tied to quality and to transferrelated questions across the NQF Sub-Frameworks as well as to emergence in the context of learning pathways. 'Articulation' assumes boundary zones, and transfer processes. At one level, it has already been argued that sustainable development is a transversal issue that 'transfers' across the NQF Sub-Frameworks, but the question assumes 'transfer barriers'.

Our pilot data informing the unit of analysis for the research programme show that 'transfer barriers', cannot simply be conceptualised at the interface of the different Sub-Frameworks of the NQF, but may better be conceptualised at the interface of different system elements and system processes. Such a conceptualisation makes provision for researching learning *pathways as educational and occupational progression* where a more complex range of transfer barriers might be found, outside of those that can be attributed to educational progression pathways only.

CONCLUDING VIEW

Why articulation research is important

The discussion in this paper shows that researching articulation and learning pathways in the South African NQF context requires a careful analysis of what would form the most defensible unit of analysis within such research. Learning pathways or articulation issues require an understanding of differentiation and border crossing from a Systems Theory perspective. There is also a need to understand the mechanisms that create boundaries between systems and their environments. What has not been discussed, however, is *why* articulation research is of importance in the context of understanding change-oriented learning and sustainable development practices (although some insights are provided by the pilot data analysis in Box 1).

Parallel and 'second-chance' learning pathways

The notion of 'parallel and second chance' learning pathways is important in a context of social transformation, where many people must learn new skills on the job or have to change careers because the world around them changes. For example, the response to climate change is introducing a Green Economy in countries around the world, and new technologies, new workplace practices *etcetera*. will need to be learned (United Nations Environment Programme [UNEP], 2013). All societies are faced with the challenge of adapting to climate change and 'second chance' learning pathways will therefore become more important.

In contexts of poverty, parallel learning pathways are often important. Our initial research explorations showed that articulation and learning pathways are 'coupled concepts' central to a more sustainable *system* of change-oriented learning. Researching this 'coupled concept', as shown in this exploratory paper, is not just a technical matter. There is a *multi-dimensionality that requires further exploration*, particularly in the context of the 'newness' of sustainable development thinking and practice in the environments surrounding the education and training sub-systems, and the open-ended and rapidly changing nature of sustainability practice, and thus its need for ongoing change oriented learning.

Understanding of 'articulation' as being multi-dimensional

Giving further voice to the multi-dimensionality of the concept of articulation, is the Organisation for Economic Cooperation and Development (OECD) definition, which we also found useful at the start of the Phase 2 research programme:

Articulation is not a mechanical matter of formal recognition of qualifications, or of prior learning experiences, necessary as these may be. It is also a *learning concept, implying complementarity*, continuous enhancement or development of competencies, achievement and progression along a pathway that is personally meaningful and has social recognition and status (OECD, 1998:51).

Thinking of articulation as a 'learning concept, implying complementarity' along a personally meaningful, yet socially recognised pathway spoke to our thinking that an appropriate unit of analysis for learning pathways research would be *educational <u>and</u> occupational progression* (rather than one or the other of these). Aligned with the research programme's interest in change-oriented learning and sustainable development learning pathways, and our wider framing of the unit of analysis for learning pathways research as opened up in this paper, is a point made by Biersta (2006). Biersta argued for a multi-dimensional, triadic 'nature' of lifelong learning, which has personal, democratic and economic functions. As noted in this opening paper, our research would argue for a sustainability function too which presents particular transversal challenges to researching learning pathways in the NQF context.

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NOTES

PAPER 2

Learning Pathways and Differentiation: Initial Methodological Explorations and Implications for Research Design(s)

Dr Presha Ramsarup, Professor Heila Lotz-Sisitka, Ms Nthabiseng Mohanoe

INTRODUCTION

The deliberations on what may constitute an appropriate unit of analysis for research focusing on learning pathways as educational and occupational progression reveals the need to consider appropriate theoretical and methodological frameworks for undertaking research that can accommodate a 'complex object' (Lotz-Sisitka & Ramsarup – Paper 1, in this Bulletin). Failure to do this may lead to over-simplifying the phenomena, thus producing poor quality knowledge of the object. To address this potential validity threat, we focused on methodological issues, by which we mean the 'theory of method' (that is, theoretical perspectives that shape methodological processes in research).

We approached this task in different ways, as will be reported across the papers in this Bulletin. A critical starting point was, however, to undertake a substantive literature review to illuminate how researchers in other parts of the world were conducting learning pathways research. The key finding here was that learning pathways research was methodologically eclectic with a focus on either the individual learner's pathway (career story) or on wider systemic dynamics of learning pathways (work and learning transitioning within a system) (see Ramsarup, 2017; and Paper 3, in this Bulletin).

In response, we thought that Systems Theory might help to respond to this methodological problem, and we started by exploring the potential of Luhmann's (1995) work on system differentiation. While the Luhmann project provides useful tools for thinking about learning pathways from a systems perspective, we found that this work lacked adequate dialectical and ontological depth and we then focused on how Critical Realist (Bhaskar, 1993) underlabouring may help to deepen critical engagement with the system in ways that are not limited by the potentially self-referential nature of autopoesis¹⁹ in the Luhmann project.

^{19 &#}x27;Autopoesis' refers to the tendency of systems to become self-organising, self-reproducing, and self-referential, and therefore potentially increasingly conservative or exclusionary (Luhmann, 1995).

We later in the research programme expanded our work with Critical Realism via other Critical Realist tools such as laminated systems, absence and dialectics emerging from Bhaskar's dialectical Critical Realism (Bhaskar, 1993; Ramsarup 2017; and Paper 8 in this Bulletin)²⁰. The current paper reflects our initial interest in the idea of 'border crossing' inherent in the notion of educational and occupational learning pathways. This paper shows how we engaged in early methodological work in the research programme via a focus on borders and border crossing to inform learning pathways research.

Starting Out: Viewing systems differentiation with Luhmann's Social Systems Theory

The emphasis on differentiation and transgressing boundaries in learning pathways research, and our uncovering of the multi-dimensional nature of the research object (Paper 1 in this Bulletin), as well as the micro-macro level methodological features of the field of learning pathways research (Paper 3 in this Bulletin) took us into exploring systems approaches to learning pathways research.

Early deliberation on methodological perspectives led us in two directions: Critical Realist research which recognises open systems and emergence (changes in structure and agentive capabilities as these interact over time) after Bhaskar (1993) and Archer (2000); and the later work of Luhmann (1995) whose work on social systems theorised the manner in which systems differentiate in response to environmental changes. Luhmann's earlier work was critiqued for being too functionalist, and negating the power of agents in the system; hence our interest in also considering some of the Critical Realist work that helps to theorise the reflexivity of agents within systems and structures aspects which were deliberated in Phase 1 of the research (Mukute, 2010; Masara, 2011; Olvitt, 2012; Lindley, 2014).

An early reading of the Luhmann (1995) work provided some insight into how these theoretical lenses could potentially help to 'unpack' some of the articulation questions we raised (see Paper 1 in this Bulletin), within a systems perspective. Luhmann's (1995) work is underpinned by the following ideas about systems theory.

²⁰ Paper 8 in this Bulletin includes a detailed explanation of 'Laminated Systems'.

- Systems are made up of interrelated parts, and there is a relationship amongst the parts and the parts with the whole. In the SAQA-Rhodes Phase 2 research programme, this would mean that there is a relationship between the QCTO and the CHE (parts) and the NQF Sub-Frameworks (parts) with the whole (the NQF; and broader tendencies to use NQFs to structure education and training).
- A system exists in an environment it cannot be completely open or completely closed as systems are formed by boundaries between the system and its environment. A completely open system would have no boundaries, and would thus be part of the environment. A closed system could not form as it needs to differentiate itself from the environment, and is constantly shaped by influences from the environment. Systems Theory therefore pays attention to the relationship between the system and its environment. In the SAQA-Rhodes research, it is interesting therefore to consider the relationship between the education and training system (with its sub-systems) and the broader, changing social-ecological environment, where sustainable development imperatives are increasingly being articulated in different forms (eg. the Green Economy being the latest rendition of the same imperative to align society, economy and environment in less destructive ways).
- Systems are dynamic all systems involve processes of change which involve 'feed forward' and 'feed back' mechanisms. If a system can adjust to its environment, then there is some form of feedback taking place; and for a system to develop consciousness of the need to adjust to its environment, some form of 'feed forward' is needed. Education and communication play an important role in both.

Concepts of function and functional analysis (Luhmann, 1995) shift from focusing on only the system and how it functions (eg. how the Occupational Qualifications Sub-Framework [OQSF] functions) to the relationship between the system and its environment (eg. how the OQSF adjusts to environmental demands and conditions). Examples from our early pilot studies in the programme seemed to suggest that much still needs to be done in the NQF system for strong relationships of this kind to be the case (See Paper 1, Paper 4, and Paper 5 in this Bulletin).

Systems include other systems

Luhmann's (1995) work also points out that system environments are made up of other systems. For example:

- the Sector Education and Training Authority (SETA) system is made up of the OFO system, workplace skills development systems, and the QCTO and DHET systems;
- Umalusi exists within the General and Further Education and Training system with its partners and various stakeholders, and the SAQA, DBE, and DHET systems;
- the QCTO system includes the SETA system, the systems of the Development Quality Partners (DQPs), Assessment Quality Partners (AQPs) and Skills Development Facilitators (SDFs), and the DHET and SAQA systems; and
- the CHE system is made up of the public and private Higher Education Institution (HEI) systems and the SAQA and DHET systems.

From this perspective, it is clear that systems are interdependent, and thus often mutually constitutive (See also Paper 7 in this Bulletin). The Further Education and Training (FET) and Technical and Vocational Education and Training (TVET) College systems are interdependent with the DHET, SAQA, and Quality Council systems, and so on.

Significant for this research programme is the point that Luhmann (1995) makes in terms of the unit of analysis for systems research. He states that it is not the system itself that needs researching, but rather the *boundary between the system and its environment*.

This idea has two implications.

Systems are defined in terms of boundaries. A system exists only if it is different from its environment, that is, if there is a boundary between the system and its environment. Neither the system nor the environment are more important. From this it can be inferred that the relationship and boundary *between* the two is important.

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The importance of both system and its environment involves a radical de-ontologising of objects, because shifting analysis to focus on the boundary means that to treat social structures (eg. a provider of education or training) as real objects becomes very difficult.

The boundary between system and environment is created by reducing complexity and risk. Risk is defined as the relationship between the system and its environment. A system must maintain a boundary between itself and its environment, and the boundary must reduce the risk of the system being overwhelmed by the contingencies of the environment. Thus, systems must be less complex than their environments because environments are composed of risk-reducing and complexity-reducing systems. Thus the three Sub-Frameworks of the NQF can be seen as differentiated sub-systems, created in response to risk, and with the aim of reducing complexity and risk.

Differentiation

The concept of *differentiation* becomes significant in developing an understanding of what occurs at the boundary of a system and its environment. As social reality becomes more complex, systems, and people working within them, assume different functions and set themselves apart from other systems, achieving differentiation between levels. From this point onwards, differentiation then occurs within each system through systems of replication; systems differentiate internally along the same path that they used to differentiate externally. Thus sub-systems within the NQF system, for instance, are likely to function through sub-systems of replication. Differentiation, according to Luhmann (1995), becomes a reflexive and recursive form of system building. Every differentiated sub-system has three references, namely:

- the external environment common to all subsystems (eg. the NQF and DHET, in the case of the Post-School Education and Training [PSET] system);
- its relation to other sub-systems within the larger system (eg. the relationship between the systems of the three Quality Councils – QCTO, CHE, Umalusi – and the broader NQF system); and
- its relationship to itself (eg. the sub-systems within each of the Quality Council systems).

Luhmann (1995) argued that *differentiation 'pattern types'* emerge within sub-systems as they respond in ongoing ways to increasing complexity. Thus, to understand articulation issues in an NQF requires an understanding of not only the systems and sub-systems themselves and their references, but also their differentiation 'pattern types' as well as the boundary forming feed forward and feedback processes. It is therefore expected that different forms or approaches to sustainable development education and training exist in the NQF, which continue to self-differentiate according to pattern types, making articulation, coherence, and co-ordination very difficult across the sub-systems of the NQF.

Contingency

Luhmann (1995) went further in his theorising of systems, by noting that it is important to focus on *contingency* in systems research, as the system is always less complex than its environment, and simplifying complexity means being forced to select; and being forced to select means contingency, since one could always select differently (*Ibid*.). One may for example ask why 'Environmental Practices Manager at NQF Level 2' was selected for inclusion in the OFO system, while 'Environmental Practices Officer' was not (Ramsarup, 2011). Contingency means risk, that is, it could be the wrong selection (as currently seems to be the case regarding this element of the OFO system).

Of further significance to this research programme is the insight from Luhmann (1995) that systems also become *autopoietic*, or *self-organising* and *self-reproducing* and *self-referential*, and could therefore become increasingly conservative or exclusionary. Luhmann (1995) argued that there is a need for the environment to 'disturb' the inner workings of a system from time to time, and this involves more than individuals within the system; collective movements are most often required to disturb self-reproducing systems. While Luhmann (1995) theorised individuals as being subsumed into the

system (which they often are when they fulfil system-reproducing roles); social movement theory (Melucci, 1996; Touraine, 2000) and critical theory attribute stronger 'disruptive agency' to collective social groups (Freire, 1970; Giroux, 1983).

Communication and making meaning

Luhmann (1995) also emphasised *communication* as a significant element in system formation, differentiation and reproduction, and potentially also in system disruption. Communication in turn is associated with meaning, and meaning-making within systems, on system 'borders' and between systems. Wals (2007) has theorised that sustainability education needs to work consciously with dissonance in border zones if change-oriented learning (and system formation) is to take place. This is not unlike Engeström's (1987, 2000) work on expansive learning that arises in 'border zones' between culturally and historically constituted activity systems (explored in more depth in Phase 1 of the research programme).

Luhmann (1995) explained further that meaning appears only against the backdrop of contingency – if there is no possibility of being different, then there is no meaning. Thus, it is possible to say that an Environmental Practices Manager at NQF Level 2 in the OFO system has no meaning, unless it could potentially be different. This has implications for learning pathways research, as learning pathways can potentially chart new contingencies and new possibilities for the system and learner, particularly within a sustainable development imperative that by its very nature crosses borders and sectoral boundaries, even though it may manifest differently in different sub-system contexts.

System-environment nexus

Ritzer (1981; 2008) working with Luhmann's theory, noted too that variation caused by differentiation allows for better responses to the environment. Thus one could theorise that the variation emerging from the differentiation into three NQF Sub-Framework systems will allow the NQF to be more responsive to its environment.

Ritzer (*Op.Cit.*) noted too that differentiation and variation allows for faster evolution (change responses are quicker); the more variation available, the better the selection for those selecting. From this perspective one may theorise that more sustainable development education and training opportunities may be possible in the current system, within a quicker response time, than has been the pattern previously under the SAQA

Act (Republic of South Africa [RSA], 1995. From an articulation perspective, all of this means that there are more 'border zones' to investigate and understand.

Boundary-crossing/Border-crossing

From a systems perspective, it means understanding systems not as objects, but rather as a *distinction*. As Ritzer (1981: page unknown) asked:

A system in the form of a distinction, possess therefore two sides: the system (as the inside of the form) and the environment (as the outside of the form). Only the *two* sides together [emphasis original] constitute the distinction, constitute the form, constitute the concept. The environment is thus for this form just as important, just as indispensable to the system itself...everything which can be observed and described with this distinction belongs either to the system or to the environment. Certain peculiarities make themselves apparent. Does the unity of the system belong to the system, or to the environment? And where do you find the boundary of the form? The boundary between system and environment separates the two sides of the form. The boundary exists *only as an instruction to cross it – whether from inside to outside, or from outside to inside.*

Applied to learning pathways research where articulation is noted as being of interest, this reasoning would mean that there is a need to observe not only border zones, but also *distinctions* and forms of boundary crossing from inside to outside, or from outside to inside (see Paper 5 in this Bulletin).

Boundary crossings can occur:

- from the environment to the system (as was occurring in the Environmental Practices OFO analysis reported in Paper 1 in this Bulletin, where a new 'selection' was identified);
- between sub-systems, (from one sub-system to another inside one system, for example within a school, within a College, within a HEI, or between types of institutions of learning and workplaces);

- from an informal learning experience to a formal learning experience (as was shown in the case of the young Mining Geologist scholar's learning pathway reported in Paper 1 in this Bulletin); or
- between disciplinary boundaries (from Natural Sciences to Social Science learning pathways), or epistemological boundaries that involve learning in-andout of practice; or via combinations of knowledge (eg. tacit and explicit).

Our interest here is to consider how one might 'observe' border crossings in learning pathways research. Data from the pilot studies mentioned in Paper 1 in this Bulletin, shed some light on the kinds of 'border crossing' perspectives that can be gained from learning pathways research interviews, as illustrated in Vignette 1 below.

Vignette 1: Observing distinctions and border crossings

[EXTRACT ONE, from interview with Sports Manager in local municipality, which involved probing his learning pathway (Mohanoe, 2014)]

On the job distinctions and border-crossings: "Yes, I was trained. What I am battling with is to distinguish the difference between a Sports Manager and a Sports Supervisor. There is a huge difference. The Sports Supervisor will talk more about the environment and staff. The Sports Supervisor for example will know how long the grass should be in December and how long the grass should be in June. But Jacob, as Sports Manager [referring to himself], is to ensure there is a programme, there is someone selected, there are administrators and everything is running smoothly. Whether we need to change the field, give the field a rest. Jacob [referring again to himself] is clueless on that. Again, a Sports Supervisor will know when to fertilise the field; I don't. If we are going to stick to the current organogram, I will require training in that regard. I have been fighting to have a Sports Supervisor employed because I was not trained as one, I have been trained as a Sports Manager I studied Business Management and acquired skills for writing business plans When I came here I was working as a Sports Officer. The requirement for the job was 'a Matric plus'. The job description was to supervise the general workers, and the development and management of facilities; basically it was that. After two months I felt that the job content was empty. I discussed this with Mr X [Interviewee's manager] and we agreed to expand it to a Sports Manager position instead of being a Foreman."

From this extract it is clear that Jacob [not his real name] has associated several distinctions [identified in bold in this paragraph] with his learning pathway; which are important for observing his border crossings. From his studies in **Business Management** he has 'crossed' into **Sports Officer** and **Sports Manager** (distinctions which are used to show a border crossing he negotiated in the workplace, based on his confidence in his own knowledge and experience). Currently he is faced with another border crossing; which involves combining **Sports Management** with **Sports Supervision**. While he is knowledgeable about the differentiation associated with the two categories; he lacks the specialised content knowledge and skills to achieve both positions successfully. He identifies two solutions to this border crossing problem: (1) to cross the border himself with additional training; and (2) to not cross the border himself through further learning, but to employ additional staff to fill the 'gap' in his own knowledge.

[EXTRACT TWO, from interviews with local government workers in the Nursery Department (Mohanoe, 2014)]:

On lack of border crossings and learning pathways: "We know nothing besides what we do here daily. Twenty years of my life [the respondent left school in what was then known as Standard 5²¹] I know nothing else, but this. We are expected to do our job as best we can, but how? Every year we fill in the skills development forms and nothing happens".

The distinction in EXTRACT TWO, between **skills development** and his **regular job**, indicates a desire for a learning pathway that is not materialising.

²¹ Standard 5 in the pre-NQF (pre-1995) system or Grade 7 in the NQF system, is the seventh year of schooling.

[EXTRACT THREE, from an interview with a worker on the commonage, who left school at what was then Standard 4 (Mohanoe, 2014)]:

"We are not sure what kind of training we should be getting because when I got here I was employed as grass raker but now, I do maintenance, paint, plumbing, etc." EXTRACTS TWO & THREE show some insights amongst workers, that training is linked to learning pathways, but the workers appear to be disempowered to make decisions about their own training and learning pathways, and are not being adequately supported in the workplace to establish 'border crossing' in learning pathways from workplace to training programme.

Types of differentiation

Taking the discussion on differentiation further, Luhmann (1995) went on to identify four different *types* of differentiation that have emerged. He noted that these forms of differentiation have different abilities to produce variability and therefore provide more selectivity for evolutionary processes. The four *types of differentiation* he identified are as follows.

- Segmentary differentiation: Differentiation is into equal and alike sub-systems; these divisions are based on the need to fulfil identical functions over and over again (each has the same structure and fulfils the same function). The SETA system is a good case example from the South African Education and Training system here.
- 2. Stratificatory differentiation: Differentiation is into unequal sub-systems often involving vertical differentiation, with some sub-systems having greater power or status than others. Inequality is essential in this system, where every rank fulfils a distinct function in the system. The system can only survive if all the ranks fulfil their functions; the importance of those in the lower ranks and their difficulty in becoming the subject of influential communication creates a structural problem that limits the complexity of the system. The DHET and Higher Education systems, the Department of Basic Education (DBE) and Basic Education systems, are some examples.

- 3. **Centre to periphery differentiation:** Differentiation in this instance is from the centre to the periphery, as in decentralised government structures. The DBE and Provincial Education Departments are a case example here.
- 4. Functional differentiation: This is the most complex form of differentiation, as every function within a system is ascribed to a particular unit. As long as each fulfils its function, units can attain a high degree of independence. Functionally differentiated systems (the Sub-Frameworks of the NQF are functionally differentiated systems) have a complex mix of interdependence and independence. Complexity increases the risk of system breakdown if a function is not properly fulfilled, and increased vulnerability is often a necessary price for the increase in possible relations between sub-systems. Having more possible relations (border crossing options) between sub-systems means more variation to select structural responses to changes in the environment, this being an important insight for articulation-oriented research. Systems differentiate through using 'codes' that become the basic language of the functional system.

Codes are used to limit permissible communication (eg. the codes of 'occupationally-driven qualifications' limits permissible communication within the QCTO system; or the code of 'academic freedom' limits permissible communication within the CHE system). Eventually these codes become solidified within the system, such that every communication that does not use the communication code is seen to not belong to the system. This can lead to the problem of 'no system understands the code of another system, and systems can only then react to stimuli from the wider environment.

A problem arises here regarding change-oriented learning and learning pathway border crossings in that what may be necessary for society (eg. social justice approaches to sustainable development) may not be dealt with by any functional sub-system and functional sub-systems may not have the necessary codes to represent the problem. The consequence is that this aspect is treated as 'noise' from the environment.

Functional differentiation therefore requires a displacement of the problem from the level of society to the level of the sub-system. The result of greater independence of functional sub-systems is greater vulnerability of the social
system as a whole; hence there is a need for ongoing work on 'border crossings'; and those change oriented transversal issues (such as social justice approaches to sustainable development) that disrupt or provide dissonance on the borders of established systems.

Differentiation and the evolution of systems

An important point which has relevance for the learning pathways research, and the articulation question, is that more complex forms of differentiation have the potential to accelerate the evolution of the system. Greater differentiation (eg. at the NQF sub-system level) may accelerate the efficacy of the knowledge/skills development system. This acceleration would however depend on the efficacy of boundaries and border crossings. It would also depend on the tensions created and maintained at the borders of the existing systems, so that their transformative nature would be retained and so that new possibilities for selection would exist, while the solidification of codes into conservative discourses would be avoided.

Drawing on this theoretical framing, researching learning pathways and articulation questions in a functionally differentiated education and training system requires taking account of the two-fold meaning of functional differentiation:

- the division of a social system into two or more specialised sub-systems; and
- the emergence of autonomous sub-systems (Vanderstraeten, 2004).

Luhmann (1995) argued that several problems/challenges emerge at the level of the sub-system, and their analysis requires a shift to the level of the sub-system. Vanderstraeten (2004) argued that autopoietic systems (the self-referential systems), using communication and their 'codes' as their modes of reproduction, lead to a situation in which social systems can only react to their environments in accordance with their own modes of operation. Such systems can become closed with respect to the meaningful content of their communicative acts, as meaning can only be actualised "by the circulation in the network of ongoing communications" (Vanderstraeten, 2004). He argued (*Ibid*.) that consequently, *it is necessary to analyse (and not just to formalise) the mechanisms that are used to establish and maintain boundaries between systems*. This raises the question as to how one could potentially analyse the mechanisms that are used to establish and

maintain boundaries between systems. For methodological guidance here, we turned to Critical Realism which provides appropriate under-labouring for various epistemological theories such as the Systems Theory of Luhmann (1995).

Focusing on the analysis of mechanisms with Bhaskar

Following the deliberations thus far, we decided to focus in more depth on the question of *mechanisms* that are used to establish and maintain boundaries between systems, as it is these that would need to be overcome for articulation to emerge in the context of learning pathways as educational and occupational progression. Here we are also mindful of some of the complexities associated with these systems and are not promoting a mechanistic approach to resolving boundary-related concerns in the NQF.

Rather, we draw on Bhaskar's (1993) Critical Realism which provides tools for analysing more complex generative mechanism interactions and their influence on systems. Here we note that Critical Realist research works with an open systems view that is not as defined by autopoiesis as in Luhmann's systems theory (Mingers, 2002).

Mingers (2011) noted that Bhaskar's work reflects many principles that have been developed in Systems Theory, that are not articulated in the same way in the Critical Realist project. Mingers (2011), for example, noted that boundaries are not well defined in the work of Bhaskar, yet are implied by the emphasis on emergence in 'laminated' systems²².

Bhaskar's (1993) work on mechanisms proposed that generative mechanisms are related to structures (but are not the same thing) and that they have powers and liabilities that generate the events that actually occur, and that these structures are distinct from the events they generate. It is these generative mechanisms with their tendencies and powers that are relatively enduring, where the powers are exercised or not exercised in interaction with each other in the world. With these theoretical tools we can, for example, consider what the generative mechanisms might be that enable or constrain boundary crossings in learning pathways, or that produce absences or complexities in learning pathways research.

²² Paper 8 in this Bulletin includes a detailed explanation of 'laminated systems'.

Of interest to the process of analysing mechanisms that influence boundaries, and boundary making and boundary crossing processes, is Bhaskar's (1993) 'DREIC' social scientific method which involves:

- <u>D</u>escribing patterns of events (that is the differentiations; contingencies; codes; distinctions, border zones, *etcetera*, associated with the systems that shape learning pathway 'border crossings' and their possibilities);
- **R**etroduction of possible explanatory mechanisms or structures (disjunctive plurality of alternatives);
- <u>E</u>liminating competing alternatives;
- Identifying the most causally efficacious generative mechanism/structure; and
- <u>C</u> iterative Correction (through dialectical processes of absenting the absences, which leads to transformative praxis).

From this, one can see that Critical Realism provides a methodological process that allows for empirical description, and retroduction to the level of the real, where generative mechanisms have tendencies to shape actual events and empirical experiences. For example, we could consider the experience of the municipal worker who stated "*We know nothing besides what we do here daily. Twenty years of my life [the respondent left school in what was then referred to as Standard* 5²³] *I know nothing else, but this … We are expected to do our job as best we can, but how? Every year we fill in the skills development forms and nothing happens*".

We can see the empirical experience of the worker as being constrained by lack of progression along any viable learning pathway, and inefficient or dysfunctional workplace skills planning systems (explanation/abductive analysis). Real mechanisms shaping this situation would most likely be a combination of histories of disenfranchisement and capability deprivation, poor management systems, and capitalist and racially structured forms of under-development for workers with low levels of education (retroductive analysis).

²³ Standard 5 in the pre-NQF (pre-1995) system or Grade 7 in the NQF system, is the seventh year of schooling.

Critical Realism therefore allows for in-depth analysis of mechanisms that affect boundary crossing in learning pathways research. Underlabouring systems theory with Critical Realism would bring to the fore a focus on the structures that generate the systems and emergent events (articulation boundaries as observed in the cases provided in Vignette 1) and learning pathways (experiences) or lack thereof, as well as the complex relational dynamics of the system.

This philosophical 'underlabouring' of systems theory allows for more in-depth analysis of the generative mechanisms or 'generative complexes' that produce boundaries in the NQF system. These underlabouring tools were used to probe the underlying generative mechanisms influencing the boundary experiences of workers, managers and supervisors in local government in the case study of Mohanoe (2014). The tools were also used by Fourie (2017) in an Expanded Public Works Programme case study which focussed on the experiences in an environmental learning programme, and in the PhD study of Ramsarup (2017), that focused on learning pathways in two scarce skills occupations.

CONCLUSION

The deliberation in Paper 2 has opened up methodological proposals for learning pathways research which include developing more in-depth understandings of system element analysis, to identify system differentiation and border zones that require further investigation. In this paper, we drew on the work of Luhmann (1995) to provide some perspectives on differentiation and borders in systems. We noted especially the work of Vanderstraeten (2004) who suggested that autopoesis can become self-referential, and hence there is a need to analyse the mechanisms that shape boundaries and their formation.

We went on to deliberate how such an analysis could proceed with depth and emancipatory direction, and drew on Critical Realist research process direction to guide this analytical work. Building on these starting points, in the overall SAQA-Rhodes research programme, we have probed boundaries in more depth (see Papers 5 and 7 in this Bulletin), and we have also developed the work with Critical Realism further in the case studies associated with the research programme. Here we have moved beyond the analysis of generative mechanisms only as outlined above, to include the analysis of absences (Ramsarup, 2016, 2017; and Paper 8 in this Bulletin), emergence in laminated systems (*Ibid*.)²⁴, and

²⁴ Paper 8 in this Bulletin includes a detailed explanation of 'laminated systems'

transformative praxis (Ramsarup, 2017). In this paper we explain how we moved from Systems Theory thinking to Critical Realist analytical tools in our search for adequate methodological frameworks for learning pathways research.

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PAPER 3

Understanding Learning Pathways and Transitioning: Perspectives from the Literature

Dr Presha Ramsarup

INTRODUCTION

Sustainability practices are contested and complex. Central to the aim of the SAQA-Rhodes research programme is the understanding of how 'individuals' in key environmental occupations gain access to, use and navigate, the learning opportunities in a complex national system for education, training, development and work. In the South African context, using traditional supply and demand approaches to investigate learning pathways within a rapidly changing environmental sector where people are transitioning into specialist jobs, did not appear to offer nuanced enough understandings of the complexity of the learning pathways (South Africa, Department of Environmental Affairs [DEA], 2010). There was thus a need to understand the learning and work transitions people were making in constructing individual learning pathways. The notion of *learning and work transitions* is therefore an important concept for understanding wider systemic articulation concerns, as it provides for both structural and systemic insights.

Focusing on learning and work transitions has enabled the programme to portray environmental learning pathways as *educational and occupational progressions* (see Paper 1 in this Bulletin). Using this conceptual construct to guide the unit of analysis in our learning pathways research, it was possible to investigate the nature of learning and work transitions across the life-course of selected environmental professionals to surface an understanding of the complexities associated with pathway construction, articulation and efficacy in the associated systems of provisioning.

In attempting to characterise the complex nature of environmental learning pathways, this paper thus frames underpinning theoretical influences from the area of work and learning research, that have shaped the design and methodology of this research programme and provided further development of the theoretical basis for making sense of environmental learning pathways (see Papers 1, 2, 4 and 8 in this Bulletin for further insights into the broader theoretical framing of the research programme). The research programme's

focus on education-to-work transitions that moved beyond early entry into the labour market, necessitated the knitting together of theoretical ideas from related complementary theoretical fields: the learning pathways literature and the learning and work transitioning literature.

A THEORETICAL EXPLORATION OF LEARNING PATHWAYS

Emergence of the idea

Evans and Furlong (1997) highlighted that over time international research has utilised four metaphors to define the phases through which research and policy have explored youth transitions namely, (1) 'niches', (2) 'pathways', (3) 'trajectory', and (4) 'navigation'. Early conceptualising used an analogy of 'filling society's *niches*', where the emphasis was on fulfilling 'growth tasks' to ensure successful integration into adult roles. The concept was expanded to the idea of *pathways* to describe the longer and more complex transition process. The emergence of *trajectory* as a viable metaphor attempted to expand the notion beyond government-designed pathways to include social forces that shape youth transitions. More recent attempts have aimed to express the individuals' roles in 'shaping their lives' within the opportunities and constraints that faced them; these have utilised the metaphor of *navigation* (Raffe, 2003; Furlong, 2009). Raffe (2003) cautioned though that these metaphors should not be viewed as distinct periods and that pathways must rather be designed to meet the needs of the people who use them.

Understanding the concept 'learning pathway'

The concept of 'pathways' has been the most widely utilised both in policy and research and is the most extensively used term in South Africa. In the discussion below I illustrate some of the work and deliberation around the pathways concept in order to develop a broader conceptual understanding of pathways as an empirical phenomenon.

Despite extensive use of the learning pathways concept in policy, both locally and internationally, in countries such as the Netherlands, Norway, Germany, Australia, New Zealand, Scotland and Denmark (Vaughan, 2003; Raffe, 2003; McKenzie, 2000a; Organisation for Economic Cooperation and Developmet [OECD], 2000), it remains a metaphor that is imprecise. It is used in a variety of ways to express different meanings (Raffe, 2003). Raffe (*Ibid.*) acknowledged that the concept is a very useful bridge between policy and research, despite the fact that learning pathways alone are not a recognised theory or a rigorous theoretical tool.

Pathways have served as an influential organising construct and the imagery of the pathway, with its *sense of order and structure*, and linked education and training experiences that lead to employment, has had a significant impact on educational policy (McKenzie, 2000b; McKenzie & Hillman, 2001). In a study by Harris, Rainey and Sumner (2006), 'learning pathway' was interpreted as a '*journey of learning*'. Their research expanded notions of pathways and challenged the idea that the pathway analogy is a 'deterministic notion' with a set trajectory. Rather, the study highlighted that pathways are 'continuous' and should be seen as a series of stepping stones, making the trajectory *'fragmented and discontinuous*'.

Another highlighted feature of pathways was direction – pathways lead somewhere, although *where* is often not known or understood, and sometimes they change direction. In reflecting on the complex patterns of movement, the Harris *et al* study (2006:3) concluded that pathways are not linear and seamless, but rather "stepping stones, zig-zags or lurches". The term 'crazy paving' was used to describe a range of pathways from 'erratic' to 'merging', 'tangential', 'parallel' and 'swirling' (*Ibid*.). Raffe (2003) outlined how the term 'pathways' helped to express length and complexity, and illustrates something longer than a step. In addition, pathways can interconnect. Travellers can choose between pathways, change direction or they may "set off with no clear destination in mind" (*Ibid*.:4).

The Australian Finn report (1991) as reported by McKenzie (2000b) outlined five main elements of pathways, which have had a very significant influence on conceptualising research on pathways, and which continue to represent some of the core foundational ideas shaping work around pathways. McKenzie (2000b) reflected that each of these elements (which together provide a coherent structure of pathways through education and training and into work) have contributed in various ways to policy reforms as follows (McKenzie, 2000b; McKenzie & Hillman, 2001):

- as set of *interrelated* experiences providing for *progression*;
- education and training should have a *sense of continuity* even when individuals cross institutional and sectoral boundaries;
- young people should have access to a *range of different pathways* and should be able to move from one to another *without losing ground*;

- there is a need for effective credit transfer and articulation arrangements to provide *smooth bridges* between pathways; and
- *signposts* (information and career advice) are needed at the start of each pathway and at each junction between pathways.

Using the concept of 'learning pathway'

The pathways concept has proven difficult to apply and identify empirically (McKenzie, 2000a, 2000b). Data have always presented challenges in that there are limits to using data to measure social change, especially in its longitudinal range (Vaughan, 2003; Raffe, 2003). McKenzie (2000b) noted that most empirical work linked to pathways research is focused on either:

- policy reviews linked to the institutional and formal opportunities in different educational sectors that attempt to distinguish the main types of pathways (Raffe, 2003); or
- 2. interconnections between pathways and what young people do (the collective gap and learning pathway); or
- the career journeys people take which may not coincide with formal structures (the individual gap and/or career story) (Harris *et al* 2006; Raffe, 2003; McKenzie & Hillman, 2001; McKenzie, 2000a).

Current empirical work across these three areas reflects that although one-way models of student movements leading to university are well documented (Walther *et al* 2006), "relatively little is known about the educational and employment pathways of students moving between the sectors" (Harris *et al* 2006:11). The latter is significant for the present research programme as indicated in the Environmental Sector Skills Plan (DEA, 2010), which showed that work in the environmental sector is characterised by boundary crossing.

Pathways research to date has focused largely on youth studies (Raffe, 2003; Vaughan, 2003; McKenzie, 2000a; Harris *et al* 2006; Walther *et al* 2006), concentrating mainly on school to work transitions. There is also relatively little research on those who do not reach university, or those whose learning pathways hardly exist, or are virtually absent, an

issue which is of interest in the South African social context (Ramsarup, 2017). An area not expressly addressed in previous research, which is of interest for the environmental sector in South Africa and the envisaged transition to a Green Economy, is how people create pathways into specialised jobs (Ramsarup, 2017; see also Paper 6 in this Bulletin).

'Pathways engineering' emerged in the 1990s as a very significant component of education review in many countries like the Netherlands, Norway, Germany, Australia and Denmark (Raffe, 2003; McKenzie, 2000b). In 2000, the OECD comparative review of education-to-work transitions in 14 countries reported that most reviewed countries had attempted to make the pathways by which people move from school to work more *attractive, open and flexible*, and had attempted to provide more opportunities to combine vocational learning with general education (OECD, 2000; McKenzie, 2000b). These policy ideals resonate with South African policy developments and are explicitly outlined in the National Qualifications Framework (NQF) Act (Republic of South Africa, 2008).

A focus on the main types of pathways helps to raise concerns on 'academic drift' – the favouring of the general pathway as opposed to the vocational. Raffe (2003) warned that this drift is often hidden by the way tracks are classified and interpreted and used. Raffe (2003) explained that pathways discourse is very popular with policy makers, as pathways can be constructed to lead to particular destinations, and policy and practice can make some destinations easier to reach than others.

In expanding these ideas, Wheelahan (2009) argued that putting pathways at the centre of an education and training system helps to bring many parts of the system into direct relationship with each other and thus helps us to raise questions on how qualifications and curriculum provide for educational progression. Investigating the nature of pathways helps to create better flow within education and training, improved connections between education and work, and improved development and use of skills at work (Wheelahan, Moodie & Buchanan, 2012). Central then to the framing of the current research programme was the idea that "pathways need to be premised on continuity and complementarity if they are to support educational and occupational progression" (Wheelahan, 2009:6).

Purposes of learning pathways

Wheelahan (2009:6) further *outlined two important purposes of pathways*, both of which are relevant to the present research. Firstly, pathways increase the effectiveness and efficiency of education systems – this, according to Wheelahan (2009:6), means that individuals need to be able to move between "different types of qualifications and different occupational sectors with ease", to reduce time and costs to individuals and governments. The second purpose is linked to equity and social inclusion: pathways aim to give access and opportunity to disadvantaged individuals (Wheelahan, 2009). Pathways are thus an important mechanism to redress issues related to widening the participation in education and training by students from disadvantaged backgrounds, which is relevant for South Africa's transition to a more just and sustainable society. Wheelahan (2009:7) explained further,

Pathways must support educational and occupational progression if they are to contribute (to) the first criterion, and they must provide social and educational opportunities for students from disadvantaged backgrounds if they are to contribute (to) the second.

Understanding pathways with a frame of educational and occupational progression has been a useful idea within the SAQA-Rhodes Research Partnership as it allowed the research programme to examine the development of the person across their life course, within the context of an occupation.

It can be argued that integral to a well-articulated and integrated system is the emergence of parallel and second-chance pathways, which learners can use to move through quality education and training provision from Basic Education through upper secondary education into Higher Education or Vocational Education and Training (VET), and work. Hoppers (2009) argued that learners should be able to do this how, when and where they want to, in order to realise their chosen pathways. The emergence of parallel and second chance pathways is critical for enabling access for disadvantaged and marginalised learners, and the Association for the Development of Education in Africa (ADEA) conference in 2008 raised the importance of this within African contexts (Hoppers, 2009).

South African use of 'learning pathways' in context

A particular characteristic of the focus on educational transitions in South Africa is the conceptualisation of transitions through a metaphor of pathways. The notion of pathways has been integral to the South African education and training context and is fundamentally linked to the principles of mobility and progression. Discussed against the socio-political intentions of education and training in South Africa, the South African intent behind this conceptualising resonates with Vaughan (2005:174) who highlighted that a "pathways framework on transition says to young people: no matter what your background and how successful or unsuccessful you were at school, there are options for you; there are pathways to a good career and future."

Bauman (2001) and Giddens (2006) have commented on the conditions of late modernity and the need for ongoing reflexivity, and both noted that lifelong learning (and flexible learning pathways) have become the main educational consequence of such conditions. Field *et al* (2009:4), drawing on Walther *et al* (2006), noted that transitions research in the context of youth transitions to university is comparatively mature and is increasingly giving attention to the relationship that exists between youth agency and structures and constraints, and is "informed by theoretical understandings of learning lives in late modernity, sometimes conceptualised, following Ulrich Beck, as 'a risk society'."

Critiques of the concept of 'learning pathways'

However, the concept of 'learning pathways', despite its potential as a useful organising concept, has been criticised for:

- linearity and determinism, highlighting that learning pathways traditionally tend to ignore complexity, most often implying that transitions are uni-directional and emphasising a distinction between educational pathways and labour market destinations, and ignoring the overlap of study and work;
- 2. economism this critique centres on an over-emphasis on transitions through education into the labour market and ignores other transitions such as family, household or lifestyle transitions; and

 individualism – "[learning pathways discourse tends to] ... ignore social structure and inequality; it implies that pathways are equally accessible to everyone and that if people differ systematically in the way that they use them, this is merely because they want to go to different places" (Raffe, 2003:4).

These perspectives and critiques on learning pathways discourse are helpful for developing a fuller understanding of the meaning of learning pathways discourse in the South African context, particularly in the light of the stated commitment of the NQF to address transformation issues (RSA, 2008). Thus, a concept of learning pathways in South Africa ought not to ignore issues of social structure and inequality, nor ignore complexity. Further, while important, the learning into work relation is not fully adequate for understanding learning pathways in South Africa, as other learning relations also emerge as being significant, for example, the 'learning public good' and 'learning democracy' relations (See Paper 1 in this Bulletin).

Addressing the macro-micro dualism

Notions of systemic/institutional pathways and individual pathways have emerged across the literature as indicated in the discussion thus far. This apparent dualism presents a challenge to pathway work. In this research programme, the Critical Realist lens enabled us to transcend the dualism between the systemic pathway and individual pathway through its emergent properties in open systems ontology (Sayer, 2000; and Paper 4 in this Bulletin). The stratified ontology (Sayer, 2000) of Critical Realism enabled us to work with pathways as a 'laminated totality' (Bhaskar, 1993; Ramsarup, 2017; and Paper 8 in this Bulletin)²⁵. This allows one to work with social phenomena like learning pathways by explaining them at different levels or scales, and acknowledging that in open systems a multiplicity of mechanisms (conditions, agencies), emergent at different levels of reality, is always involved (Price, 2012).

To develop an understanding of the nature of environmental learning pathways, it is necessary to reflect on people's educational and occupational progression and it requires a careful examination of their transitions. The section below explores this by providing a critical understanding of learning and work transitioning.

²⁵ Paper 8 in this Bulletin includes a detailed explanation of 'laminated systems'.

Conceptual understandings of learning and work transitions

The SAQA-Rhodes research programme set out to understand the real pathways followed by key environmental and sustainable development workers in contexts of great change. In this context, the nature of the actual institutionalised and non-institutionalised learning and work transitions becomes a very useful lens for understanding pathways formation. In this section, I discuss learning-to-work transitions and how these transitions facilitate understandings of key issues that underpin pathway construction.

Transitions research

Raffe (2008) highlighted that transition system research often appears theoretically eclectic and fragmented, so researchers tend to borrow from other theoretical domains. George (1993), writing from a sociological perspective on life transitions, emphasised that transitions are too heterogeneous and too dependent on social contexts to be captured by a single generic model. Transitioning questions paint a broad canvas of research stories that span different fields, so economists, labour market analysts, human capital development analysts, sociologists, educationists, as well as policy makers, have an interest in transition research, each with different foci.

Field (2012:11) reflected that the "boundaries and expectations of transitions though the life course are changing, at the level of the individual and at the level of the wider society." These positions raise important questions about how transitions are changing, how they can be managed more effectively, and how we need to pay more attention to how we conceptualise learning and work transitions within changing societies and changing occupations.

A number of authors have recognised that various professions are experiencing a heightened sense of transitions (Evetts, 2009; Sawchuk & Taylor, 2010; Fenwick, 2013). Field (2012) reflected that the boundaries and expectations of transitions though the life course are changing, at the level of the individual and at the level of the wider society. An OECD (2008) report noted that transitions are increasingly fragile and exclusionary and that the number of 'stepping stones' required by youth to secure a labour market position is multiplying. Within this, individual learning and work transitions are becoming more challenging (Sawchuk & Taylor, 2010). Individuals are thus being called

on to manage transitions throughout their careers – beginning with the shift from initial professional education/training to workplaces. All these perspectives raise the critical need for education/training and work systems to pay attention to the *experiences of transitions*.

To help me to develop a perspective and a framework for creating meaning regarding this concept of transitions, I step back initially to provide a brief overview of the general meanings of transitions, and how they are viewed in the literature, and then I highlight components that need to be considered for purposes of this research.

Understanding the concept of 'transitions'

Fenwick (2013:1) broke down the word 'transition' as follows: "the Latin *tranitus* (passage; crossing); the Late Latin *transire* (go over, cross); the Latin *trans* (beyond, across)". This deconstruction supports the idea that inherently transitions involve movement from one point to another.

Kralik *et al* (2006:322) cautioned that it is important that we do not conflate 'transition' as simply another word for 'change' and in our work understand that it is the "process involved in adapting to the change event or disruption". Supporting the idea that transition involves a passage of change, Chick and Meleis (1986:239) explained:

Transition, as passage from one life phase, condition, or status to another, is a multiple concept embracing the elements of process, time span, and perception. Process suggests phases and sequence; time span indicates an ongoing but bounded phenomenon; and perception has to do with the meaning of the transition to the person experiencing it.

Burns (2010) noted that much social analysis records transitioning processes from one period to another (eg. modern to late modern), one state to another (eg. feminising a profession), or the importance of one variable to another (eg. labour force data, levels of education, retraining). Wheelahan *et al* (2012:4), writing from an education to work perspective, also highlighted that transition refers to "movement from one state to another, such as from education to work, or work to unemployment, or work to retirement". Drawing on the ideas of Fenwick (2013), Chick and Meleis (1986), Kralik *et al* (2006), Brzinsky-Fay (2011) and Burns (2010), it is clear that transition involves a process, and an outcome, one or more individuals (as it can be individual or collective), and a context. Within research, it can allow us a vantage point into these aspects, from both a macro (structural

and institutional) level as well as a micro (individual) level. Both of these aspects are investigated within this research programme.

'Transitions' versus 'trajectories'

'Transitions' and 'trajectories' are two terms that pervade this literature; they are interrelated but analytically separate (George, 1993; Pallas, 2003). The discussion thus far has illustrated that transitions are changes in status, discrete and bounded in duration (eg. first job; transition into school) although the consequences could be long term (George, 1993). Trajectories, on the other hand, are "long term patterns of stability and change which often include multiple transitions" (George, 1993:358). Pallas (2003) explained further that trajectories are sequences of transitions but also emphasised that trajectories involve the attributes of an individual. Pallas (*Ibid*.) further drew links between trajectories and educational pathways. Wheelahan *et al* (2012:4) concurred that trajectories refer to the "general direction in which individuals' multiple transitions take them". Sampson and Laub (1990:610) also emphasised that the "interlocking nature of trajectories and transitions within and across life stages ... may generate turning points or a change".

Ecclestone (2009:125), writing with a focus on individual transitions, agreed that transition could involve movement but argued that it is much more than this. She proposed that transition was a "change process but also a shift from one identity to another" (*Ibid*.). Life course researchers, like Eccelstone, argued that effective transitions require us to understand how people progress cognitively, emotionally and socially at different stages and how they navigate the complex demands of different contexts (*Ibid*.:126). Eccelstone summarised her ideas into three key meanings of transitions: (1) navigating pathways, structures and systems, (2) becoming someone, where transition is between two states of being, and (3) life as transition, where the whole of life is a form of transition.

This background discussion has helped to illustrate that how we view transitions will determine how we manage them; managing transitions is a very important contemporary area of investigation (Eccelstone, 2009) in education/training and especially in societies like South Africa.

Traditions of transition research related to learning and work transitioning

Although the focus in this paper is on an educational research programme, it is not only educationists that have considered the domain of transitions. In this section, I will briefly explore some of the more general scholarly approaches to transitions as they have all contributed to how understandings of transitions are shaped in modern society. Fenwick (2013), in a meta-review of transition literature related to work, outlined three traditions of research, namely developmental psychology, life course sociology, and career studies. The discussion below explores these as well as a Human Capital approach, which remains dominant within South African education and training discourses (Human Sciences Research Council [HSRC], 2009).

Economic approaches: Human Capital

Economists centre transition work mostly on understanding and matching the demand side (the labour market) with the supply side (education/training); analysing the labour market mechanisms that aid this relationship, and trying to explain empirically the returns on education (Brzinsky-Fay, 2011; Field, 2012). All these are framed from a position of viewing education/training as a means to increase the productive capacity of workers (Woodhall, 2007). Olaniyan and Okemakinde (2008:157) shed further light onto the mindset behind this economic framing of education and training, and how value is placed on workers' skills and abilities:

Education is an economic good ... Economists regard education as both consumer and capital goods because it offers utility to a consumer and also serves as an input into the production of other goods and services. As a capital good, education can be used to develop the human resources necessary for economic and social transformation. Focus on education as a capital good relates to the concept of human capital, which emphasizes that the development of skills is an important factor in production activities.

Inherently, the above views are synonymous with Woodhall (2007:219) who also stated that "investment in human capital produces benefits both to the individual and to the society as a whole. The individual who takes part in education or vocational training benefits by increasing his or her chances of employment and by increased lifetime

earnings." Woodhall highlighted that both the costs and benefits of education and training also affect society as a whole since society benefits from the increased productivity of educated workers.

Field (2012:1) explained that economic studies on transitions will measure the cost of investment and the cost of the returns, and then compare the balance. He also highlighted (*Ibid*.) that these studies are often "macro-level processes of structural transformation and institutional change" that enable economists to reflect on the returns of education over time. Another area of work highlighted by Field (2012) was the importance of preparing workers for transitions such as redundancy or unemployment.

While these are helpful in developing an understanding in some respects as discussed, they are restricted in other ways. If we view labour markets as mainly social institutions that exist in interrelationship with other social institutions, these approaches are unable to capture some of the institutional characteristics and complex interrelations, especially in school-to-work transitions as these extend over two social systems (education and work) (Brzinsky-Fay, 2011). As noted in South Africa's Environmental Sector Skills Plan (DEA, 2010), the environmental sector provides goods and services that are mostly of a public goods nature. Thus, this is not a sector driven by pure economic or commercial returns on investment (*Ibid*.; HSRC, 2009). This has implications for how transition research is framed.

Developmental Psychology

According to Fenwick (2013), the main interest within this tradition is to explain individuals' responses to different types of change in their lives and in the environment. Though not central in the present study, I briefly explore the field of Developmental Psychology as it is widely used within the research domain in which the current project is located. Fenwick (2013:5) explained:

Work in this area focuses on the internal dynamics of transitions on life tasks; self concept ideals; coping strategies; sequence of developmental tasks which could be related to career stages. These new life tasks could pose self-concept discrepancy between actual and ideal. To manage the anxiety of these transitions – people employ cognitive and emotional coping strategies.

Fenwick (2013:5) highlighted that a challenge here is to eschew the notion of a single normative self-concept: "individuals perform and identify with diverse images of self". However, she elaborated that focusing on the psyche of a single individual and their experience provides a limited analysis. She also argued that when people construct their stories, individuals have to select from hundreds of memories and many learning opportunities; it can vary as to which memories are triggered in which contexts when constructing a particular interpretation over time.

Developmental psychology may offer insights into the internal dynamics of transitions and into the internal world of the professional. Fenwick (2013:6) agreed that culture and interactions also have a role to play:

Individuals' emotional responses and notions of self within different transitions clearly are influenced by their particular cultural knowledge and cultural experiences, the mediation of their interactions by others' expectations, language and positions, the forms of activity in which they are engaged (and the tools and technology), their positionings and representations and so forth.

Critical Realists raise a key critique of this methodological individualism, which they maintain is flawed, as structural properties and their real causal powers are marginalised and only the individual is viewed as having real existence (Sayer, 2000; Bhaskar, 1993).

Although not fully relevant to the interest in the current study, work in this domain pervades organisations in terms of building self-concepts, coping strategies and the building of personal brands, and thus does have an influence on educational conceptions of transitions (Fenwick, 2013).

'Life course' Theory

Elder, Johnson and Crosnoe (2003) regarded the life course as a 'theoretical orientation' that provides a framework for descriptive and explanatory work around social pathways, their developmental effects, and their relation to personal, socio-historical conditions. It is, however, not a 'definite theory' with a "coherent system of descriptive as well as explanatory conceptions, principles, definitions, and statements which are empirically testable – ie. [there is] no unified life course theory" (Wingens *et al* 2011:6). Kok (2007:204) expanded these points to explain that life course can be viewed as a heuristic device, which allows

us to "conceptualise lives within the contexts of families, society and historical time". He defined (*lbid*.) life course as a "sequence of positions of a particular person in the course of time". Fenwick (2013: 7) explained that life course studies "investigate the interactions between the economic, social, physical, behavioural, cultural, and other environments that mediate or modify individual functioning".

Every life course is characterised by a course of events that gives shape to life stages, transitions and turning points. In this research programme, we found the focus on life events useful as it helped to connect and study the ordering of life events, and relate them to the way trajectories unfold. Key events can act as 'triggers' and this allowed linking events to transitions in later stages of the life course (See Paper 6 in this Bulletin). Elder (1994:5) emphasised that even though researchers tend to consider a full life course, analysis is always sensitive to the "consequences of early transitions for later experiences and events". Kok (2007:207, original emphasis) concurred that the life course approach and its "methodological translation in event history analysis promises a shift from the study of simplified single events to the study of processes". The focus on events in a life course is not done in a disjointed way; rather these events viewed over the life course allowed for ascribing social meaning very differently. How these life events emerge, how they are recognised and how people adapt to life events is also crucial as the same event or transition followed by different adaptations can lead to different trajectories. Life courses show how transitions can modify life trajectories, where turning points denote a substantial change in the direction of a life course (Sampson & Laub, 1990; Elder, 1994; Elder et al 2003; Kok, 2007). Thus the life course tradition offers specific constructs that are useful in the study of learning and work transitions.

The idea of 'turning points' in life courses

The construct of 'turning points' is useful for this research programme, and Hodkinson and Sparkes (1997) who were writing from career turning points perspectives, helped us to expand this theoretical construct. They outlined three main types of turning points – *structural, self-initiated* and *forced*. Structural turning points are the result of external structures/institutions. An example of a structural change is that which comes at the end of compulsory schooling, or the compulsory retirement age. *Self-initiated* turning points occur when the person concerned is instrumental in precipitating a transformation, in response to a range of factors in his/her personal life in the field. Sometimes turning points are *forced* as they can be precipitated by external events and/or the actions of others such as redundancy (*Ibid*.:39).

Life spans, life cycles, life histories, life trajectories

Elder *et al* (2003) stressed the importance of clarifying terms that some people use in conjunction with life course; these include life span, life cycle, life history and life trajectory. They emphasised that researchers should be wary of conflating these terms. Their *Handbook on Life-Course (Ibid*.:4) defines the terms as follows:

- **life span** specifies temporal scope of inquiry, extends over substantial portions of life, links behaviours in two or more life stages;,
- life history [means a] chronology of events and activities across the life course, allows the examination of life trajectories along multiple stages of life, and
- **life cycle** [delineates a] sequence of events.

Life course theorists have synthesised some key ideas of the paradigm into some fundamental principles. I will start by discussing five of the fundamental principles that guide life course work and that provide useful theoretical vantage points for research.

- The principle of life span development emphasises the need to take a longterm perspective and study lives over a substantial period of time. This alerts us to the idea that we can only really understand behaviours by considering experiences in earlier life (Elder *et al* 2003:11; Kok, 2007).
- The principle of agency people construct their life courses through the choices and actions they take within the constraints and opportunities that they face. This principle acknowledges that we are not passively acted on by social structure and institutions; we make choices and compromises according to how we perceive them. Choice-making has a significant impact on trajectories (*Ibid*.).
- Time and place an individual's life course is embedded and shaped by the times and places that they have encountered. This highlights the importance of a researcher paying attention to the interactions of the life course with the temporal and local contexts (Kok, 2007). Elder (1994) also highlighted historical worlds and historical effects and encouraged researchers to look out for the

period effect that history can have, which can sometimes be seen across a birth cohort.

- **Timing** the consequences of life transitions, events and behavioural patterns vary according to timing in a person's life. The same event may affect different people in different ways depending on when they occur in the life course (Elder, 1994; Kok, 2007).
- **Linked lives** people live their lives interdependently this acknowledges the network of shared relationships that we face in our life-course (eg. family; co-workers; friends).

Researchers tend to talk about life course research in two ways: 'object-view' and 'paradigm-view' (George, 2003; Shanahan & Macmillan, 2008). The work of Elder (1994) outlined above could be regarded as 'object-view'. George (2003:673) argued that the future of life course research lies with an "integration of life course principles with the total range of theoretical and substantive themes", which indicates more of a 'paradigm-view' of the life course approach and reflects a more interconnected approach to using life course. This is largely how the ideas were used in the present research programme to explore selected career stories (Ramsarup, 2017; and Paper 6 in this Bulletin). The career stories needed to be viewed across a life span; this provided one layer of meaning to developing an understanding of the learning pathways.

Challenges with the 'life course' conceptualisation

Kok (2007) drew our attention to the idea that the elevating of a socially determined trajectory leads to an 'oversocialised' image of individuals. Fenwick (2013:8) critiqued the 'overfocus' on a trajectory of "linear chronological change", which she saw as located within an individual and an individual life-path. She also (*Ibid*.) critiqued the focus on events, which she claimed could "flatten the complexity of social relation", reducing multi-faceted processes to single events as they appear to one individual.

Fenwick (2013:8) critiqued the humanist idea of a "self-determined, agentic subject", and claimed that the life course approach fails to deconstruct "cultural discourses and infrastructures constituting the narratives". Also lacking is the ability of this research to examine "systemic influences on and outcomes of their actions which individuals tend to disregard in their everyday practices" (*Ibid*.).

These critiques are shared by the commitment of those working in the Critical Realist paradigm, to a stratified ontology (Sayer, 2000; see also Bhaskar's [1993] Transformative Model of Social Action [TMSA]). Bhaskar's (1993) view of agency as being 'embodied *agentive* agency' that is emergent in open systems has been useful in the present study to mitigate these critiques.

Challenging transitions – managing transitions in transitioning times

The social, environmental and economic challenges in South Africa in the early years of its democracy are central to any educational investigation. Educationists such as Allais (2003) have critiqued the ushering in of neo-liberal globalisation in the transitioning systems within the democracy, which in the skills context, has been cloaked in the scenario of high skills and global competiveness. South Africa faces high levels of unemployment: the small and low growth scenario in the economy have not resulted in greater labour absorption into the formal economy, and the extent of graduate unemployment is of concern. Trying to understand how people make transitions in challenging and changing contexts is one of the intentions of this research programme as noted.

Sawchuk and Taylor (2010) reflected on changing global economic contexts and articulated some implications for researching school-to-work transitions. They emphasised that learning and work transitions are increasingly complex, extended across life courses, and are differentiated and differentiating across social groups. They noted that transitions are increasingly fragile and exclusionary. Supporting these ideas, the OECD reported that the number of 'stepping stones' required by youth to secure a labour market position is multiplying (Sawchuk & Taylor, 2010). The authors explain that primary labour markets (good jobs) are shrinking in relation to labour market participation. Workers in primary labour markets will retain the ability to cope positively with their transitions, whether vertical or lateral, and will probably see either stable or growing remuneration. But secondary labour market workers will experience transitions differently, which again raises the issues of social difference and non-linearity. Within South Africa, labour market discrimination in the form of gender, race, ethnicity and disability is still a reality (Ramsarup, 2017).

Sawchuck and Taylor (2010) mapped some ideas for a way forward for transition research. They have positioned their views as 'Critical Vocationalism focusing on learning-to-work transitions'. Although they stressed that New Vocationalism (which draws strongly on economic approaches) and Critical Vocationalism remain on a continuum (so as not to create two 'camps'), their positioning is very distinct and well-defined. Sawchuk and Taylor (Ibid.) argue that the central underpinning idea in Vocationalism is that workers need to be adapted to the needs of the economy - and a key idea of the New Vocationalist position is the notion of Human Capital. They argued that the Vocationalist position, which they see as primarily foregrounding an individual/adaptive perspective, has inherent difficulties in admitting structural contradictions rooted in both institutions of education/ training and the economy. The reality behind the Vocationalists' propositions is that in minimising the attention on how education systems work together with labour markets and work systems, "they are shaped by the tensions, and contradictions inherent within processes of control, conflict, accommodation and occasionally resistance" (Sawchuk & Taylor, 2010:9). Thus a response within a Vocationalist mindset assumes that more responsive education, continuing education, vocational and workplace training (from the cradle to the grave), would address the problems in the economy/labour market. Similar critiques have been raised in South Africa (Ramsarup, 2017) where the emergent NQF and Outcomes Based Education were seen as key mechanisms to address the considerable social and economic issues post-apartheid (Allais, 2003). However, as illustrated by Livingstone (2004) and Sawchuk and Taylor (2010), this remains a flawed thesis, as a significant 'education-jobs' gap remains under-recognised and misinterpreted within the New Vocationalist position (Sawchuk & Taylor, 2010:9). These perspectives have much synergy with current issues in South Africa.

Critical Vocationalism has its theoretical roots in areas of work concerned with race, disability, social class, and gender, and represents a school of thought intended to disrupt the *status quo*. Central to the Critical Vocationalist perspective is an understanding of context, social differences and power relations that "define how learning capacities are productive and reproductive of uneven social and economic prosperity" (Sawchuk & Taylor, 2010:1); these aspects need to be emphasised in work transitions. Bynner (2001), as cited by Sawchuk and Taylor (2010:9), in reflecting on transitions, highlighted the "interconnectedness of activity across the different domains of life". Bynner (*Ibid*.) further emphasised that there is a lack of attention regarding the broader political climate, culture, and the effects of other spheres of institutional and non-institutional life as dimensions of transition processes.

Sawchuk and Taylor (2010) argued that many critical approaches remain fixated on the distribution of education and training generally, ignoring different social groups, and focusing simply on job attainment rather than the quality of the transition experiences.

It forces a shift in gaze when we examine transitions and highlight the variety of social variables that shape the patterns of transitions. These ideas resonate very strongly in our research programme on learning pathways and have enabled us to acknowledge that education/trainng pathways are not neutral mechanisms for allocating opportunities to people. The learning and work transitioning lens enabled us to dissect learning pathways as opportunity structures. The Critical Realist work in this research programme enabled a focus on the generative mechanisms shaping learning-to-work transitions and the opportunities for transformative praxis (see Papers 2, 4, 6 and 8 in this Bulletin).

In addition to calling for more attention on social variables, Sawchuk and Taylor (2010) argued for an expanded view of transitions that encompasses inter-institutional concerns which focus on formal and non-formal learning experiences within learning and work transitioning, as well as intra-institutional transitions that are focused on transitioning into different types of work, sectors and occupations. In our research programme we considered the case of transitioning into a sought-after emerging specialism within an organised profession, 'Environmental Engineering' (Ramsarup, 2017; and Paper 6 in this Bulletin), and an occupation with widely changing and undefined parameters, 'Environmental Scientist' (Ramsarup, 2017). We reasoned that this would make a contribution to expanding the insights into learning and work transitions in the environmental sector. The critical intent of this research programme to highlight structural contradictions in the education, training and professional systems supporting environment and sustainable development occupational learning pathways development, also resonates within the wider framework of Critical Vocationalism as proposed by Sawchuk and Taylor (2010).

Sawchuk and Taylor (2010) argued that an important theme in Critical Vocationalism is the informal dimensions of transitions, learning and experience, which we found useful for our study on environmental learning pathways. Sawchuk and Taylor (*Ibid*.:1) claimed that to understand the range of complexity of learning and work transitioning throughout people's life courses, we need to recognise "learning and experience throughout its full range of variation" – which they posited is absent from dominant theoretical and policy-based research (see also Paper 1 in this Bulletin). The neglect of informal learning, these authors contend, is due to the difficulties in giving it credit and commodifying it. The Critical Vocationalist approach helps to highlight these barriers and their impact on individuals and groups.

Looking at macro frameworks for understanding learning-to-work transitions

Raffe (2008) provided a useful frame for helping to develop an understanding of the macro aspects of transitions, which he outlined as being the different institutional and structural arrangements that shape young people's education/training-work transitions. His heuristic of a transition system provides a useful overview for learning pathways research. This idea enables one to identify components that require attention and it provides a useful way to conceptualise the notion of a 'transition system' as a multi-dimensional concept, that involves strong interdependent relationships between education/training and labour market and societal, historic and political factors. It helps us to understand the components within institutional arrangements and how they can impact and shape transition processes and outcomes. Raffe's (2008) framework was useful in highlighting transition variables (see Figure 1).



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The OECD (2000) study also highlighted six key ingredients of an effective transition system:

- a healthy economy;
- well organised pathways that connect initial education with work and further study;
- widespread opportunities to combine workplace experience with education/ training;
- tightly knit safety nets for those at risk;
- good information and guidance; and
- effective institutions and processes.

These characteristics are inherently framed within a vocationalist perspective of education which prepares people for the labour market. These six characteristics have been useful to develop a critical analysis of the provisioning for Green Skills from a more systemic perspective, as presented in Ramsarup (2017; see also Paper 7 in this Bulletin). Wheelahan *et al* (2012) reflected that despite the *theoretical eclecticism* that Raffe (2008) highlighted within transition research, the macro perspectives presented by his macro frameworks help to understand the characteristics of transition systems, the patterns of transitions, and the logic of the transition system. The frameworks further help to understand how the structure of social institutions impacts on transitions, which in turn provides insight into the nature of social change and helps to frame implications for policy.

These macro frameworks provide this study with a vantage point that allowed us to consider how the structure of social institutions can impact on transitions and enabled a clearer view of the nature of institutional changes. The macro frameworks view has implications for reflecting on education/training policy and the systems of provisioning. Our interest here was to explore how transitioning systems respond to new areas of work as envisaged by the transition to the Green Economy and sustainable development.

However, these frameworks do not assist with raising structural contradictions in the education and training system, nor do they pay sufficient attention to the historical, political and social factors shaping learning and work transitioning. Hence our inclusion of a Critical Realist underlabouring in this research programme.

A closer look at the informal learning dimension in transitions

Fundamental to understanding educational and occupational transitions is understanding the learning underpinning these processes. Field (2012) emphasised that transitions are an important focus for adult learning. Gallacher, Ingram and Field (2009) also referred to transitions between different forms of learning and Glastra, Hake and Schedler (2004) supported this view by stressing that all lifelong learning is transitional learning. All learning implies the integration of two very different processes, namely an external interaction process between the learner and his or her social, cultural or material environment, and an internal psychological process of elaboration and acquisition (Illeris, 2009:8).

In this section I explore some theoretical constructs on learning that help to make sense of the learning transition relation. The need to broaden views of learning beyond the formal has been a long-time focus of educational discussions. Although I support the view of Colley, Hodkinson and Malcolm (2003) that formality and informality in learning should be viewed as a relational continuum, I consider it useful to explore some typologies that are used in the literature to understand the relationship between these elements of learning. I draw on somewhat related typologies to help me to make meaning of these learning relationships in this study.

The first typology outlined is from the European Commission (EU) (2001). Although not purposefully theoretical, its intent was to guide EU educational policies, projects and programmes. It still represents a powerful construct and has influenced conceptualising within EU countries. This three-way typology has been incorporated by SAQA, the three Quality Councils, the DBE and the DHET in their respective Recognition of Prior Learning (RPL), Credit Accumulation and Transfer (CAT) and Assessment policies.

EU's three-fold definition of learning: *formal learning* (ie. learning that occurs in a structured context and that results in nationally recognised qualifications); *non-formal learning* (ie. learning that is embedded in planned activities that are not explicitly designated as learning) and *informal learning* (ie. learning that arises from daily life experiences, that traditionally does not lead to certification but may be subject to some form of accreditation/recognition) (European Commission as cited in Colley *et al* 2003)

Sawchuk (2008), commenting on work done in Canada, drew on Livingstone's conceptualisation of formal and informal learning:

When a teacher has the authority to determine that people designated as requiring knowledge, effectively learn a curriculum taken from a pre-established body of knowledge, the form of learning is formal education, whether in the form of age-graded and bureaucratic modern school systems, or elders initiating youths into traditional bodies of knowledge. When learners opt to acquire further knowledge or skill by studying voluntarily with a teacher who assists their self-determined interests by using an organised curriculum, as is the case in many Adult Education courses and workshops, the form of learning is non-formal education or further education. When teachers or mentors take responsibility for instructing others without sustained reference to an intentionally-organised body of knowledge in more incidental and spontaneous learning situations, such as guiding them in acquiring job skills or in community development activities, the form of learning is informal education or informal training. Finally, all other forms of intentional or tacit learning in which we engage either individually or collectively, without direct reliance on a teacher or an externally-organised curriculum, can be termed self-directed or collective informal learning. In the most expansive conceptions of human learning, self-directed learning may be seen as coterminous with life experience itself (Livingstone, 2005 as cited by Sawchuk, 2008:5, emphasis added)

This rather long but useful elaboration brings up issues of agency, and helps us to recognise that the mediation of learning involves knowledge and skill artifacts (Sawchuk, 2008) as well as values. These learning artifacts can be expressed through dominant institutional structures (curricula, policy, teacher authority), while other forms could express cultural norms, content, habitus, language codes (Sawchuk, 2008). This discussion places an emphasis on knowledge form or knowledge structure, which is distinguished as either pre-established or situational.

Eraut (2000) classified learning into formal and non-formal learning. He outlined the following characteristics of formal learning (implying that any other learning is non-formal):

- a prescribed learning framework;
- an organised learning event or package;
- the presence of a designated teacher or trainer;
- the award of a qualification or credit; and
- the external specification of outcomes.

He deepened his conceptualisation of non-formal learning in a later framework (Eraut, 2004) in which he outlined a more comprehensive understating of informal learning. Table 1 below is extracted from Eraut (2004:250).

Time of focus	Implicit learning	Reactive learning	Deliberative learning
Past episode(s)	Implicit linkage of	Brief near-	Discussion and
	past memories with	spontaneous reflection	review of past actions,
	current experience	on past episodes,	communications,
		events, incidents,	events, experiences
		experiences	
Current experience	A selection from	Noting facts, ideas,	Engagement in
	experience enters	opinions, impressions;	decision making,
	episodic memory	asking questions;	problem solving,
		observing effects of	planned informal
		actions	leaning
Future behaviour	Unconscious	Recognition of	Planning learning
	expectations	possible future	opportunities;
		learning opportunities	rehearsing for future
			events

Table 1: A typology of informal learning (Source: Eraut, 2004:250]

All three of the above typologies provide insight into elements that need to be considered when thinking about forms of learning that may be involved in transitioning. The typologies therefore broaden the view that learning and work transitioning involves transitioning into and out of formal learning only.

However, Billet (2004) and Colley *et al* (2003) offered a critique for this categorisation of learning. Billet (2004) explained that you cannot describe a phenomenon by what it is not (eg. informal as 'not formalised; unstructured – not structured'; unplanned practice as practices that are not planned); approaching concepts this way does not help us to understand their qualities and characteristics. Billet (2004) further critiqued that these typologies set up learning and teaching as synonymous or at least as being linked – therefore the absence of a qualified teacher would mean that learning that does not take place in educational institutions. Writing from the perspective of learning in and through work, Billet (*Ibid.*) objected to what he termed as the privileging of the practices of education and training institutions (curricula, teachers, planned practice). He (*Ibid.*) then raised the concern that within this frame of thinking, learning through work can be deemed as 'weak' or '*ad hoc*' or 'incidental' and so on.
CONCLUSIONS

This review of learning pathways research internationally shows that researching learning pathways is notoriously 'difficult to do' and that learning pathways research lacks methodological refinement. The theoretical limitation in the research work discussed thus far is the dominance of an actualist ontology (the focus on experiences and events) which means that causal laws are defined in terms of empirical regularities – this can be seen in large scale tracer studies on transition work. In open systems, constant conjunctions cannot be a necessary condition for causal law (Hartwig, 2007; Cruickshank, 2003; Sayer, 2000). Hence the learning and work transitioning research enabled us to develop descriptions of events, turning points and experiences but failed to help provide a deeper analysis of generative mechanisms.

In summary, the environmental context within which this research programme is located, needed a more complex notion of learning pathways, as neither completely individualistic nor wholly structurally determined pathways are advocated. The concept of learning pathways used in this study is informed by the Critical Realist recognition that structures precede human actions *and* that agents may influence structures and exercise reflexivity as they 'make their way through the world' (Archer, 2000). Based on this emergent view of human development, the perspective on learning pathways used in the research programme aimed to recognise that systemic and structural factors shape learning pathways in certain ways, but agents (the individual learner or other organisational/ corporate agents) may shape the learning pathways in certain ways too.

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NOTES

PAPER 4

Using Dialectical Critical Realism in the Analysis of Career Stories in Learning Pathways Research

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INTRODUCTION

In this paper we expand on our earlier methodological deliberations associated with differentiation within systems, boundaries and transition mechanisms (see Paper 2 in this Bulletin). We explore the potential for using a combination of two methodological tools for our learning pathways research, in order to address the central methodological question raised through the literature review of learning pathways research, which highlighted a macro-micro dualism this area of study (see Paper 3 in this Bulletin). In Paper 4, we seek to explore whether Bhaskar's (1993) dialectical approach may help with addressing this methodological dualism. We do this through applying the dialectical method, to career stories research approaches, which are one of the foundational approaches used in learning pathways research (see Paper 3 in this Bulletin). Our analysis in this paper therefore uses (a) the development of 'career stories' and (b) Critical Realist analysis of these career stories, using Bhaskar's (1993) dialectical method which foregrounds both absence and emergence.

BHASKAR'S DIALECTICAL METHOD

Bhaskar's dialectical method, best articulated in his 1993 book *Dialectic: The Pulse of Freedom*, differs in a significant way from the Hegelian dialectic which has informed much Marxist and neo-Marxist research in the 19th and 20th centuries. It does this by including *negativity or non-being*, in the form of the 'determinate absence' into an understanding of being. For learning pathways research, this means that 'determinate absences', are *as significant* for the learning pathway as that which already exists in the learning pathway. For example, the 'determinate absence' of successful Adult Basic Education and Training (ABET) can determine substantively, the 'being' of a worker in terms of their learning pathways²⁶.

²⁶ The terms Adult Basic Education and Training (ABET) and Adult Education and Training (AET) are used interchangeably in South Africa.

Critical Realism is a philosophy of science which stresses the crucial role that 'being' (ontology) plays in our understanding of how knowledge (epistemology) is possible (Norrie, 2010:7). This view differs from many modern philosophy and social research traditions which "... after successive 'linguistic', 'constructivist' and 'discursive' turns, is centred on epistemology" (*Ibid.*). Critical Realism insists on the importance of ontology which, according to Norrie (2010:7) "... maintains the centrality of an understanding of being in the natural and social worlds that grounds, but does not guarantee, our efforts to understand the way things are." In Bhaskar's (1993) Dialectic, he uses the notion of the 'reality principle' meaning that there is a natural necessity in things that grounds our knowledge of them. In this work, Bhaskar develops an account of being in which "reality is stratified, and knowledge involves processes of accounting for the events we observe in terms of the underlying structures and other mechanisms which generate them" (Norrie, 2010:7). Bhaskar (1993) argued that it is the process of structured, causal generation of being which is called 'necessity', and that these processes of generation operate differently in the natural and the social worlds. Collier (1994:6) explained that 'depth realism', which takes account of 'necessity', stresses that knowledge may be "not only of what appears [eq. the positive rendition of a learning pathway], but of underlying structures which endure longer than ... appearances, and generate them or make them possible". From this we learn that the positive account of a learning pathway may therefore only provide partial knowledge of learning pathways, and that there is a need to examine the underlying structures that shape or generate learning pathways in particular ways. There is also a need to consider negativity and absence in learning pathways.

Critical Realism posits three domains of 'being here': the empirical, the actual and the real (Bhaskar, 1993). In the empirical domain, it is possible to identify the experiences of knowing subjects (eg. the Taxonomist or Municipal Manager who reflectively shares a story of his or her learning pathway and how it came to be constructed). In the actual domain, one can identify events and their experiences by subjects²⁷ (eg. how a particular course or degree programme shaped the learning pathway of the Taxonomist or Municipal Manager). In the domain of the real, one can identify both experiences and events, and the *underlying mechanisms that generate these events and make them available to experience* (eg. [a] how the existence of university education allowed for the Taxonomist to study Taxonomy and thus become a Taxonomist, or [b] how the policy of transformation or the change in power relations in society influenced the Municipal Manager's chance to

²⁷ The phrase 'knowing subjects' refers to 'actors' in systems; the term 'subjects' in this discussion means 'areas of study'.

obtain a management position, or [c] how the policy of *apartheid* excluded the Municipal Manager from learning opportunities for obtaining a much-desired Master of Business Administration (MBA) qualification, for example).

Norrie (2010:7) explained that it was the identification of the third domain of the real (what he calls "the broadest level of being") that drives the Critical Realist research interest in 'natural necessity' or 'real depth of being' – the interest in examining what is available to experience, differently, using this 'depth ontology'. This approach in turn, allows for the differentiation between intransitive (not socially constructed) and transitive (socially constructed). It also addresses what Bhaskar (1993) saw as two key problems of Western Philosophy, namely 'ontological actualism' and the 'epistemic fallacy'. The epistemic fallacy emerges when epistemology is overemphasised at the expense of ontology; it reduces being to the knowledge of it (that is, it could reduce learning pathways research to knowledge of the existing, experienced learning pathways of the learner/ worker/professional). Ontological actualism, on the other hand, involves equating ontology to actual events. For social science, this means that human conduct (eg. the construction of a learning pathway) cannot be reduced to observable behaviour or social effects (as it is, in positivist naturalism), or to interpretive action (as in hermeneutics).

Agency is linked to social structures, which "stand as objects of study in their own right" (Norrie, 2010:10). Understanding learners' agency in constructing their learning pathways cannot be understood without an understanding of social structures, and how they shape learners' choices, and how they in turn are shaped by agents in the NQF system. People do not work or develop learning pathways to reproduce the capitalist economy, yet these results are unintended outcomes of their actions (which reproduce structure) and the necessary condition of their acting (grounding and enabling their agency) (*Ibid*.:11).

Dialectical development of Critical Realism integrates an account of 'becoming' with an account of 'being'. This is constituted through Bhaskar's (1993) dialectic which has four terms: (1) non-identity (or absence), (2) negativity, (3) totality, and (4) praxis (agency). Norrie suggested that Bhaskar's usage of these terms is radically different to Hegel's, as Hegel emphasises identity, negativity and totality. Norrie (2010:12-13) described Bhaskar's dialectic as follows.

 First moment (1M) - Non-Identity: the sheer, real difference that exists in the world; associated with the 'stratification and differentiation of the world' (Bhaskar, 1993:392), with 'real causes and generative mechanisms' (*Ibid*.). This refers to the possibility for real differentiation in the world (not a generic, necessarily abstract, sense of difference as used in Post-Structuralism). For learning pathways research, we may identify real causes and structural mechanisms influencing learning pathways at 1M.

 Second edge (2E) - Negativity: real negativity and contradiction, disclosed by things in the world; the idea of real, determinate absence that exists in things, as part of what is called 'natural necessity'. Bhaskar (1991, as cited in Norrie, 2010:14), described this as follows:

An entity may be absent from its spatio-temporal ... region either because it is in some other region ... or because it does not exist at all either because it is finite and has perished ... or because it never did exist ... (whether it will or may come to exist or not). And the absence of such an entity ... may precisely, *qua* absence, have causal effects on objects in the relevant space-time region, and as such satisfy the causal criterion for ascribing reality to things Think of ... the monsoon that doesn't come which makes the crops perish ... [the bursary that is not awarded that affects the life chances of a science graduate ...]

This, according to Norrie (Ibid.)

...asserts the philosophical need to think of both negative and positive qualities in reality, and points to the consequences of most research which tends to miss the importance of the negative in a purely positive account of reality ... [which tacitly assumes that] the negative can always be analysed away in purely positive terms The world, including the natural world, contains absences, omissions, liabilities, just as much as presences, commissions and powers ...

For learning pathways research, we may identify absences, omissions, liabilities as *well* as presences, commissions and powers at 2E. Absence is a key concept in dialectical Critical Realist research because dialectic, at its most complete, involves 'the *absenting* of constraints on the *absenting* of *absences*, or ills' (Bhaskar, 1993:396, emphasis original). What this means is that that which is present (eg. an ABET training programme in a workplace) is a tiny, but important "ripple on the surface of a sea of absence" (*Ibid*.). Absences include those

things that are erased, hidden, omitted, forgotten or excluded (amongst others). "Negativity embraces the *dual* senses of the (evaluatively neutral) absence and the (pejorative) *ill*" (Bhaskar, 1993:238, emphasis original). The purpose of dialectical Critical Realist explanatory critique is to "absent *ills*" (*Ibid.*, emphasis original), for example to absent exclusion from the education and training system for historically disadvantaged workers.

- Third level (3L): Totality: this negativity is located in the world at a 'third level' of a real, open, unfinished whole. Relating the negativity or absence as identified at 2E to 'totality' allows for the dialectic to be engaged. Bhaskar's work develops a crucial link between absence as an *ontologically real*, and *absence as negation*. This "... brings out the world's dynamic and processural quality, and establishes change as integral to it" (Norrie, 2010:15). It is at this level that the "... processural categories of negation, contradiction, development, becoming, emergence" are engaged, an analytical process that revolves around the categories of 'totality and reflexivity' (Bhaskar, 1991:126). For learning pathways research, we may identify processes of negation, contradiction, development, becomment, becoming, and emergence at 3L.
- **Transformative praxis (4D):** the capacity for practical human agency to change the world, or 'agential ethical praxis' (Norrie, 2010:15) which is borne from an account of eudemonia "as a place where the freedom of each depends on the freedom of all" and associated universalisation of practical commitments that are based on ethical positions of "what it means to be free, and to enter into relations of solidarity with others" and the non-human world on which we depend (*lbid*.:17). In this regard, Norrie (2010:17-18) explained that:

... by virtue of our nature, evolved in society and in history, we are a species that possesses the possibility of extrapolating through a process of reason to the dialectical necessity of an ethically complete world. Yet this possibility coexists with the need to recognise that ethical values are socially developed and deeply implicated in structures and power that are historically emergent ... the historical and the ethical are constellationally co-embedded in a totalising dialectic that enables them to be co-present ... ethical experience can be real and irreducible ...

... [eg. we may recognise that choices made in providing for learning pathways have

real social justice implications, or democracy implications], and at the same time are connected to and influenced by historical conditions [certain ethical practices may be more necessary at certain times in particular contexts; eg. it may be ethically significant to give attention to the absence of learning pathways for oppressed workers in South Africa at this time in history, for good reason] ...

This framework (also named 'the MELD') in Bhaskar's (1993) work, allows for the analysis of learning pathways in a uniquely different way to that made possible through positivism or hermeneutic research. Bhaskar's work allows us to analyse change in learning pathways in terms of "... a process of movement in which a thing becomes something else, and in that process, ceases to be what it was" (Norrie, 2010:15). This change can be the learner on the learning pathway; or the system of learning pathways provisioning; or both, as they change in relation to each other. Change is what ties 'being to becoming'. "Becoming is the absenting of what *was* in favour of the emergence of what now *is*, for every becoming is also, in some part at least, a 'begoing', an absenting of what was there" (*Ibid*.). In dialectical Critical Realist research "[a]bsence plays a huge part, either as a noun, 'absence', or as a verb 'absenting', and it is present in a variety of modes" (*Ibid*.) – in the overall *ontology* of change; the epistemology of learning processes and dialogue (the absenting of error); and in ethics as the dialectics of agency (the absenting of constraints on freedom).

We could therefore argue that the identification and absenting of absences is important for democracy and social justice, as it involves ethical agency for absenting constraints on freedom. If, for example, the effective ABET programme is 'absent' in a local government training context for entry level workers, the absenting of this absence will involve an ethically constituted dialectics of agency which reduces constraints on workers' freedoms. Providing for 'absent' qualifications or occupational categories that address public good concerns in various Sector Education and Training Authority's (SETA) or Technical and Vocational Education and Training (TVET) colleges, can similarly be viewed as a dialectically constituted form of ethical agency that absents constraints on the freedom of people to choose career options and learning pathways that address public good concerns, and so forth.

But how does one begin to identify such absences in learning pathways research, and what can be learned from doing so? We approach this question via an analysis of some 'career stories' which are constituted in the first instance as reflections of the empirical

experiences of people in different workplaces at different levels of the professional hierarchy of 'jobs'. Our point of departure is career stories relevant to our interest in the environment and sustainability arena, given the potential of the stories to highlight how 'newness' can be dealt with under a National Qualifications Framework that has an interest in not only lifelong learning oriented towards economic growth, but also lifelong learning that concerns itself with democracy and social and environmental justice concerns, and holistic development (public good concerns) (Biersta, 2006).

CAREERS AS STORIES: NEGOTIATING THE INTERRELATIONSHIPS OF LEARNING AND WORK

Careers are inherently dynamic – evolving, developing and intersecting in planned and unplanned ways making it problematic to utilise linear, agentic frameworks for understanding career trajectories (Cohen & Mallon, 2001). Storytelling is a fundamental human activity and hence stories have emerged as a major source of understanding about how careers work. As people experience things and tell stories about their career experiences, they also construct their personal experiences and biographies (Patton & McMahon, 2006), and it is through these constructions of reality that we are able to see patterns and relationships between wholes and parts. Hence stories have been recognised as useful retrospective sense-making tools. We suggest that stories are useful retrospective sense-making tools in the transitive domain²⁸ (Bhaskar, 1993). The idea of connecting events and the order of happening that stories unfold has been discussed in detail by many career theorists (Cohen & Mallon, 2001; Patton & McMahon, 2006; Inkson, 2007). Savickas (2005) also confirmed the usefulness of the story, noting that in chronicling the recursive interplay between self and society, career stories explain why individuals make the choices they do and the private meanings that guides these choices. Cohen and Mallon (2001), in substantiating the rich value of stories for career research, highlighted four key related benefits:

- sequencing which provides a chronicle of events;
- revealing the inconsistencies and contradictions;
- providing retrospective sense-making gazing backwards and investing past

²⁸ Bhaskar (1993) differentiated between the transitive (epistemological) and intransitive (ontological) domains. He suggested that conflation of these leads to either: (1) the epistemic fallacy (where knowledge of being is conflated with being) – the epistemic fallacy is mediated by actualism, or (2) ontological monovalence which involves providing a purely positive account of being.

events with meaning that resonates with the present; and

• enabling insight into how individuals view their relationships to social structures.

Stories enable the researcher to build a "rich, complex, multifaceted and integrated picture from the perspective of situated individuals" (Cohen & Mallon, 2001:55):

Stories are both products and processes. As products, we are interested in their potential for capturing the richness and ambiguity of social life while at the same time providing a sense of order and sequence. As processes ... qualitative interviews worked as dynamic sense-making/sense-giving processes during which each participant retrospectively constructed a version of his/her career story ...

Representing careers as stories is an attempt to move the study away from viewing career moves, routes or events as 'once-off' and avoiding narrow 'fractured understandings and reductionist perspectives' (Cohen & Mallon, 2001) and to support the construction of a rich multi-layered picture of careers (in the case of our work, newly emergent environmental careers). However, despite an increasing discussion on the relevance and value of stories in careers research, there have been surprisingly few story-based empirical studies (*Ibid.*). Reflecting on the empirical use of stories in career research, Inkson (2007) noted that narratives involve *temporality* (how events are related in time) and *causality* (how events cause each other) but the time involved is subjective and the causality is subjective and loose rather than rational and precise. Patton and McMahon's (2006) work also highlights the importance of highlighting 'acausality' (lack of linear cause-effect relationships) within career stories.

Cohen and Mallon (2001) used Silverman's (1993) constructs of *form* (the narrative flow of the account) and *content* (the stories people tell and the themes that arise) to enhance their analytical work with stories. Cohen and Mallon (*Ibid*.) highlighted clearly that to explain a career transition, interviewees needed to move beyond the abstract and situate the career event within a meaningful context, and that this context was both *temporal* (eg. the sequence of events leading up to the decision to leave the organisation) and *social* (eg. including the important people and events which were seen to influence the decision).

Despite the fact that stories as a research method offer great authenticity, they can be critiqued for lacking orderliness, generalisability, and efficiency (Inkson, 2007) and yielding a mass of unwieldy data (Cohen & Mallon, 2001). Our research sought to explore the

learning journeys of environment and sustainable development professionals as the biographical narratives made up of interconnecting sub-stories told as their paths or trajectories through 'figured worlds' unfolded²⁹.

The career stories allow the following:

- capturing the process notion of career formation in the sector;
- enabling a focus on the 'human beings' in action, and on the mechanisms underlying human action, as this allows *bringing human agency* and the *dynamic nature of career formation via structures and systems that exist* or don't exist to the fore (that is, the singular concrete in relationship to the universal concrete, after Bhaskar, 1998a); and
- capturing the relational and dynamic processes embedded in supporting the career development of environment and sustainable development professionals.

Inkson (2007) noted that stories can provide commentary on external institutions affecting careers but that little empirical work had been done within career research around this dimension. Despite broadening understandings of the systems inherent in career development (Patton & McMahon, 2006), namely the individual system (inner circle) and the environmental-societal system, little open systems research has been done in this field. Within the theoretical work being developed in this area to guide empirical research, there is acknowledgement of a multitude of influences on career development, which highlights the complex, multidirectional relations that exist within career development (outlined in Figure 1 below), according to Patton and McMahon (2006:95):

... presents career development as a dynamic process, depicted through its process influences, recursiveness, change over time and chance Fundamental to understanding the systems framework is the notion that each system is an open system. An open system is subject to influence from outside and may also influence that which is beyond its boundaries.

²⁹ The concept of 'figured worlds' was first introduced by Holland *et al* (1998) in their seminal book *Identity and Agency in Figured Worlds*. Holland *et al* (*Ibid*.:40-41) broadly defined figured worlds as 'socially produced, culturally constituted activities' where people come to conceptually (cognitively) and materially/procedurally produce (perform) new self-understandings (identities). See also the special issue of the *Urban Futures* Journal on 'Figured Worlds and Education' (Urrieta, 2007).

Such interaction is termed recursiveness ... which in diagrammatic form is depicted by broken lines that represent the permeability of the boundaries of each system. The final process influence, chance, is depicted on the ... diagram as lightning flashes, reflecting an increased recognition of the part chance plays in career development. All of the systems of influence are located within the context of time – past, present and future – all of which are inextricably linked; past influences the present, and together past and present influence the future...

The career systems framework of Patton and Mahon (2006) acknowledges the influence of multidirectional feedback and thus opts to use the construct of recursiveness, as recursions are often non-linear and generally imply multiple influences. This provides a useful framework for developing a conceptual understanding of career development. Considering the above from a Critical Realist vantage point, this framework may be inadequate for developing a deeper understanding of the *relationship* that exists between individual learning pathways biographies, and wider structural and systems views within a wider, critically emancipatory and transformative view of learning pathways research, as the potential exists to conflate the intransitive with the transitive, and to commit the errors of (1) the epistemic fallacy (where knowledge of being is conflated with being), or (2) ontological monovalence which involves providing a purely positive account of being. Bhaskar (1993) noted that both errors deny adequate emancipatory theorising and can block change potential.

In the next section of the paper, we use *initial renditions of career stories* (which could be further deepened through ongoing research and the use of additional research tools such as curriculum vitae analysis)³⁰ to probe the methodological possibilities of combining career stories research in the context of Bhaskar's dialectic.

³⁰ The purpose of this paper is not to provide in-depth career stories, but rather to *explore the possibilities that exist* for Critical Realist methodological tenets for learning pathways research. This analysis is therefore propositional and *exploratory* rather than definitive. More definitive accounts can be found in Mohanoe (2014) and Ramsarup (2017).



Figure 1: A systems framework for career development (Source: Patton & McMahon, 2006)

CRITICAL REALIST ANALYSES OF ABSENCES ASSOCIATED WITH CAREER STORIES

Story Set 1: Worker Career Stories

The career stories that follow were selected from a local government context as this is a primary site for environmental/sustainable development policy implementation and practice in South Africa; they are part of a larger study (Mohanoe, 2014). This context has both economic and public good dimensions, that is it provides an interesting site for testing Biersta's (2006) notion of a broader purpose for lifelong learning, and provided us with a 'test case' to examine how the NQF is engaging social justice, redress, environmental/ sustainable development and economic interests. Three career stories are provided (they are illustrative of many others) and are presented here as examples of the 'singular concrete' in the sense that what is found in one case may be related to what is found in other cases. 'Singular concretes' in Critical Realist research (ie. the conditions of one) are related to the concrete universal³¹ (Bhaskar, 1993). The three stories are presented here to show both the diversity and the similarity of the singular concrete. The MELD analysis that follows, shows how the singular concretes are potentially related to the concrete universal.

Career Story 1A

Worker A is a female Toilet Cleaner in a municipality (the only female in a team of five Toilet Cleaners interviewed). She completed schooling to a Standard 2 level³²; and has been working in the municipality for 40 years. For the first 25 years of her career she worked as a driver, and was then moved to the toilet cleaning division, a job she has been doing for 15 years, with no or very little training ever provided. She explains that her work is important but that "it is the chemicals that we work with that are hazardous to our health". And that "we don't have gloves to protect us". Her colleague reflects that "the chemicals … are not user friendly. We get given chemicals to use but are never taught how to use them. Sometimes we do get protective clothes but are never taught how to use them and what they are for". She goes on to explain: "We used to go to ABET classes but never completed³³. Because the classes are in the evenings, transport and time was a challenge". She explains that she is 'used to' her job, she sees it as an important job because "cleaning public toilets and making sure they are clean is important for a healthy environment", but that she does not need training now because she is about to go on pension.

Career Story 1B

Worker B is a male Sweeper in the same local municipality. He completed schooling to

^{31 &}quot;Typically the concrete universal manifests or individualises itself via one or more differentiations in some ... concrete singular" (Bhaskar, 1993:105). "The concrete universal is a multiple quadruplicity constituted by structures, particular mediations and singularities, rhythmically processualised ... The concrete singularity of an individual human being consists in a core species being ... particular mediations and rhythmics, uniquely individuating her or him as in effect a natural kind *sui generis* ..." (Bhaskar, 1993:371).

³² Standard 2 in the pre-NQF (pre-1995) system or Grade 4 in the NQF system, is the fourth year of schooling.

³³ Adult Basic Education and Training (ABET) comprises four levels, the highest level being at NQF Level 1 – the level of the ninth year, or Grade 9, in Basic Education.

Standard 8 level³⁴. He explains that he has been in the same job for eleven years, and came to the municipality after working as a casual labourer. He thinks his job is important because it "keeps the environment clean", but states that "if we had alternatives we would not be here". His colleague says, "Imagine having to sweep all day long. Instead of sweeping outside I would rather be cleaning offices and be indoors". Another colleague says, "I would rather be a messenger than sweep the streets". When asked about training, Worker B says, "sweeping in the streets, really what is there to learn?", while his colleague says that he would like to learn "anything that takes him out of the streets". Asked if there has been any training provision, the worker states "they have always said there will be training, but none so far, even as casual workers. They made us fill in forms but nothing has happened", and "We have never been trained on ABET".

Career Story 1C

Worker C is a male Waste Collector who has been working in the same municipality for four years; some of his colleagues have been working as Waste Collectors in the same job for over 15 years. Worker C left school in Standard 9³⁵ due to family circumstances which dictated that he had to find a job. He and his colleagues see the job as important because "we work with people and we ensure that we clean their environments. It is important to live in a clean and healthy environment. Worker C's colleague explains that "because of the kind of work we do, they [the community] look down upon us, and make our job difficult It is difficult working with the community even when you try and educate them because they put you at the level of the kind of work you do". Worker C explains "it is a dangerous job ... our challenge is working with rubbish all of the time. Sometimes we have to pick up dead animals, we inhale the germs and we go through every day without medical check-ups on our health ... we don't know what our health status is and the damage the rubbish we work with daily is causing to our bodies". He says further "we have never been trained, we just work" and "the problem is we don't know what we need to be trained on", but "we would appreciate better working conditions ... [the] "equipment is old and does not function properly ... we are short staffed ... we do not have capacity ... the township is growing ... maybe the supervisors should be trained on what we do, then they will understand the things we face in our daily work"

³⁴ Standard 8 in the pre-NQF (pre-1995) system or Grade 10 in the NQF system, is the tenth year of schooling; it is the first of the final three years of Senior Secondary school.

³⁵ Standard 9 in the pre-NQF (pre-1995) system – now Grade 11 – is the second last year of Senior Secondary school.

MELD Analysis (incomplete; first stage analysis only)³⁶

1M: NON IDENTITY	What exists
(What exists in the empirical, actual, and real domains)	Workers have not (over a long period of time), and are still not obtaining, any education and training related to the environmental health and safety and environmental practices that are the core of their work. Workers experience their roles positively, but the reader is asked to note that these roles are seen as 'inferior', as lacking in power, in the workers' communities.
	There appears to be a breakdown in relations between the workers and the managers/supervisors in relation to the training and development needs of the workers. Training opportunities that had existed in the past (eg. ABET) were seen as not being as effective as they needed to be; neither were the attempts to understand and respond to the training needs of the workers (workers were asked to fill in forms to state their training needs, but these had not been used). There appears to be no attention given to career pathways or developmental trajectories within the workplace of the workers interviewed, which is linked to the response 'little or no training' being provided.
	<i>Mechanisms influencing this situation may be:</i> Oppressive power relations and a history of neglect of worker training in municipalities. These patterns are linked to class and race histories in South Africa which have tended to discriminate and neglect working class employees who are most often Black people, and are seen as being 'under-educated' (in the sense of not having completed schooling).
	Within the training system, there appears to be a neglect of public sector worker training focusing on sustainable development practices. It is suggested that this neglect is influenced by neo-liberal economic histories that have shaped the education and training provisioning arena (Allais, 2003) and systems of education and training provisioning.

³⁶ To conduct a more refined MELD analysis of this data would require a more systematic and extensive process (see Mohanoe, 2014, for a partially completed analysis of this nature). The analysis here is illustrative.

2E: SECOND EDGE,	Absences included:		
NEGATIVITY	 the absence of effective Adult Education and Training (AET) opportunities focusing on sustainable development; 		
(Identification of absences and contradictions)	 the absence of adequate training on environmental health and safety; 		
	• the absence of career planning and career pathing for workers (linked to the absence of education and training opportunities and availability of learning pathways that intersect formal training and workplace practice);		
	 the absence of training that builds stronger relations between supervisors and workers and an understanding of each other's roles and struggles; 		
	• the absence of adequately mobilised qualifications for elementary occupations in the environmental practices and sustainable development arena in the SETA system (and where qualifications exist, they are not being used); and		
	• the absence of effective workplace skills planning that gives attention to sustainable development, well-being, <i>etcetera</i> .		
	At another level, and influencing the above, are the need to:		
	Address the absence of more equitable power relations between workers and supervisors; and		
	Address the absence of adequate attention being given to sustainable development training at worker level (elementary occupation level).		

	The following things are in theory possible:		
SL. TOTALITY	The following things are, in theory, possible.		
(The real, unfinished	Clean and healthy environment;		
whole ie. possibility)	Reduction of waste production in society;		
	Transformation to a 'Green Economy' which foregrounds 'clean and		
	decent' work over 'unsafe and unhealthy work';		
	Effective technologies for waste management; and use of harm-free		
	cleaning equipment; and		
	Effective education and training for workers that provides learning		
	pathways out of poverty and illiteracy, and out of environmental		
	health and safety risks, improved worker-supervisor relations, and		
	career development opportunities and career pathing that combine		
	formal training and learning and workplace practice.		
4D:	The following are possible transformations:		
TRANSFORMATIVE			
PRAXIS	Potential system transformation from unsafe and unhealthy work		
	environments to 'clean and decent' jobs as proposed in Green		
(Practical human	Economy thinking;		
agency to change the	Potential transformation of the education and training system		
world)	provisioning (eg. though effective courses, training planning,		
,	etcetera) that provides effective learning pathways for elementary		
	occupations in municipal and other contexts; and		
	Potential transformation of societal and supervisory views on the		
	value of the sustainable development practices and associated		
	needs for learning and inclusion in workplace skills planning		
	processes in municipal service delivery contexts		
	processes in municipal service delivery contexts.		

Story Set 2: Environmental Professionals Career Stories

To provide a contrasting set of career stories to the first set of career stories offered above, we include the two career stories of environmental professionals who have completed school, who have had the opportunity to complete Higher Education qualifications and who are now working in the environmental sector, contributing in various ways to the sustainable development of society through their management and professional level roles (from Ramsarup, 2017). The two stories are taken from the biodiversity sector which, like the local government sector, provides a site of analysis for lifelong learning and learning pathways that are broader than economic interests in society only, and include both economic and public good concerns.

Career Story 2A

Professional A is 28-year-old Zulu-speaking young South African male from rural KwaZulu-Natal (KZN) where he attended public schools in his community. At school he did Maths, Physics, Biology, English, Afrikaans and Zulu. His subject choices were heavily influenced by his teachers as "nobody in his family was educated". Looking back he reflects that he would have liked to do Geography. When he made his choices he did not think about a career.

After school, he was unable to get into university but managed to get into an academic bridging course at the University of KwaZulu-Natal (UKZN), which he funded through a student loan. In the programme he had a very good chance to explore careers in science. He then entered an undergraduate programme that included the following subjects: Geography; Environmental Science; Remote Sensing; Geographical Information Systems (GIS); Psychology; Sociology. He chose this combination as he felt that it "gave him options and was more flexible". He states further that in the Science Department electives were very narrow and he didn't like this because he "felt fixed and linked to set careers". He really struggled with these choices, not having done Geography at school, and he reported that his poor school knowledge and the large university classes (+/-200) were frightening; the pace was very fast and he felt shy in the foreign environment. Things that helped him were the student support structures such as access to resources/ the university library and staying at the university residence as this helped him to be with a group of people that focused on studying. Reflecting on his choices, he noted that, "I didn't want to be stuck in an office and I didn't want to do something fixed. I wanted to constantly learn [and] equip myself".

Throughout his undergraduate programme he worked part-time at the local municipality in a local research institute, capturing data. He ended up taking five years to complete his undergraduate degree. Straight after his undergraduate programme he registered for an Honours in Remote Sensing and GIS because during his undergraduate degree he had attended a presentation organised by the university and from this he knew that it was a scarce skill in South Africa. He wanted to do a Masters degree but did not do so, and regrets this greatly – he says: "it's very difficult when working". He reflects that "undergrad gave me the background and the urge to know but postgrad gave me more hands-on introduction to the field of GIS" and only in postgrad did he feel like "a captain of my own ship … in control of my own path". He started work as a GIS intern at a national parastatal and has since obtained a permanent job as a biodiversity monitoring officer. He reflects: "As much as working in a new field is exciting, GIS is an evolving, dynamic field so I need to be continually learning and learning quickly". He says "you won't be done with studies when you finish varsity".

Career Story 2B

Professional B is an English-speaking male aged 40. He grew up in Magaliesberg in the Gauteng province. His parents ran a small nature reserve so he has always had an interest in environment, ecology, and being out in the wild. *At school* he studied English, Biology, Physical Science, Maths, Geography, and Afrikaans. *On leaving school* he wanted to work with animals and outdoors but a Bachelor of Science (BSc) Degree did not appeal to him. He states "I didn't want to be in a laboratory". He was not attracted to pure science and he had a sense that he wanted to work with animals but he could not find or see the right route to get there. So he ended up studying Animal Husbandry as it was the closest to Wildlife Ecology that he could find. He was, however, disappointed with this Degree as it turned out that it "was completely not what I wanted as they taught me about looking after cows". But he stuck it out because he knew he needed what he calls "a stupid certificate" or he would not be able to find a job.

He worked in Botswana on a game farm for three years but he wanted to deepen his interest in Ecology so he enrolled for an Honours Degree in Wildlife Management. This was the easiest access route for him as he had integrated a focus on Botany and Vegetation Ecology into his Degree. He highlighted that it was very difficult to see clear "routes" before being in a working environment and also, "working helps to give you different ways of looking at your interests". After his Honours Degree he completed a Masters Degree in Wildlife Management and was very keen to proceed into the Doctor of Philosophy (PhD) Degree but an opportunity presented itself for him to work in Tanzania for the European Union. On returning to South Africa he worked in an Information Technology company as a support person. After three years he joined a consulting company as a Specialist Ecologist. He has a professional designation 'Professional Natural Scientist' (*Pr Sci Nat*) and is a registered professional consultant. He has done additional short courses on GIS, bird identification, and wetland delineation (Ramsarup, 2017 [study data]).

MELD Analysis (incomplete; first stage analysis only)³⁷

1M: NON IDENTITY	What exists
(What exists in the empirical, actual and real domains)	School subject choices are significant in determining access to other learning pathways, and influence the experience of further study (either through presence or absence).
	Not everyone knows the full significance of school subject choices for further learning.
	Perceptions about careers influence choices (eg. perception that BSc is about laboratory work only, and not animals).
	Interest in post-graduate scholarships and learning pathways (Masters and PhD-level studies), but this is not matched with viable opportunities.
	A recognition of the importance of the 'articulated short course' or lifelong learning opportunity for 'keeping up' with the changing knowledge and environmental context.
	Inadequate or inappropriate use of funding for career guidance. Orientation and post-graduate studies.
	Mechanisms influencing this situation may include:
	System and history of poor quality education and training. Rapidly changing knowledge environment and environmental conditions.

³⁷ To conduct a more refined MELD analysis of this data would require a more systematic and extensive process (see Ramsarup, 2017 for a full scope analysis of this nature). The analysis here is therefore partial and illustrative.

³⁸ See the National Articulation Baseline Study report (South African Qualification Authority - Durban University of Technology (SAQA-DUT). 2017. Final Draft Report. Pretoria: SAQA. Short courses must be (a) part of a full qualification, or (b) in the case of the present discussion, part of learning-and-work pathways; they must not lead to 'dead ends'.

2E: SECOND EDGE, NEGATIVITY	Absences included:
(Identification of absences	 Absence of clarity on how school subjects are linked to various career choices.
	 Absence of nuanced and in-depth knowledge of career options and choices and how to approach these.
	 Absence of funding policies related to career guidance, orientation and knowledge, with associated post-graduate study options.
	 Absence of clear understanding of the relationship between short courses and changing knowledge and environmental conditions and learning pathways.
	At another level, and influencing the above, is the need to: Address the absence of an improved quality education and training system that provides clear career orientation and support for existing and emerging environment and sustainable development occupations.
3L: TOTALITY	The following are, in theory, possible:
(The real, unfinished whole ie. possibility)	Functioning and well-articulated career guidance system. Freely available and accessible knowledge of career options and what they mean; and what possibilities exist. Those with an interest in post-graduate studies are free to pursue possibilities for post-graduate studies should they be able and interested in doing so. High quality open learning systems that allow for reflexive learning are available for biodiversity professionals and other sustainable development occupations.

4D: TRANSFORMATIVE	The following are possible transformations:
PRAXIS	
(Practical human agana)	Transformation of the school to Post-School Education and
to change the world)	career guidance relating to subject choices and the options
	and possibilities associated with these, relevant to existing
	and emerging environment and sustainable development
	occupations.
	Transforming the systems of career information provisioning and
	access to this knowledge.
	Transforming the current system of short course provisioning and
	access.

DISCUSSION: ABSENTING ABSENCES AND TOTALITY

The introductory and possibly incomplete MELD analyses of the career stories above show that it is possible to begin to conceptualise the relationships that exist between the individual career story or biographical narrative, and the wider context or systemic dynamics. The MELD analysis also points to the manner in which the dialectic constituted as a process of 'absenting the absences and absenting ills' provides a productive platform for conceptualising transformative praxis or the 'dialectic pulse of freedom' (Bhaskar, 1993) which potentially emerges from the transformative praxis associated with absenting absences. As noted in Norrie (2010:25), "absence denotes a relationship between something that is away from being and what is in being". The career stories above indicate such relationships between what is in being (having difficulties with career choices; or environmental health conditions associated with practice) and what is *away from being* (effective, facilitating systems enabling career choices; or environmental health and safety training that reduces worker's exposure to health risks). Critical Realism, different to idealism, provides an approach that allows for the development of *practical social theories* that are potentially transformative. For example, we may suggest that the education and training system should have effective career orientation systems and adequate training opportunities that are functioning effectively at worker level. Establishing these requires a deeper understanding of the system and its functioning; this may provide further insight into the ontological-axiological chain of the MELD, as proposed in dialectical Critical Realism.

Resonant with the 'totality' perspectives outlined in the MELD analysis are the findings of the Organisation of Economic Cooperation and Development (OECD, 2000) study as cited in Raffe (2003) and McKenzie (2000). The study (OECD, 2000, as cited in Raffe [2003] and McKenzie [2000]) identified six 'key ingredients of successful transition systems', namely:

- a healthy economy;
- well organised pathways that connect initial education with work and further study;
- widespread opportunities to combine workplace experience with education;
- tightly-knit safety nets for those at risk;
- good information and guidance; and
- effective institutions and processes.

Bhaskar's dialectical Critical Realism helps us to realise that such 'ideal states' or system- based features that allow for the existence and coherence and 'seamlessness' of learning, *pathways (1993) need to emerge through transformative praxis* and that transformative praxis needs to be seen as a *systematic and dialectically constituted process of absenting absences.* The inclusion of the two sets of career stories noted above, indicates that transformative processes *differ in emphasis and focus* at different levels of the NQF system (and also potentially differ across the three NQF Sub-Framework contexts). The stories also suggest that there are some features that are similar across NQF levels (eg. inadequate advice for learners regarding learning pathway possibilities).

CONCLUSION

In Paper 1 of this Bulletin, we reported on how we identified the need for giving attention to the unit of analysis in learning pathways research. We argued that learning pathways present a 'complex object' and can be differently constituted depending on research design decisions made at the level of the unit of analysis. We identified the following possible units of analysis for learning pathways research:

- the learning in the activity system itself, in the workplace;
- the interacting systems of workplace learning and training, or
- the system of training provision and its differentiated sub-systems.

In *this* research paper, Paper 4, we have focused on the 'career story' as one dimension of a wider unit of analysis for learning pathways research. The stories need to be complemented by analyses of (1) the activity system of the workplace; (2) the system of training provision, and (3) the interacting activity systems of the workplace and training. Further, these elements could probably better be conceptualised as a wider 'unit' or frame for explanatory critique, than as separate units of analysis. These interacting units of analysis can be interpreted using the meta-theoretical lenses provided by Bhaskar's (1993) Critical Realism within a perspective that theorises the possibilities for transformative praxis.

By identifying the absences in a selection of career stories, and by linking them to Bhaskar's (1993) notion of 'totality', and to the evidence of *possibilities for absenting such absences (possibilities for transformative praxis)*, this research potentially provides a re-oriented research trajectory. The re-oriented trajectory does not separate out the micro level analysis of career stories that focus on individual learning pathways, and the macro-level analysis of learning pathways which is more *systemic*. For a comprehensive explanatory critique with dialectical transformative possibility, Critical Realist research requires *both types of (macro and micro-level) data* to provide a fuller picture. Further, in addition to the career stories outlined, in-depth analysis of the system of provisioning, and its emergence and functioning, which we proposed could be approached through the use of systems research concepts provided by Luhmann (1995) and by mechanisms analysis (Bhaskar, 1998b), could potentially shed further light on the absences and other elements of the MELD.

Our methodological proposals for learning pathways research are therefore to undertake (a) 'career story' research; and (b) system elements analysis (see also Papers 6 and 7 in this Bulletin), and then (c) subject these career stories and systems perspectives to Critical Realist dialectical analysis; in order to (d) identify absences that need absenting at a systemic level; and (e) establish the manner in which the NQF as a differentiated system may be able (better) to respond to the absences identified (see Paper 8 in this Bulletin). In our view, this will provide a substantive approach for learning pathways research, in which the individual learners' learning pathway absences are not neglected or reified within either a focus on career stories, or wider (open) systems-based analysis of learning pathways.

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NOTES

PAPER 5

Boundary Making and Boundary Crossing in Learning Pathways Access and Progression: Voices from the Workplace

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INTRODUCTION

In the South African Qualifications Authority and Rhodes University (SAQA-Rhodes) partnership research it was found that 'researching the boundary' is an important unit of analysis in learning pathways research (see Papers 1 and 2 in this Bulletin). The researchers have argued that this focus has relevance for discussions on articulation, as articulation is a boundary crossing practice³⁹. However, to understand boundary crossing processes, it is important to understand what the boundaries *are* in learning pathways research and to understand how these boundaries were developed. Boundaries in learning pathways are both social and material and are constructed by people's actions and practices, and can only be resolved through people's actions and practices.

This paper – Paper 5 – considers the manner in which social-material factors are 'boundary makers' in learning pathways, affecting access, mobility, progression and articulation possibilities, with specific reference to articulation between workplace experiences and contexts on one hand, and education and training systems on the other. The paper argues for a perspective on the social-material that includes the Critical Realist concept of 'absence' (Bhaskar, 1993) as an important shaping force in learning pathways research (see Paper 4, in this Bulletin). By identifying 'boundary making' processes and factors, as articulated through 'voices in the workplace' [one perspective on this issue], the paper identifies key areas for 'boundary crossing' practices in the South African National Qualifications Framework (NQF) system and its associated sub-systems.

The paper draws on case study research (Mohanoe, 2014) and presents the findings relating to the learning pathways investigated in key occupations, in three categories related

³⁹ The concept of 'articulation is defined in Paper 2 in this Bulletin.

to sustainable development in a local government context. The categories include workers, supervisors, and managers, in this order of sequence. Local government is one of the sites where articulation between the workplace, and education and training system opportunities, has significant implications for service delivery and sustainable development.

It is important to note that while this case study focuses on one workplace only, this workplace is 'representative' of other workplaces in the sense that while the context may change, the analysis process may be applied to any other workplace, and may yield similar, or different findings⁴⁰. It is therefore *the process of exploring boundary making and boundary crossing practices* that is of significance for this paper. The data provide the empirical texts used by the researchers. The paper concludes with the key point that if articulation, mobility and progression in learning pathways for sustainable development are to be realised, then *boundary crossing practices* need to be at the centre of efforts to engage with articulation questions in the NQF context.

RESEARCHING THE BOUNDARY

In the early explorations of the SAQA-Rhodes research programme, the researchers identified 'researching the boundary' as an important unit of analysis for learning pathways research (see Paper 2, in this Bulletin). They noted that there are multi-layered and multi-faceted articulation issues that require investigation in learning pathways research and that:

... a unit of analysis focusing on the 'cross overs' in learning pathways research can provide a rich picture of 'learning pathways'. Such a unit of analysis potentially provides a more interesting way of understanding articulation in the context of learning pathways, albeit it being more complex ... (Paper 1, in this Bulletin)

The researchers further noted that:

... the question of articulation is tied to quality; to transfer-related questions across the NQF Sub-Frameworks; and to emergence in the context of learning pathways. It assumes boundary zones, and transfer processes ... (Op. Cit.)

⁴⁰ It is also an instance of the concrete singular, which as explained by Bhaskar, is related to the concrete universal (Bhaskar, 1993, see also Paper 4, in this Bulletin).

We argue that it is necessary to develop an understanding of learning pathways within a system perspective, because this sheds light on boundaries and how they are formed and change in relation to their environment. We drew on Luhman's (1995) point that it is not the system itself that needs researching, but rather the *boundary between the system and its environment* (See Paper 1 in this Bulletin).

In Paper 5, the 'voices from the workplace' (ie. empirical data of peoples' experiences) are considered as a means to begin to understand how boundaries are made and crossed within educational and occupational learning pathways, especially between the education and training system (with all its structures, programmes and elements) and the workplace environment. We are explicitly interested in exploring how boundaries are made and can be crossed between the workplace on one hand, and the education and training system on the other, as this transition is an important *facet* of broader articulation research.

BOUNDARY MAKING AND BOUNDARY CROSSING

The nature of boundaries in social contexts

We agree with Fenwick, Edwards and Sawchuk (2011) that boundaries are socialmaterial. They are constructed by people's actions and practices in material and social contexts, and can only be resolved through people's actions and practices in material and social contexts. We have argued elsewhere too that the sustainable development learning pathways we are interested in, are social-ecological in nature, as workplaces and education systems worldwide seek to respond to increased environmental degradation and persistent inequality and poverty (Lotz-Sisitka, 2011; Ramsarup, 2017). The socialmaterial dimensions of boundaries are of interest in learning pathways research that focuses on learning pathways for sustainable development. For example, if mines were not required to rehabilitate mining areas, there would be no need for mining rehabilitation learning pathways in the mining sector.

In their book on social-material approaches to educational research, Fenwick, Edwards and Sawchuk (2011), all renowned theorists in the arena of workplace learning, suggested that social-material approaches to educational research have important contributions to make to social justice; they wrote:

... Humans, and what they take to be their learning and social processes, do not float, distinct, in container-like contexts of education, such as classrooms or community sites, that can be conceptualised and dismissed as simply a wash of material stuff and spaces. The things that assemble these contexts, and incidentally the actions and bodies including the human ones that are part of these assemblages, are continuously acting upon each other to bring forth and distribute, as well as to obscure and deny, knowledge ... (Fenwick *et al* 2011:vii)

Fenwick *et al* (2011) asked further, and more critically of education and training acts, policies and practices: "What patterns of materiality support their continued enactment ... [which include] ... all the categories – all the things – that are commonly used to conceive, think about and act upon education: policy, curriculum, learning, development, achievement, student, teacher and so forth" (*Ibid*.:vii).

Socio-material boundaries and learning pathways

Drawing on these ideas, we might ask what patterns of materiality support the continued enactment of education and training policy and practice in ways that exclude or include, and what does this mean for learning pathways research? In such analyses, it is possible to trace the implications of social-materiality on how learning pathways are constructed. We can, for example, take a social-material orientation to identifying boundary making and boundary crossing, hence our interest in capturing 'voices from the workplace' as a mechanism for exploring boundary making and boundary crossing in learning pathways research.

However, Fenwick *et al* (2011) failed to take account of the *social-materiality of absence* in their analyses – that which is not (yet) there (eg. the missing learning pathway, the missing training programme) (see Paper 4, in this Bulletin). As Bhaskar (1993) argued, both difference and change presuppose the category of absence. And as Hartwig (2007:13) stated "On any depth ontology, what is absent from actuality is definitionally far vaster and greater in possibility than the actual". *Absence*, in learning pathways research, therefore has substantive social-material possibilities and/or consequences, and could be seen to be as *important* as that which is already socio-materially present (eg. the policy, the curriculum, or the intention to provide the training or the learning pathway that is yet to materialise). In earlier research, (Lotz-Sisitka, 2016; Ramsarup, 2016; see also Paper 4 in this Bulletin), we have argued that the identification of absences is critical for conceptualising transformative praxis in ways that traverse the micro-macro divide in

learning pathways research (See also Ramsarup, 2017). Hence we include a focus on absences in this research on boundary making and boundary crossing.

Fenwick et al (2011:viii, emphasis added) stated further that:

... socio-material approaches highlight the *actual processes* of *boundary-making* that create educational phenomena and produce knowledge and objects. They trace the *actual dynamics* through which powerful entities and linkages are assembled, reassembled and occasionally transformed, showing how they can be disassembled, but also moved forward in the course of assemblage ...

Focus on boundary making in learning pathways in selected contexts

This paper is interested in *the actual processes of boundary making,* as these can shed light on what boundary crossing processes are needed within an articulated system of education and training provisioning.

Without understanding the boundary making processes, it is not possible to conceive of the concept of *articulation*, which SAQA is particularly interested in, given that what is sought, is articulated learning pathways within and across the three NQF Sub-Frameworks making up the NQF in South Africa (See the Introduction in the Bulletin). By taking its departure in the social-material⁴¹ realities of learning pathways (or absence thereof) in workplaces (through voices from the workplace), this paper seeks out a means of understanding some of the social-material aspects of how the *boundary making* processes occur between workplaces and the education and training system. The intention is to explain and unbundle issues related to learning pathways access, progression and construction (or lack thereof).

With this in mind, the paper presents the findings of the learning pathways investigated in three key occupational categories relevant to sustainable development in a local government context, as the empirical site for exploring the notion of 'boundary making' processes that emerge from, or take into account 'voices from the workplace'. We do

⁴¹ Note that a full and detailed social-material analysis in the broadest sense of the word of 'all assemblages' (Fenwick *et al* 2011) has not been undertaken, but we have considered key aspects of the social and material, and how they relate to the learning pathways experiences in this paper.

this because much boundary making process work conceptualised in NQF policy and structures takes the policy and structural arena as the site of boundary making processes, without necessarily taking full account of boundary making processes emergent from, or reflected in, workplace voices. We think that this approach may provide a valuable 'additional lens' for learning pathways research (over and above, or additional to, the policy and structural arena lenses). In this paper, we therefore relay stories from the workplace, from three occupational categories in local government workplaces, including environmental practice workers, supervisors and managers, in this order of sequence.

EMPIRICAL CONTEXT AND ANALYSIS

The empirical context of this paper is Municipality X, a relatively small municipality located in District Y, in the rural Eastern Cape in South Africa⁴². The bulk of the data reported on here are drawn from a study conducted by Mohanoe (2014). The Municipality has a population of approximately 200 000 people and was chosen because (a) it is not a large city (of the type which tend to have the benefits of urban development policy, planning and infrastructure), and (b) it was not very far removed from an urban area (therefore it was assumed to have experienced some influence from urban policy, planning and infrastructure systems). It was also relatively small, but not very small, and was influenced by the possibilities provided by a Higher Education institution nearby. The town considers itself an 'education centre' and one would therefore assume that education and training opportunities would be easily accessible in such an environment. Thus, it was neither too urban, nor too rural, and could therefore be seen to be representative of a 'middle range' form of organisation, where, one would assume, policy would be put into practice, and because of its claim to being an 'educational centre' one could have thought that educational practice was part of the social-material reality of people in this place.

While this is only one case study of a municipality, in Critical Realist research it is possible to generalise from a case study at the level of the real (which refers to those structural mechanisms that shape empirical experiences and events). This is based on Bhaskar's (1978) ontological framework that recognises that reality is stratified. This ontological (reality) framework explains that what we experience is often shaped by factors that we don't always see or recognise on the surface. We may not even 'know' about them, yet they influence what we do every day. For example, we may experience no progression

⁴² The actual name of the municipality and district have been withheld.

in our learning pathways, but it may be difficult for us to understand or perceive the underlying mechanisms (systemic complexities, or global forces) that shape why we have not been able to progress in our learning pathways. Yet they are still there, shaping our experience of our learning pathway, whether we can perceive or recognise them or not. Such mechanisms exist, whether we can perceive them or not, and they have social-material effects.

In the research reported in Paper 5, the boundary making processes are also structural mechanisms shaping access to, and progression in learning pathways, hence they are useful to consider within the case, but also more widely. Critical Realist research (eg. Ramsarup, 2017) suggests the examination of 'concrete universals', noting that there is always a relationship that exists between the concrete singular case, and the wider, more universal reality, and that these two aspects should be recognised relationally, and not be separated dualistically, in analysis. This approach gives case study research a stronger capacity for making claims in relation to the wider context in which the case is situated, than would otherwise be the case.

SOCIAL-MATERIALITY OF SUSTAINABLE DEVELOPMENT WORKERS' LEARNING PATHWAYS: BOUNDARY MAKING

To understand the social-material boundary making processes at play between workplaces on one hand, and access and progression in learning pathways on the other, we examine the socio-materiality of a small sample of sustainable development practice workers' learning pathways from the selected Municipality. Sustainable development practice workers in this context are seen as those workers who play key roles in service delivery functions that also contribute to the environmental management and sustainable development of society at a community level. Examples of these workers include toilet cleaners, refuse collectors, street cleaners, water and sanitation workers, and staff involved in greening and maintenance, and biodiversity and coastal zone management (amongst other emerging occupations and roles oriented towards Green Economy and sustainable development) (Department of Environmental Affairs [DEA], 2010a, 2010b).

Our research uncovered that in all cases of sustainable development practice in this context, (ie. worker learning pathways investigated in the Municipality concerned), there were no opportunities for progression; neither was there access to the education and training system, beyond some initial schooling. Thus, we found a strong boundary

between the workplace, and the education and training system, particularly regarding the provision of opportunities for learning and progression in the occupational context.

Some of the stories are summarised in diagrammatic and tabular form below, in Figures 1-8, and Table 1. The figures indicate the NQF Sub-Framework contexts in which the selected workers had studied, by the Quality Council that oversees the Sub-Framework concerned. The reader is reminded that the South African NQF comprises the following three articulated NQF Sub-Frameworks:

- the General and Further Education and Training Qualifications Sub-Framework (GFETQSF), overseen by Umalusi: Council for Quality Assurance in General and Further Education and Training;
- the Higher Education Qualifications Sub-Framework (HEQSF), overseen by the Council on Higher Education (CHE), and
- the Occupational Qualifications Sub-Framework (OQSF), overseen by the Quality Council for Trades and Occupations (QCTO).



Figure 1: Sustainable Development Practice worker learning pathway 'broad profiles' (Source: Mohanoe, 2014)⁴³

⁴³ The baseline in Figure 1 denotes zero activity (ie. an absence of involvement in the GFETQSF, HEQSF and OQSF sub-systems), and no access in the QCTO context, to sustainable development education and/or training opportunities.

The learning pathways showed virtually no engagement with the CHE or QCTO education and training sub-systems⁴⁴ in this workplace, even though the Sector Education and Training Authority (SETA) system and workplace skills planning systems had been in place for over ten years. Reference to QCTO-linked learning opportunities was primarily focused on sustainable development learning opportunities. The research found that other than Expanded Public Works Programme (EPWP) training in one case (which the worker obtained before entering the workplace which was studied), there were no QCTO-linked training opportunities on offer. This finding differed from those linked to the supervisors and managers interviewed, as shown later in this paper. Details of the worker learning pathways are provided in Table 1 below.

⁴⁴ The researchers recognise that the QCTO and OQSF are relatively recently established structures, and that the worker experiences were located in the historical system and can therefore not strictly be placed under the QCTO system, but the heuristic use of the NQF Sub-Framework systems provides perspective on the present, since SAQA's interest has been to understand the relationships that exist between these sub-systems, and how articulation and progression may occur across the sub-systems of the NQF, as defined in the NQF Act of 2008 (RSA, 2008).

Wo	orker	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
1.	Male, nearing retirement; isiXhosa speaking ⁴⁵ ;	Toilet cleaner	40 years (in the same job)	Left school in Standard 8 ⁴⁶ . No further training	Low quality educational experiences
	values the job as it provides			Lack of access to further learning	No progression
	family subsistence			opportunities (None have been provided by institution or system of education and training as part of job/	Lack of interest in new learning (sees no point in it) Intersecting poor working conditions;
				pathway/ career development)	education and poor quality of life - all affects work output and learning pathway opportunities

Table 1: Sustainable development practice worker learning pathways (Source: Mohanoe,2014 [Extracts of study data])

⁴⁵ There are 11 official languages in South Africa, namely, English; Afrikaans; IsiZulu; IsiXhosa; Setswana; IsiNdebele; Northen Sotho, Sesotho, Xitsonga, Tshivenda, SiSwati.

⁴⁶ Standard 8 in the pre-NQF (pre-1995) system or Grade 10 in the NQF system, is the tenth year of schooling.

Worker		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
2.	Male; isiXhosa speaking	Sweeper	11 years (in the same job); changed from casual to permanent worker	Left school in Standard 8. No other training provided Lack of access to Adult Basic Education and Training (ABET) ⁴⁷ No transition in learning pathway, rather just shift in job status	Change in job status (from temporary to permanent) did not lead to mobility or progression Lack of interest in learning
				(temporary to permanent)	
3.	Male, isiXhosa speaking;	Domestic Refuse Collector	3 years	Left school in Grade 11	Poor worker- manager relations
	considers his job important in terms of its value to the	(Rubbish Collector)		No other training provided	Barriers in communications in the workplace
	community				Poor working conditions Poor working
					equipment

⁴⁷ ABET/Adult Education and Training (AET) comprises four levels, Level 4 being at NQF Level 1 which is equivalent to the ninth year of schooling.

	·				
Worker		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
4.	Male, isiXhosa	Domestic	1 year	Grade 12	Socio-economic
	speaking;	Refuse		certificate	issues appear to
	family	Collector			have influenced
	circumstances	(Rubbish		Qualified	learning pathway
	forced him	Collector)		electrician in	options and
	to look for			Technical and	choices
	a job in the			Vocational	
	municipality,			Education and	No progression
	despite			Training (TVET)	in learning
	mismatch			context	pathway; appears
	between skills				to be 'misplaced'
	and knowledge			Learning pathway	in terms of
	_			shaped by choice	knowledge and
				of subjects in	skills
				school (isiXhosa,	
				English, Afrikaans,	
				Maths and	
				Physical Science)	
				- aided choice of	
				this vocational	
				stream	
				No further	
				qualification	
				beyond Grade 12	
				level	

Wo	orker	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
5.	Woman, isiXhosa speaking	Nursery Worker	5 years	Changed from casual worker to permanent worker Finished school in Grade 11	Learning pathway shows no progression since joining the Municipality after the WfW Programme
				Started in the Working for Water (WfW) Programme where some accredited training was given relevant to the WfW practice, not to sustainable development, in the municipality	Change in status from temporary to permanent had no effect on learning pathway No progression in learning pathway
6.	Male, isiXhosa speaking	Tree Cutter	17 years	Left school in Standard 3. Attended a training programme on tree cutting machine use (not a qualification)	Social-economic circumstances influenced educational options, and consequently job opportunities. No progression in learning pathway

Wo	orker	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
7.	Male, isiXhosa speaking	Commonage Maintenance	30 years	Completed school at Standard 4 level Started job as grass cutter 35 years ago. Now involved in commonage group supervision and maintenance	Supervision responsibilities related to length of service, did not increase formal learning pathway opportunities No progression in formal learning pathway
8.	Male, isiXhosa speaking	Caretaker of Sports and Recreation Centre	11 years	Completed Grade 12 Learning pathway only related to learning from others in workplace. No formal training	No progression in formal learning pathway Learning from others and years of experience are contributory factors but these did not seem to influence worker's formal learning pathway

Wo	orker	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
9.	Male, isiXhosa	Water and Sanitation employee	4 years	Completed Grade 10 Change in occupation from water tank builder, to water and sanitation employee was not linked to change in learning pathway Training in water and sanitation practice is being offered by SETA at NQF Level 2	Some possibility of a learning pathway from NQF Level 2 to NQF Level 3 exists, if training is continued. Currently it seems however, that only Level 2 training is available

ANALYSIS: BOUNDARY MAKING AND BOUNDARY CROSSING PRACTICES FOR STRENGTHENING THE EMERGENCE OF AN ARTICULATED SYSTEM FOR SUSTAINABLE DEVELOPMENT PRACTICE WORKERS

Poor quality prior education/training

Poor quality prior education/training experiences, coupled with or often caused by poverty, have a profound social-material impact on the sustainable development practice workers' learning pathways and their capacity to access and progress along learning pathways that include access to the wider education and training system. Overall, analysis of these sustainable development practice workers learning pathways revealed that there is a general low level of formally acquired education/training and literacy amongst the workers. This shapes the workers' learning pathways. None have a qualification related to sustainable development practices, and none have been exposed to sustainable development practice training (except for one who was exposed to Working for Water

training⁴⁸). Most learn from each other and through years of experience in the same occupations. This seems to pose tensions and complexities at the transition points of the NQF structure, for the workers. None of the workers included in the study had completed school beyond Standard 10/Grade 12⁴⁹. Their reflected experiences shape their formally constituted learning pathways, which hardly exist.

Poor guality prior education/training would seem to be a boundary making factor that shapes access to the education and training system, and progression in learning pathways. A boundary crossing response needed is to improve the quality and scope of workers' education/training in order to facilitate access to the education and training system. From an *education and training systems perspective*, the provisioning of ABET is crucial, and from an education for sustainable development perspective, and an occupationally directed learning pathway perspective, the provisioning of ABET linked environmental practices/sustainable development practices education and training programmes is important if workers are to access learning pathways and the benefits of the education and training system. The articulation issue is the boundary crossing from the workplace to the ABET system. It was noted that workplace skills facilitators in the municipalities were aware of ABET training, and had incorporated it into workplace skills plans. It was, however, not actualised. The problem therefore does not seem to be at the qualifications development level, but rather at the level of *boundary crossing* practice, namely the implementation of provisioning and the actualisation of system policies and qualifications.

One of many, and the scale of provisioning demands

The researchers have only detailed the learning pathways of nine workers, but there are 30 000 similar workers in South Africa. The experiences of these nine workers cannot be said to represent all 30 000 in a positivist sense, but when viewed through Critical Realist lenses, which view universal *shaping mechanisms* as factors influencing experiences

⁴⁸ In 1995 the South African government started the Working for Water Programme. The programme focuses on removing instrusive alien plants which use more water than does the indigenous vegetation. In extreme cases the alien vegetation outgrows the indigenous plants, to the extent of wiping them out. Training is provided to workers as part of this programme.

⁴⁹ The final year of secondary schooling was referred to as Standard 10 in the pre-NQF (pre-1995) system; in the NQF context it is Grade 12.

at a concrete level and which recognises the 'concrete universal'⁵⁰ as being an indicator of wider societal conditions, it is possible to surmise that this experience is relatively representative of local government workers in South Africa.

The DEA (2010b) study for the Environmental Sector Skills Plan (ESSP) could find little evidence that the environmental practice training needs of workers at elementary occupation level involved in sustainable development practices in local governments was being substantively attended to by either the SETAs or the system more broadly, beyond the availability and registration of a qualification on environmental practices. The problem was not at the policy level, where qualifications existed, but at the level of *boundary crossing practices*, namely the *provisioning of Environmental Practices Training Programmes*. The DEA and Local Government Sector Education Training Authority (LGSETA) have been supporting the development of Environmental Practice Training Programmes and their implementation (ie. boundary crossing practices), although this work is still in its infancy, and continues to serve the few, rather than the majority.

The scale of provisioning demand can therefore also be conceptualised as a socialmaterial *boundary making factor*, which in turn is shaped by the social-material reality of inadequate capacity for the provisioning of training at scale. This in turn, is linked to scarcity of Human Capital Development (HCD) specialists in the sector (DEA, 2010b). This shows that boundary making factors are often complex, and the *boundary crossing practices* that are necessary to 'cross the boundaries' require systemic engagement and time-scale engagement with both 'what is present' (eg. the available qualifications), but also what is absent (eg. not enough trainer capacity to offer the available qualifications). From a *systems perspective*, we can therefore suggest that it is necessary to build the capacity of a cadre of Human Capital Development specialists within a wider system of provisioning if an articulated system is to be achieved. To make this work, however, *requires boundary making practices* that focus on the HCD development of trainers, who in turn can develop and offer the training needed.

⁵⁰ Hartwig (2007) explained that the concrete universal links the concrete singular (the local, contextual, individual case) with the universal (broader whole). As such, the local is never merely part of the local, it is always a part of the wider whole.

Policy implementation disjuncture

The SAQA-Rhodes research found that the lack of attention given to the learning pathways of local government sustainable development practice workers responsible for improving quality of life in urban and rural communities through their sustainable development practices (waste collection, sanitation management and community greening), was paradoxically running counter to numerous policy statements. According to the workers' experiences, there is a clear indication that there is no mobility or progression along their learning pathways. This indication is contrary to current NQF policy (SAQA, 2012, 2013, 2014a, 2014b, 2016; Minister of Higher Education and Training [MHET], 2013; 2017) and earlier documents such as that produced by the Department of Education (DoE) and Department of Labour (DoL) in 2003 which states that:

... [NQF] Level Descriptors are meant to aid learner progression through the learning system, since they are designed to provide a recognised currency for learning achievements and thus enable standards and qualifications across all the domains, disciplines, fields and learning pathways to be pegged at levels that are appropriate and mutually consistent ... (DoE-DoL, 2003:12)

The evidence of no mobility or progression is in stark contrast to, not only national policy, but also local strategy in the Municipality itself, as well as its training policy – which states: that the policy will have to lead to the acquisition of credits for learners in terms of the NQF and promote the vocational and educational progression of employees of [this] Municipality (Municipality X, 2005; Mohanoe, 2014). These realities are in contrast to system objectives at the widest level, as articulated in the objectives of the NQF which are directly relevant to mobility and progression, which seeks "... to facilitate access to, and mobility and progression within education, training and career paths…" (DoE-DoL, 2003:12) and which is expressed in current NQF policies (eg. SAQA, 2012; 2013; 2014a; 2014b; 2016 and MHET, 2013; 2017).

From the Municipality studied, it is possible to see that the *policy implementation disjuncture* is also a *boundary making factor*. *Boundary crossing practices* that *actualise policy in practice* are needed for an articulated system to emerge.

Absence of access mechanisms and support, and/or systems of recognising alternative forms of learning

With the National Skills Development Strategy (NSDS III) (Department of Higher Education and Training [DHET], 2011), and the integration of education and training under the DHET⁵¹, a new emphasis on Technical and Vocational Education and Training (TVET) Colleges and QCTO occupationally directed training programmes emerged which could potentially support the emergence of learning pathways for sustainable development practice workers. ABET, as noted, has been on the education and training landscape for decades, but is often inadequately implemented, as was found to be the case in the Municipality in the study. We found a municipal environmental education and training strategy (Mohanoe, 2014) which clearly articulated that workers should gain access to both ABET and sustainable development practices training up to and including NQF Levels 1-4, and specified the types of sustainable development practices training needed. However, the workers currently employed in elementary occupations (as described in this paper) appeared to have no understanding of this strategy, nor did they have the means or powers to gain access to appropriate learning pathways or education and training opportunities. The workers in our study repeatedly reported that "each year someone comes to ask, fills in a form, but nothing happens". There is also little or no evidence of Recognition of Prior Learning (RPL)⁵², or ways of recognising other forms of learning that the sustainable development practice learners may have achieved in and through years of practice. From this, it seems that what has been gained in strategy and policy sophistication, has been paradoxically lost (or as yet failed to gain) in social-material engagement or 'on the ground' practices that support the gaining of access to available or planned education and training.

Absence of access and RPL mechanisms and the absence of support for entering and sustaining sustainable development oriented learning pathways can also be identified as a social-material *boundary making* factor. *Boundary crossing practices* need to include workplace skills and Human Resource Development planning systems that support

⁵¹ While the NQF under the SAQAAct (RSA, 1995) sought to integrate what had been a fractured education and training system in pre-democratic South Africa, further integration was achieved by establishing the Department of Higher Education and Training (DHET) in 2010 under the NQF Act (RSA, 2008) and mandating the DHET to administer and oversee all Post-School Education and Training (PSET). While under the SAQAAct, PSET was the joint responsibility of the Departments of Education (DoE) and Labour (DoL), under the NQF Act The Department of Basic Education (DBE) oversees all Basic Education, and the DHET oversees PSET which includes AET and Community Education and Training (CET).

⁵² For national RPL policy, see SAQA (2013; 2016); for national RPL coordination and funding policy, see MHET (2016).

workers to conceptualise, understand, and participate in gaining access to relevant sustainable development related education and training and learning pathways, and to obtain recognition for their existing learning. From the perspective of creating an articulated *system*, it is important to ensure that access and support for conceptualising, understanding and participating in relevant education and training opportunities within a learning pathway framework are systemically engaged and supported, and that RPL systems are in place.

Combined boundary making factors sustaining disadvantage and lack of access and progression

In the interviews with the workers it was clear that social and economic issues were directly or indirectly related to the views on learning pathways or their absence. As stated by Mohanoe (2014:84): "These generally related to the quality of life of the workers. Although these are not directly related to sustainable development practices, they somehow show a reflection of some of the barriers compounded by this situation affecting access to learning pathways". In the case studied, low quality, or absence of, education/training, combined with difficult social-economic circumstances, and a lack of access to available learning pathways *combined* to sustain disadvantage, cementing the problem of 'no progression' in workplace learning pathways (see also Fourie [2016], another study in the SAQA-Rhodes programme). This problem was exacerbated by conditions in the workplace workplace studied (Mohanoe, 2014:84):

... the issue was complicated by a lack of equipment, with only two refuse compaction units which were frequently out of commission at the same time. Essentially for several reasons, including lack of adequate staffing, lack of equipment and lack of skills, the department was under severe constraints ...

In another case (Mohanoe, 2014:94), one of the supervisors stated that "... well our [water treatment] plant is designed for 5.4 mega litres of water, and we are pushing it over 8 mega litres of water per day. It is about 48% overloaded ...". In this sense, the social-material reality of skills development, or lack thereof, was also connected to the material conditions in the workplace.

These combined factors, including the workplace conditions themselves are boundary makers influencing learning pathways, shaping what can and needs to be learned and

how. Boundary crossing practices therefore need to take a holistic approach, with full cognisance of the manner in which factors tend to be combined in sustaining disadvantage. From an articulated systems perspective, it is therefore essential to conceptualise the education and training system and its elements *in relation to the wider contextual realities of people, social systems, workplace conditions, and social-ecological conditions.*

It would seem to be important that education and training programmes related to the sustainable development practices in people's work are offered, both as learning pathway opportunities, but also as opportunities for social-material improvements relating to wellbeing. To achieve this, more attention should be given not only to the *conceptualisation* of potential training, but to *the actualisation of this in the workplaces*, where elementary occupation level employees are actively constructing and/or being constructed by the social-material worlds they occupy and contribute to. For this to happen, more attention must be given to boundary crossing practices as these actualise the system and sustainable development policy intentions, in response to contextual realities (as also identified through these workers' voices).

From the analysis presented here, it would seem that the most significant boundary crossing processes relevant to the workers engaged in this study would seem to be the boundary crossing between workplace skills planning and the actual delivery of workplace learning programmes in the form of sustainable development practices training/skills programmes. In this case the QCTO and SETAs such as the Culture, Arts, Tourism, Hospitality and Sport Sector Education and Training Authority (CATHSSETA), the Energy and Water Sector Education and Training Authority (EWSETA) and the LGSETA could play key roles in this boundary crossing work.

It must be noted that the social and material realities in the case studied were embedded in the minds of the people. For example, data in our study showed that tensions existed between those who expressed willingness and interest in further training and those who were not interested – an aspect that was determined largely by age differences in groups. Here younger workers generally showed a greater willingness to learn further and those almost at pension age were no longer interested in the notion of learning further or learning pathways. Varying literacy levels also appeared to be a source of complexity in their learning pathways. This reveals some of the complexities in the learning pathways of collective groups (eg. municipal workers) (Mohanoe, 2014). Figure 2 summarises the boundary making and crossing in this context.



Figure 2: Summary of sustainable development practice workers learning pathways: Boundary making factors and absences; boundary crossing practices needed; and system implications.

SOCIAL-MATERIALITY OF SUSTAINABLE DEVELOPMENT PRACTICE SUPERVISORS' LEARNING PATHWAYS

A second category of learning pathways constructed in social-material ways by boundary making processes was that of sustainable development practice supervisors. In the SAQA-Rhodes research, sustainable development practice supervisors were identified as those working in local government at a supervisory level, with some responsibility for sustainable development or environmental management activities. For example, the Sports Manager was responsible for managing the fields in a sustainable manner, while the Environmental Officer was responsible for managing aspects of waste and environmental health. The question was asked as to whether the learning pathways construction processes of sustainable development practice supervisors are experienced in similar or different ways to those of sustainable development practice workers, and if so, what might these differences be? Importantly too, we set out to investigate what absences exist, and the potential boundary making/crossing processes that might be addressing learning pathways issues as experienced from within the workplace studied.



Figure 3: Representation of sustainable development supervisors 'broad' learning pathways (Source: Mohanoe, 2014)⁵³

Figure 3 shows that almost all of the supervisors in this case study had 'crossed boundaries' between Umalusi's (GFETQSF) and the CHE's (HEQSF) NQF Sub-Frameworks in their learning pathways development. What is surprising, however, is that few had been exposed to QCTO/OQSF-related learning pathway opportunities. References to the QCTO/OQSF Sub-Framework refer specifically to sustainable development focused learning pathway opportunities (not general work skills). Details are provided below in Table 2.

⁵³ The baseline in Figure 3 denotes zero activity (ie. an absence of involvement in the GFETQSF, HEQSF and OQSF sub-systems) and no access in the QCTO context, to sustainable development education and/or training opportunities.

Table 2: Sustainable development practice supervisors learning pathways (So	urce:
Mohanoe, 2014 [study data])	

Supervisor		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
1.	Male,	First appointed	11 years	Grade 1254 (1990),	Accessible
	IsiXhosa	as Foreman;		Bachelor of Social	relationship
	speaking,	soon thereafter		Science (Rhodes	with supervisor
	shows	appointed as		University [RU])	influenced learning
	evidence of	Sports and		(1999); Diploma	pathway
	self-directed	Recreation		in Enterprise	
	learning	Officer – now		Management	Self-teaches on
	capacity	Sports Manager		(2000); Diploma in	aspects related
				International Studies	to sustainable
		Occupation		(2002); Certificate	development (no
		requires		in Excellence	formal learning
		sustainable		Management (2007)	opportunities
		development			accessed for
		skills		(All of the training	sustainable
				from the local	development
				university)	aspects of his job)

⁵⁴ The final year of secondary school in South Africa.

Su	pervisor	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
2.	Female, isiXhosa speaking	Environmental Officer for Parks and Recreation	6 months	Grade 12, Bachelor Agricultural Economics (University of Fort Hare [UFH]); Diploma in Business Management from Almega College. Certificate of Project Management (University of South Africa [UNISA])	Dissatisfied with match of skills – employed as Environmental Officer, but wanted to do agricultural work. Also, key areas of work were done by the Directorate: Local Economic Development, excluding her. Workplace inefficiencies affected learning pathway opportunities

Su	pervisor	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
3.	Male, isiXhosa speaking. Sees his job as critically important to community health	First, Senior Foreman, Refuse Removal (2005); now Supervisor: Waste Management division	6 years	Grade 12; Diploma in Senior Primary Education (Rand Afrikaans University [RAU]) (1997); Informal training in work skills (eg. computer courses; managing staff absenteeism; and Batho Pele principles ⁵⁵). One training course related to sustainable develpoment practice, namely Landfill Management and Operation	Previous work experiences have shaped this learning pathway. While working for DoE, respondent was appointed as ABET tutor. Worked as community liaison officer. Worked as supervisor for Census 2001 ⁵⁶ . Also worked for Department of Public Works (road works) No functioning bursary system

⁵⁵ Batho Pele ('people first') principles are aligned to the South African Constitution. Government officials must follow the Batho Pele principles which require public servants to be polite, open and transparent, and deliver good services to the public.

⁵⁶ The Department: Statistics South Africa (STATSSA) carries out population census surveys roughly every five years, and employs data gatherers, capturers, and supervisors for the related fixed periods.

Su	pervisor	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
4.	Male, Afrikaans speaking. Sees his job as critically important to community health	Supervisor for Water and Sanitation	43 years	Certificate in Plant and Water Fitter (waste water treatment and purification) No other specialised training related to his work	Learned through doing over the years; learned from others Learning pathway based on acquired years of work experience
5.	Female, isiXhosa speaking. Sees her job as very important, but laments lack of adequate budget for implementing objectives	Agriculture Manager in Local Economic Development division	4 years	Grade 12 (1997). Bachelor Degree in Agricultural Economics (UFH) (2001); Honours degree in Agricultural Economics (2003) UFH. Post Graduate Certificate in Education (2004) Certificates in Advanced Management and Supporting Urban Sustainability (SUS). Other informal courses (eg. computer literacy and presentation skills; project management)	Learning pathway influenced by prior training, but also by ongoing professional training International training (SUS) broadened her understanding of job, and direction and purpose of job in terms of sustainable development/ Local Economic Development link up. Practical outcomes have resulted, and his training has

Supervisor		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
				Currently involved	influenced
				in LG SETA	Local Economic
				funded training on	Development
				Local Economic	activities.
				Development; also	
				participated in	
				international training	
				on Supporting Urban	
				Sustainability	

As can be seen from Table 2, the learning pathways of the supervisors differed between individuals. The individuals also differed in the transitions and movements they made on their career paths. Decisions that shaped the learning pathways ranged from the nonconventional to the more conventional. In general, the supervisors' learning pathways appeared to follow a pattern which originally started out as personal choices and access to vertical learning pathways using the Umalusi-CHE (school to Higher Education) system route, followed by self-initiated decisions which the appeared to become blocked by circumstances in the workplace, and lack of available education and training opportunities and enabling systems for learning pathways development. It appears that the main form of progression by supervisors was related to knowledge gained through courses attended. with less reliance on *experience in the workplace*, although there is one case of this as cited in Table 2 above. From this, it could be surmised that a system that allows for a workintegrated model of skills development (as in the SUS programme example in the case of Supervisor 5) could be beneficial for strengthening sustainable development practice. Insights into learning pathways' boundary making and boundary crossing processes gained from the stories above, are outlined in the next section.

Lack of enabling environment

The case studies of the five supervisors in the Municipality studied show that one of the critical factors influencing learning pathways in the workplace, is an absence of an efficient, enabling working environment. For example, one of the supervisors stated, "Even in our offices we have only one computer which we share". Another stated "if the bursary system was intact, it would make it possible for us to register and study further.

This would empower us and contribute to the work that we do". A further supervisor lamented inadequate budgets for achieving objectives, and understaffing, as further factors affecting learning and work.

From this, it is clear that *inefficient management and workplace systems are boundary makers* between supervisors in workplaces, and the education and training system, especially for the ability of the system to enable lifelong learning and articulated learning and work pathways that involve workplace practices and education and training institutions and structures. Boundary crossing practices here involve seeking strategies to improve the enabling work and learning environments.

Availability of training opportunities, and capabilities to access these

Looking across the worker and supervisor cases, it is clear that supervisors have greater agency to access education and training opportunities than do workers. From the data in Tables 1 and 2 above, it appears that a first degree/HEQSF qualification appears to provide employees with deeper knowledge and understanding of how the education and training system functions and allows them to 'find access routes' to extended education and training opportunities that expand their knowledge, skills and capabilities. This is shown both in the building of learning pathways (through adding complementary qualifications/part-qualifications to initial qualifications), and also through frustration with lack of further opportunities for learning pathway development. As shown in the case of Supervisor 1 in Table 2, completing a first degree at the local university gave the supervisor confidence to complete other diploma and certificate programmes offered by the same institution. If sustainable development learning opportunities were to be offered by this institution, and if the environment were more enabling, it would be possible for the employees to take up such opportunities far more easily.

Comparison between the supervisors and the elementary occupation workers in Tables 1 and 2 above shows clearly that *lack of education/training is a boundary maker in learning pathways development*. Commitment to improving education/training levels and access, as argued, is necessary as *lack of education/training itself becomes a boundary crossing factor,* as greater familiarity with the education and training system engenders agency and competence to make further use of the education and training system opportunities on offer. From this, one can surmise that the boundary crossing practice needed here is to put *more effort into facilitating access* to learning pathway opportunities especially at the lower levels of employment where workers appear to have less agency for shaping their own learning pathways, as well as higher up in the system.

Vertical, horizontal and diagonal learning pathway developments and 'switchpoints'

As noted in the supervisor cases above, it appears that an initially vertical learning pathway, with the 'switchpoint' from the GFETQSF (Umalusi) Sub-Framework system to the HEQSF (CHE) system, was of key importance for enabling the horizontal (same NQF-level) learning pathways necessary for building workplace skills around new and emerging focus areas such as sustainable development. The supervisor case studies showed that *virtually no horizontal sustainable development learning pathway opportunities* exist for supervisor-level occupations in this context, and in the one case where they were accessed, this proved to have an impact on sustainable development workplace planning and practices, indicating the potentially significant role that such horizontal 'switchpoint' opportunities can play. As the early DoE and DoL (2003:13) document states:

... The concepts of articulation and mobility have been built into the NQF progression model because learners and workers need to be able to exercise their options to move vertically, horizontally or diagonally between learning or career pathways, with due credit for learning achieved. The idea of a pathway as embodying an organised sequence of connection or switching points is more appropriate to our circumstances ...

The more recent White Paper for PSET (MHET, 2016:3) underscores the importance of learning pathays and there being 'no dead ends':

... few can argue with the need to ... expand employment and to equip people to achieve sustainable livelihoods. This means improving partnerships, developing effective and well-understood vocational learning and occupational pathways, and improving the quality of the learning and work experiences along these pathways ...

The lack of a clear and organised sequence of connection or switching points for sustainable development learning pathways is a boundary maker, and reduces articulation and mobility between workplaces and the education and training system (including post-degree learning opportunities). Boundary crossing practices in this case would involve

developing a clear and organised system of connections and 'switchpoints' for sustainable development learning pathways. Systemically, this means that a full scope of qualifications should be available for sustainable development learning pathways, with clear guidelines for practitioners on how these could be developed and accessed.

The policy-practice gap

A lack of career path planning, and available opportunities for mobility and progression particularly for sustainable development practices goes against information presented by the DoE and DoL (2006:10) which states, regarding OQSF and professional learning pathways, "... learners [following these pathways], both young and adult, will make the most specific and flexible choices. [The pathways] will be open to those who have been able to secure access either to a workplace learning site where they learn and practice skills and attain SETA determined competency standards or expertise recognised by a professional body...". The White Paper for PSET (MHET, 2013:3) aims to address this lack of progression opportunities by addressing the strengthening and articulation of all PSET institutions, including:

... the need for these institutions to break out of the silos in which they have developed and – with the assistance of our Quality Councils and regulatory bodies – contribute to the creation of a single, coherent, and integrated system of Post-School Education and Training one of the most important measures of their success will be the extent to which they articulate with the rest of the system ...

Despite the exisitence of considerable articulation-related initiatives (SAQA-Durban University of Technology [DUT], 2017), data in this study show that there is still a large boundary making gap between policy and policy implementation in this regard, in the arena of environment and sustainable development. This issue is not dissimilar to the issue identified in discussions on the social-material aspects of *worker* training. The main difference in the case of the supervisors, is the agency of individuals to self-direct and navigate the learning pathways landscape, at least to a more effective degree than workers, who appear both neglected and disempowered when it comes to learning pathways planning and development.

Status, hierarchical benefitting and learning pathways

From the discussion thus far, it is clear that the supervisors studied all had access to both the GFETQSF (Umalusi) and HEQSF (CHE) streams of education/training, which had offered them broader and wider life opportunities than those experienced by the workers studied. It is possible therefore to say that having access to a wider learning pathway that crosses the NQF Sub-Frameworks as well as professional learning, improves one's life chances, employment opportunities and so on. While this may seem to be obvious, data in this study clearly show that learning pathways are directly associated with socialmaterial realities and the quality of life options. Not only are learning pathways sociomaterially constructed, they also have social-material consequences.

To further this discussion, it is interesting to note that if the learning pathways of the supervisors are in turn compared with those of the managers studied, it is possible to see that the managers had access to an even wider range of learning pathway opportunities than did the supervisors. While policy does not intend this pattern (ie. the education and training policy basket in South Africa is directed at redress and at equalising opportunities), practice in the research contexts studied, showed that it has been those with higher levels of opportunity who were more mobile and able to access the full scope of learning pathway opportunities on offer across the NQF Sub-Frameworks (GFETQSF, HEQSF, OQSF). The learning pathways policies as currently actualised, appear to have benefitted those who are already more mobile from a learning pathways perspective: additional mechanisms may be needed to support the actualisation of these policies for those lower down in the system. From the cases in this study, it would seem that it is those who were more educated and mobile, were more able to cross the boundaries between the sub-systems of the NQF, and to continue benefitting from the spectrum of learning pathway development opportunities available. Success regarding education/training/ work progression therefore seems to be linked to the *ability to make use of the mobility* options necessary for learning pathway development, especially where free choice is involved in supplementing existing formal learning in the GFETQSF and HEQSF contexts, with OQSF options for strengthening workplace learning and sustainable development practice.

Access to education/training opportunities, and senior positionality is therefore a boundary crossing capability. Lack of access to education/training opportunities and senior positionality is a *boundary making factor*. This is an example of how a 'lack' or an 'absence' is a boundary-maker from a social-material perspective.



Figure 4: Summary of sustainable development practice supervisors learning pathways: Boundary making factors and absences; boundary crossing practices needed; and system implications

SOCIO-MATERIALITY OF SUSTAINABLE DEVELOPMENT PRACTICE *MANAGERS*' LEARNING PATHWAYS

A third occupational grouping to be examined in this local government case study is the managers. As for the worker and supervisor groupings, five managers were interviewed. They were selected based on responsibilities for sustainable development. Their learning pathways are presented showing engagement/mobility across the three NQF Sub-Frameworks. Figure 5 and Table 3 below show a clearly different pattern of access to learning pathway opportunities to those of workers and supervisors. Managers appear to be the most mobile and capable of accessing learning opportunities from TVET to Higher Education and Training (HET) and into other occupationally directed education and training streams. When compared with the supervisors, they are more capable of accessing occupationally directed education and training relevant to the sustainable development focus of their work. Furthermore, as is shown in Figure 5 and Table 3, they are capable of accessing multiple levels of Higher Education (not only first degrees,

but second, third and fourth degrees from Higher Education Institutions [HEI]). There is therefore a *vast difference* between the construction of learning pathways at the different occupational levels considered in this research, even though all learning pathways are hampered by certain inefficiencies (eg. poor workplace skills planning). This finding confirms the point already made, that higher levels of education/training provide increased levels of access to lifelong learning opportunities and the construction of selfdirected, reflexive learning pathways. It seems also that higher levels of education and training allow employees to make stronger decisions related to sustainable development education and training, and to find pathways of access into these, if they are relevant to their jobs.



Figure 5: Managers' learning pathway profiles⁵⁷ (Source: Mohanoe, 2014)

⁵⁷ The baseline in Figure 5 denotes zero activity (ie. an absence of involvement in the GFETQSF, HEQSF and OQSF sub-systems); where the QCTO reference is to no access to sustainable development education and/or training opportunities.
Table 3: Sustainable development practice managers' learning pathways (Sourc	e:
Mohanoe, 2014 [study data])	

Managers		Occupation	Time spent in	Learning pathway	Socio-material realities and
			occupation		consequences
1.	Male, isiXhosa speaking	Environmental Manager	6 years	Grade 12 (subjects: IsiXhosa, English, Afrikaans, Geography, History, Biology). Bachelor of Arts (BA) (majors in Psychology and Geography) (RU) (1990). Higher Diploma in Education (2003). Bachelor Honours: Geography (2004). Masters Degree in Science: Botany (2006) Completed an Environment Impact Assessment (EIA) course (2000) Advanced training on Local Environmental Management in Urban Areas, Sweden (2010) Currently registered for a Post- Graduate Diploma in Environmental Engineering at the University of Witwatersrand Legal requirement to attend South African Local Government Association (SALGA) course/s on financial management for non- financial managers	Moved between different fields to develop learning pathway, from Geography to Education to Science. Environmental consultant Member of Environmental Education Association of Southern Africa (EEASA). Learning pathway strongly influenced by access to short courses and environment related training (over and above formal degrees) Close mentorship and the existence of a Local Environmental Action Plan have been strong shaping forces in learning pathway development

Managers		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
2.	Male,	Manager of	6 years	Grade 12 (1970)	Foundations in
	English	Environment,		Subjects: Maths,	environmental
	speaking,	Parks and		Science, Geography,	management
	nearing	Recreation		Biology and	disciplines strong,
	retirement			languages. National	supported initially
				Diploma in Forestry	by choice of
				(1975). National	school subjects.
				Diploma in Horticulture	First Diploma full-
				(1981).	time, following two
					Diplomas part-time.
				National Diploma in	Chose to deepen
				Parks and Recreation	competence
				Management (1984)	horizontally rather
				Cape Technikon	than vertically (all
					Diplomas are on
				Completed	NQF Level 6).
				various certificate	Projects and project
				courses related	management also
				to management,	developed skills
				workplace skills	
				etcetera	Has also benefitted
					from mentorship.
					Membership
					of professional
					body (Institute
					of Environment
					and Recreation
					Management)
					has been strong
					influencing factor on
					learning pathway

Managers		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
3.	Female,	Director	6 years	Grade 12 (1976),	Studies not directly
	Afrikaans	of Local		Subjects: Afrikaans,	related to sustainable
	speaking	Economic		Maths, History,	development. Shift
		Development		Science, Biology.	from social work
				BA Social Work	took place during
				(University of Pretoria	Master of Business
				[UP]). Bachelor	Administration
				Honours in Medical	(MBA), second
				Social Work (United	shift to Journalism
				States)	and then Estate
					Agency. Learning
				Masters Degree in	pathway initially
				Social Work (UP).	self-chosen, but
				Master of Business	more recently more
				Administration (MBA),	closely aligned with
				(Business school in	job specifications
				the Netherlands).	and requirements.
				Diploma in Industrial	Strategic planning
				Journalism. Estate	skills necessary
				Agent Qualification	(facilitated by MBA),
				Currently involved in	but also by work
				training programmes	experience and
				relevant to legislation:	colleagues and
				'All Section 57	mentorship. Attends
				employees must do	workshops and
				programme in financial	seminars to keep
				management, paid	'skills polished'
				for by the SETA	
				[concerned]'	

Managers		Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
4.	Male, isiXhosa speaking	Manager for Water and Sanitation (recent promotion from Water Technician to Water and Sanitation Manager)	4 years. Water Technician: 2 years Acting, 2 years Manager Recent appointment as Water and Sanitation Manager (2012)	Grade 12 (Maths, Science, Agriculture, English, Xhosa and Afrikaans). Diploma in Civil Engineering (Vaal University of Technology [VUT]) Infrastructure Asset Management Training, Expanded Public Works Programme (EPWP) NQF Level 5 certificate in Water and Wastewater Treatment Systems. Informal training on water quality management, water conservation, demand management and safety planning (strongly occupationally directed) (paid for by Department of Water Affairs, and offered by institutions such as Rand Water Currently enrolled for B.Tech Degree, allowing for specialisation in water	On-going focus on sustainable development related training throughout learning pathway development. Choice of subjects in high school a key factor Coherent, seamless learning pathway offering steady progression in career development Occupationally directed training programmes are supported by the government department responsible, as well as the SETA concerned. Working on sustainable development projects also seen to be a key learning pathway development practice
				engineering	

Ма	nagers	Occupation	Time spent in occupation	Learning pathway	Socio-material realities and consequences
5.	Male,	Manager,	7 years	Grade 12. Subjects:	Choice of high
	Afrikaans	Environmental		Afrikaans, English,	school subjects
	speaking	Health and		Maths, Biology,	influenced post-
		Cleansing		Woodwork,	school qualifications
		Services		Agriculture. Diploma	
				in Public Health	
				(Environmental	
				Health) at Cape	
				Technikon. In-house	
				courses focusing on	
				management, and	
				occupationally relevant	
				training programmes	

As in the case of the workers and the supervisors, for the managers there appear to be some important boundary making processes at play, which require boundary crossing practices:

Costs of further learning and investment in scarce skills

One of the managers noted a constraint on further study, which is financial in nature. He has to pay R16 000 towards a further Diploma, with no support from the Municipality for travel or other costs, even though these studies are directly related to his work, and the Diploma addresses a scarce skill in the sector (Environmental Engineering). From this it would seem that skills planning in the municipality is not taking scarce skills into account when prioritising skills development support. This is further revealed by a statement from a manager who noted that [staff] are sent on training which has little or no relevance to their core function: "fellow workers are complaining about mismatch of skills enhancement needs and skills training where they (the Municipality) would suggest that you go and do a course on hygiene when this is not relevant".

Capacity of skills development facilitators and workplace skills planning systems

Another social-material factor influencing learning pathways that is boundary making, is the capacity of those responsible for training and development of personnel in the municipality. These critical personnel are said (by Mohanoe, 2014) to be 'inefficiently capacitated', and this appears to affect the quality of their work. This adds to tensions, and creates unhappiness amongst employees, as it presents barriers for learning pathway development and access. Workplace skills systems are generally inefficient, not geared to development of scarce skills, or skills necessary for job enhancement or improved service delivery (as observed at this Municipality). One manager stated "I don't know what they do [referring to the skills development facilitators] ... it [the training] does not come to us on the ground. Every second year they come to us and [we] fill in a form on career pathing. Each and every worker fills in the forms, after a year they come to us and ask us to fill it in again. And I just said, 'I refuse to fill in the forms, you are wasting our time, because it is a lot of time that we invest' ... the problems in skills facilitation are leading to bottle necks".

Access to mentorship

In all cases the managers indicated that at some point they had had access to excellent mentorship, and that this had facilitated their capacity to draw on colleagues and shaped their capacity to make decisions related to their learning pathways. Thus mentorship appears to be an important boundary crossing mechanism.

Workloads and responsibility

One of the managers reflected that workload and level of responsibility created problems for accessing further training. The manager used the example of the legally compulsory training which she must do in her position, but each time she tries to get time to do it, her requests are declined. Workloads and responsibilities can be a social-material boundary maker. For boundary crossing, it seems that management planning is needed to factor in time for skills updating amongst senior managers, and internal planning is also needed, to cover for the senior managers when they attend training.

Seamless and well-co-ordinated provisioning systems that cross boundaries between CHE and QCTO systems, and that allow for expanded learning and occupational progression

In the case of one of the managers (the Water and Sanitation Manager), it was very clear that a smooth and seamless learning pathway had been shaped by a combination of formal qualifications and informal learning, both of which were *occupationally directed and related to sustainable development* (Mohanoe, 2014). Furthermore this learning pathway construction was supported by the government department concerned with the effective delivery of water and sanitation services, *as well as* the relevant SETA, and knowledge was further enriched through industry-related partner training experiences and mentorship. The seamless, well-co-ordinated and well-supported provisioning systems within an organised sector appeared to be important for enabling expanded learning and occupational progression, making *a systems approach important for boundary crossing*. This is particularly important for deepening specialist skills, as revealed by this manager's statement:

You need to be trained in water-related courses or workshops especially if you are going to do water demand, as this is a specialist skill on its own. Then if you are going to do Blue Drop and Green Drop [water and sanitation quality-related work respectively], you need to be trained in water quality management because that alone is a speciality. Let alone the Civil Engineering skills which you need, which are also specialist skills on their own (Mohanoe, 2014 [study data]).

Working on sustainable development projects

In the manager cases above, most of the respondents noted the importance of working on large scale sustainable development projects as being an important driver of their skills development. These projects do not always have training attached to them, but often include workplace-based learning processes as problems need to be solved and processes need to be managed.



Figure 6: Summary of sustainable development practice managers' learning pathways

CONCLUSIONS

As indicated in this paper, there are numerous and varied kinds of social-material boundary making processes that hinder articulation between workplace occupation and sustainable development learning pathways development, access and progression. These include:

- the absence of available qualifications and ineffective workplace skills planning tools and systems;
- policies and strategies that do not translate into practice (distance between policy and practice; which may have to do with the conceptions of policy and practice, and/or systems of policy translation);
- inadequate attention given to learning and learning pathways due to poverty at elementary occupation level; ie. societal neglect;

- lack of clear sustainable development learning pathways with vertical and horizontal 'switchpoints'; and
- lack of clear systems and structures that prioritise scarce skills and funding and support training for these at workplace level.

While these and other boundary making factors were identified from the empirical cases which formed the focus of this study, further empirical studies could shed light on the systemic nature of these boundary making factors. Broader research in a number of Human Capital Development strategy planning processes (DEA, 2010a; Human Sciences Research Council [HSRC], 2009) show that these boundaries are not only context specific, but that they are more broadly systemic, which implies that addressing them requires a systemic response, if an articulated system of learning pathways for sustainable development is to emerge within the NQF across its sub-systems (Umalusi, CHE and QCTO contexts). In our analysis above, we have pointed to some of the systemic elements that need to be put in place if such an articulated system is to emerge. However, we also found that many of these elements were already in place (at least at policy level, or in principle). The case data show, however, that it is the social-material actualisation of these policies that is important. Hence, we place a high emphasis on the *boundary crossing practices* that are needed to traverse the boundaries created by the social-material boundary making factors and processes. This we argue, ought to be a key focus of any articulation/learning pathways research programme or articulation implementation initiative.

Regarding *absenting absences and actualising new intentions:* in our previous paper – Paper 4 – which reflects on methodological approaches that could link up the micro with the macro system levels, we drew on Bhaskar's (1993) *Dialectic: The Pulse of Freedom* to consider the dialectical movement that is required from the concrete and structured experience of being (eg. the experience and realities shaping no progression in a learning pathway) to a possibility for transformative praxis, or a new way of 'becoming' where such realities can be transformed. Bhaskar (1993) recommended identifying absences, as both real absences (things that are simply not there eg. the training programmes that would facilitate learning pathways for elementary occupation workers), through real possibility (eg. exploring how it might be possible to support learning pathways through relevant training on the NQF) and then realising these in practical terms (ie. actually implementing the possible training, once conceptualised) (see Paper 4, in this Bulletin).

Bhaskar (1993) called this process 'the pulse of freedom' and he said that it is *in the process of enabling the transformative praxis* from an unwanted situation to a wanted situation, that freedom emerges.

From our analysis in Paper 5, we see that the challenge is not so much to produce new policies or system strategies (many of these are already in place and are getting attention). The more substantive challenge appears to be to produce and provide the actual training programmes and supportive system actions (eg. allocation of bursaries for scarce skills, or offering career guidance to facilitate access *etcetera*), so that the learning pathways become *actualised*. There is, it would seem, still some need to make sure that appropriate qualifications and vertical and horizontal learning pathways for sustainable development exist and become known to people in workplaces. With an emphasis on *boundary crossing practices*, learning pathways for sustainable development can become strengthened, becoming a social-material reality, that is lived and experienced by the workers, supervisors and managers alike in organisations such as the one that formed the focus of this case study.

It follows therefore, that we might propose that it is equally important to invest in the actual development and implementation of the *boundary crossing practices*, as it is to invest in conceptualising and designing the system elements necessary for coherent systemic articulation of sustainable development learning pathways (see Paper 7, in this Bulletin). The intention here is to re-focus our attention on what makes systems of articulation work. From the 'voices in the workplace' represented in this paper, the systems of articulation from workplace to formal learning pathway opportunities in sustainable development are mainly functional for managers (but even these could be improved). The social-material experiences of supervisors and sustainable development practice workers, shows that much more needs to be done to equalise the potential benefit of articulated systems of education and training within the NQF.

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NOTES

PAPER 6

An In-depth Case Study of Environmental Engineering⁵⁸: Learning and Work Transitioning in Boundary-less Work

Dr Presha Ramsarup and Professor Heila Lotz-Sisitka

INTRODUCTION

Environmental issues are increasingly seen as complex, multi-faceted and integral to social and economic development. As societies grapple with the rapid and catastrophic effects of environmental degradation, occupational and educational systems have to comprehend meaningfully, the implications. In a study on the 'Green Skills'⁵⁹ in South Africa's economy, the International Labour Organisation (ILO, 2010:19) noted that "new skills and retraining needs for the greening sector should filter successfully through the 'demand and supply' process". However, despite the National Qualifications Framework (NQF) commitment to responsive skills development and lifelong learning, several recent studies (including Department of Environmental Affairs [DEA], 2010; Human Sciences Research Council [HSRC], 2009) have highlighted many skills and competence-related issues within environmental provisioning. While there is a skills development focus and a greening focus, there is little articulated alignment between the two (ILO, 2010), which highlights that the whole system of training provisioning for workplace learning and sustainability practices is poorly constituted and unresponsive to the rapidly changing nature of the sector. The sector has relatively new occupations that do not have clear-cut pathways into jobs. At the same time, the occupational contexts surrounding these occupations are rapidly changing with evolving skill needs. To enable more seamless and responsive transitions into environmental occupations, it

⁵⁸ A shorter version of this paper has been accepted for publication in the 2017 Southern African Journal of Environmental Education.

^{59 &}quot;'Green Skills' is increasingly used as a short hand term, to refer to any skills needed to take better care of the environment broadly, and which are required for a broad range of jobs across a variety of segments of the Green Economy and sustainable development – and in fact, also beyond economic activity. Included in the notion of 'Green Skills', are the skills necessary to determine and manage water quality and demand and our oceans and coast (sometimes called Blue Skills), waste management, renewable energy and cleaner production (sometimes called Brown Skills), and others. Green Skills are necessary for waste water treatment works, engineering projects, sustainable farming, catchment management, business analysis, investment risk assessment, economic planning, procurement, marketing and communications, health and safety monitoring, air quality inspection, labour representation, community development facilitation, teaching, and more." (Source: www.greenskills.co.za accessed 15 December 2017).

is critical that we broaden insights into environmental learning pathways and how they are constituted (Lotz-Sisitka, 2011).

Transition (change) is a natural characteristic of our lives in this rapidly changing world with increasing severity of environmental issues and risks. Within this context, how careers are enacted has become increasingly varied, requiring new conceptual tools to comprehend meaningfully, the learning and work transitions that people undertake. This paper uses theoretical constructs from boundary-less career discourse (Arthur & Rousseau, 1996)⁶⁰ as well as learning and work transitioning (see also Paper 3, in this Bulletin) to explore the learning pathways of nine Environmental Engineers (see also Ramsarup, 2017). The paper thus makes a contribution to empirical work that articulates on-going transitions within occupational and organisational life. The career stories help us to understand how non-linear transitions emerge, the complexity of these transitions, and the need to attend to broader institutional arrangements within and across education and training, the labour market and the workplace (see Paper 4, in this Bulletin). Through its focus on the Environmental Engineer, the paper assists us to understand the processes and outcomes of transitions in an important occupation in contemporary professional work in South Africa.

THEORETICAL PERSPECTIVE

This paper analyses the transitioning processes and outcomes of Environmental Engineers. The analysis presented suggests that Environmental Engineers are working in what can be characterised as 'boundary-less careers' (Arthur & Rousseau, 1996). Characteristically, boundary-less careers depict discontinuous career paths that typically go beyond the boundary of a single organisation with a defined career path.

Various authors have recognised that a number of professions are experiencing a heightened sense of transitions (Evetts, 2009; Fenwick, 2013; Sawchuk and Taylor, 2010). Field (2012) reflected that the boundaries and expectations of transitions though people's life courses are changing, at the level of the individual and at the level of the wider society. An Organisation for Economic Co-operation and Development (OECD) report (2008) noted that transitions are increasingly fragile and exclusionary and that the number of 'stepping stones' required by youth to secure a labour market position

⁶⁰ Characteristically, boundary-less careers depict discontinuous career paths that typically go beyond the boundary of a single organisation with a defined career path.

is multiplying. Within this, individual learning and work transitions are becoming more challenging (Sawchuk & Taylor, 2010). Individuals are thus being called on to manage transitions throughout their careers – beginning with the shift from initial professional education to workplaces. All these perspectives raise the critical need for education and work systems to pay attention to *experiences of transitions*.

The notion of **transitions** is an important concept for understanding wider systemic articulation concerns, as it provides both structural and systemic insights (see Paper 3, in this Bulletin). It also provides empirical insights into how various qualifications may or may not articulate, and how the changing context shapes choices and needs related to available qualifications, how they are used, and how they relate to more traditional qualifications-led articulation learning pathways. Hence the relevance and interest in transitions, for a research programme on learning pathways within an NQF that has articulated Sub-Frameworks that define and frame how qualifications can enable or constrain what has been referred to in Department of Higher Education and Training (DHET) policy discourse as 'seamless' learning pathways (DHET, 2013a).

Reflecting on professionals' educational and occupational progression is necessary within environmental occupations, as different dimensions of transitions emerge:

- 1. from education/training to work (eg. from higher degree into a job);
- 2. from work to education/training (eg. from job into further study);
- 3. within education and training systems (eg. from a Higher Education formal degree context into an occupationally directed [short] course/s); and
- 4. from occupational and work life into wider social processes (eg. from engineering practice to engaging with societal processes that provide normative assessments of these).

Against these, Sawchuk and Taylor (2010), asserted that learning and work transitions are increasingly complex, extended across the life course, differentiated, and in turn differentiating across social groups. All these positions raise important questions about how transition-related processes are changing and how they can be managed more effectively. This paper also considers how these things also need to be considered in changing societies and changing occupations, and what enables and constrains learning-to-work transitions in various contexts. Of interest here is the availability (or absence of) and structuring of qualifications and how these are used (or not) in transitioning processes.

Understanding learning and work transitioning demands a focus on both the transition processes and outcomes. Some authors have outlined that this process involves stages of preparation, actual transition and outcomes in the labour market (Hannan, Raffe & Smyth, 1996). This raises the significance of not viewing learning and work transitioning as a 'single point in time event'. Fenwick (2006) found that transition processes are also a process of identity development that Ecclestone (2009) further described as a slow, subtle process of "becoming somebody personally, educationally and occupationally" (in Fenwick, 2006:13). This challenges more technical views of transitioning that are considered from the perspective of, for example, access to education and training, or technical articulations and alignment between qualifications at the level of credits and/ or credit transfer, although these are vitally important within the broader processes of transitioning as they are important enablers. However, transitioning processes provide a broader framework and lens through which such issues can be understood better.

Environmental occupations typically do not have clearly defined institutionally or occupationally determined pathways. The sector is characterised by professionals navigating their own non-linear pathway into a green job (Ramsarup, 2017). This has historical antecedents, most notably the recent emergence of such occupations in the national landscape and the lack of dedicated systems of education and training development for the environmental sector which, as noted in the South African Environmental Sector Skills Plan (ESSP), is a 'cross cutting' issue (DEA, 2010). Seeking to understand learning-to-work transitioning into environmental occupations necessitated the use of theoretical ideas from boundary-less careers discourse (Arthur & Rousseau, 1996). This assists in more accurately describing and depicting the nature of work and the transition experiences of the Environmental Engineering professionals in these transitioning spaces.

Boundary-less work is conceived as the opposite of the organisationally determined career that is characteristically visualised to unfold through a single pre-structured vertical qualifications path or employment context. Boundary-less work (Arthur & Rousseau, 1996; Roper, Ganesh & Inkson, 2010) is perceived to take on many forms and has been described and depicted in various ways, such as:

- movement across the boundaries of separate employers;
- drawing validation from outside the present employer;
- being sustained by networks and information external to the current employer;

- breaking traditional organisational career boundaries; and
- perceiving a boundary-less future regardless of structural constraints.

Fenwick (2006) discussed two important elements of boundary-less work relevant to this paper. Boundary-less work involves a sense of specialised expertise being developed and offered which would mean that the career is marked by the development of specialised portable skills, knowledge and abilities (*Ibid*.). The second element is job mobility across multiple employers, erasing conventional boundaries defining job, workplace and employer (*Ibid*.). Other authors have added other elements that characterise boundary-less work, such as personal identification with meaningful work, on-the-job action learning, the development of multiple learning and peer learning relationships, and individual responsibility for career management (Ensher, Murphy, & Sullivan, 2002; Arthur & Rousseau, 1996).

This paper highlights the intricacies of understanding experiences of learning and work transitioning within boundary-less work within the context of the occupation of an Environmental Engineer.

CONTEXT OF THE ENVIRONMENTAL ENGINEER IN SOUTH AFRICA⁶¹

Internationally, Environmental Engineering is a recognised and established profession. An *American Academy of Environmental Engineers and Scientists* was founded in 1967. The United Kingdom has *The Society for Environmental Engineers*. Both are professional associations. The *Confederation of European Environmental Engineering Societies* has 12 Member States and Environmental Engineering is offered as an undergraduate degree across several European countries.

Within South Africa, a different scenario prevails, as a more integrative approach seems evident. The Engineering Professions Act (Republic of South Africa [RSA], 2000:12 Clause 14i) states that the Engineering Council of South Africa (ECSA) will "create an awareness amongst registered persons of the importance to protect the environment against unsound engineering practices" illustrating a policy framework that would appear to require all engineering disciplines to pay attention to environmental considerations.

⁶¹ This case study is one of the in-depth case studies of learning pathways developed in the PhD study of Ramsarup, 2017. This paper draws on the data from that study.

There are no undergraduate qualifications in Environmental Engineering. The broader data informing this paper (Ramsarup, 2017) reflects that Environmental Engineering is essentially viewed as a specialisation of dominant engineering disciplines especially Civil and Chemical Engineering. Environmental Engineering Masters and Doctoral degree studies are available at several institutions in South Africa. But these specialisations reflect dominance in water care, energy studies and environmental geography. Environmental Engineering as an independent discipline does not exist, even after doing a Master's degree, graduates 'cannot go around saying they are a professional in environmental engineering as it doesn't exist as an independent discipline' (Trois, 2013).

In recent years, an emerging demand for Environmental Engineers has been depicted in two national research processes. The DEA's national and provincial consultation during development of the ESSP for South Africa (DEA, 2010) and the Strategic Infrastructure Programmes' (SIPs)⁶² scarce skills analysis (DHET, 2013b) have identified Environmental Engineering as a scarce skill in South Africa. The document prepared by the DHET on *Meeting the Demand for SIP Scarce Skills* (DHET, 2013b) highlighted that Environmental Engineers have been identified as being 'significantly scarce' whith a 20%-50% shortage when the occupations were needed; this has necessitated the SIPs to identify *300* Environmental Engineers to be trained in the short term" (DHET, 2013b, emphasis added). This illustrates the rapidly emerging labour market demand for this relatively new skill. In 2009, an HSRC study emphasised that "with forthcoming environmental legislation and new emphasis being placed on environmental protection in South Africa, increased levels of graduation in Environmental Engineering will be necessary" (Du Toit & Roodt, 2009:52).

However, a co-ordinated sectoral (within related engineering associations) or education and training system (within the NQF structures) response or uptake of this demand has not been articulated, despite this also being noted as a scarce skill in the 2010 ESSP (DEA, 2010). The National Infrastructure Development Plan's SIPs skills development planning process has, however, begun to give this issue more concentrated attention in the 2013 DHET's (2013b) SIPs documentation. The DHET established an Occupational

⁶² The Strategic Infrastructure Programmes (SIPs) are the implementation mechanism for the National Infrastructure Plan of government. This National Infrastructure Plan is overseen by the Presidential Infrastructure Coordinating Commission (PICC). Eighteen SIPs have been identified which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. One of the focus areas is greening the economy (PICC, 2012). The DHET developed an integrated skills development plan for the next 20 years across all the SIPs (DHET, 2013b).

Task Team for Environmental Engineers which represents the first dedicated research and skills development focus on this occupation in South Africa to date⁶³.

SURFACING EXPERIENCES OF TRANSITIONS IN THE BOUNDARY-LESS WORK OF ENVIRONMENTAL ENGINEERING PROFESSIONALS

Methodological process

The ensuing discussion draws from a study of career stories of nine Environmental Engineers. These career stories were developed following in-depth interviews and analysis of curriculum vitaes. The stories are drawn from a range of engineering consulting firms, however firm names are not revealed. An effort was made to seek individuals from diverse populations and age groups for the interviews, as a diversity of stories was seen to offer wider views on the field as a whole.

The principle used was that of the *concrete universal* which, in Critical Realist research, recognises that in applied analysis, not only should the singular case (ie. individual things and events) be explained in terms of "the intrication of a multiplicity of explanatory mechanisms", but also "they must be conceived as concrete universals and singulars" (Bhaskar, 2010:6). Bhaskar (*Ibid.*) goes on to explain that "every particular phenomenon which in some way instantiates a universal law does so concretely". What Bhaskar meant by this is that the analysis of a singular case as a 'concrete universal' allows for interpretation of the singular case not only in terms of the individually reflected or unique characteristics of the case (ie. the individual story of a particular Environmental Engineer and all of the details that pertain to that story only). It also admits that the particular case at the same time has underlying generative mechanisms (eg. the dualism between environment and development that has led to less recognition for environment in development discourses, which in turn has affected the types of engineering qualifications on offer). These generative mechanisms can apply to the 'universal' or wider context, influencing a range of singular cases in similar ways.

⁶³ Here it should be noted that the PhD study undertaken by Ramsarup (2017) under the auspices of the SAQA-Rhodes University research programme (reported on in this Bulletin), was identified within the SIPs processes as one of the few studies that have undertaken a comprehensive systems based analysis of the Environmental Engineering occupation from a skills development, and skills system development perspective. The researcher was, during the PhD study work, invited to serve on the SIPs Occupational Task Team.

Bhaskar (2010:6) explained that the generative mechanisms are relatively enduring, meaning that they have substantive effects that can last over a period of time and can impact on a range of individual or singular cases. It is at the level of the generative mechanism that one is able to draw a more generalised conclusion from cases, which was how we sought to work with the nine cases in this study.

Readers are requested to note that this approach to research differs fundamentally from more positivist research methodologies, which would expect extensive sampling and correlational analysis. Here it should be noted that positivist research has long been critiqued for inadequate means of providing insights into correlational causality in social research (Bhaskar, 1993), hence the choice to work with Critical Realism's form of generalisation in this study, which is appropriate to, and valid for the form of social scientific research undertaken here. The research has therefore sought to surface 'deeper' level issues than would be possible through positivist or other forms of empiricist research. The findings of the research can, however, be tested with a wider audience or in a wider range of cases for further verification but it is likely that the general tendencies or underlying structural issues will be similar, leading to empirically different accounts but with more generalisable implications at the systemic level.

The first layer of analysis was focused on understanding the formal chronology of states and transitions in each of the nine Environmental Engineering professionals' lives, but also in the ways that they made sense of their learning-to-work transitions (ie. development of the nine individual cases). This led to the construction of individually unique career stories that were verified with the participating research respondents.

Following this, multiple layers of analysis were undertaken using the career stories to deepen the analysis of the stories, and to unfold some of the underlying generative mechanisms influencing the different cases. The next layer of analysis therefore involved analysis of the key stages and transitions in the career stories. While people told their stories very differently, this analytical process enabled development of a framework for descriptive and analytical work related to the career stories.

Further analysis was undertaken using different analytical tools to focus in more depth on the transition processes instead of single events. This phase of the analysis uncovered *the relational and multifaceted nature of the Environmental Engineer's learning pathway.* Here it should also be noted that this 'multi-layered' analysis of the case stories is

extended by *system analysis* (eg. analysis of the provisioning system of engineering qualifications; operations and approaches of the professional associations, *etcetera* – as briefly noted already). For the purposes of this paper, however, the wider systems analysis is not included, as the focus is more – in this paper – on *the transition experiences of the Environmental Engineering professionals sampled*⁶⁴ (Paper 7 in this Bulletin offers more insight into the wider system elements affecting environment and sustainable development learning pathways more broadly).

Insights surfaced

Within the stories, the transition into environmental related work appeared to have been 'unconscious', and transitioning into this specialised field appears to have been somewhat *ad hoc*. Engineers "stumble into this route in the workplace", as one participant reflected. Of the nine, only one reflected a rational decision to enter engineering and specialise as an Environmental Engineer. Despite this, currently all are regarded in their work contexts as practising Environmental Engineers (this is despite the occupation not been formally recognised by ECSA in South Africa).

Interviewees were not able to pinpoint a turning point in their career trajectories. But their stories illustrate that various exogenous factors prompted their deviation from their established career paths as Civil Engineers. Ibarra (2004) noted that external labour market forces ultimately determine what work/project options are available. These are related to changing occupational configurations and the emergence of new choices such as contract work (*Ibid*.). Ultimately, supply and demand factors influence options (Ibarra, 2004), showing certain structural influences on the transitioning process. But the personal adaption to this new work role can also be viewed as self-initiated, highlighting agentive dynamics as being influential in the transitional process too (Archer, 2000).

The work role transition process of Environmental Engineers in South Africa is not guided by institutionalised transition processes and involves elements of separation and incorporation simultaneously. For example, several engineers physically left engineering companies to work in environmental consultancies and subsequently returned to the engineering sector. Those who were in the engineering sector were seen as 'part outsiders'

⁶⁴ Further and more comprehensive insights on how the career stories and systems analysis 'come together' within a systems development perspective, can be found in the final thesis which brings all these dimensions of the study into environmental sector learning pathways into focus in relation to each other (Ramsarup, 2017).

as their occupation was not a 'normal' version of engineering practices. Such a condition surrounding the occupation makes for a difficult transitionary process (Ibarra, 2004).

Transitioning into a specialised environmental work role presented some challenges. A major issue appeared to be that the Environmental Engineers struggled to find their organisational fit, reporting that they didn't have a clearly defined 'work role'. As one respondent highlighted: being the "environmental guy in the office" he was always "treading a fine line between being outspoken around issues and maintaining the core business focus". This was in an engineering organisation. Several of the environmental engineers reported that they struggled to find a niche where they belonged as noted by one engineer who further struggled with balancing business work and environment work. She stated it was "difficult being an activist in a business". The stories indicate that most of the engineers had to wrestle with uncertainty and incomplete information. which are a natural feature of a less bounded organisation and the nature of boundaryless work where the people, the contexts and processes are always changing. Arthur and Rousseau (1996:21) highlighted that in these instances of uncertainty, "people fill in the blanks, people making sense of uncertainty enact a structure in which to work. Micro-level processes shape macro level organising". All nine career stories reveal a dual learning process – on the one hand, a realisation of their own fluidity continually escaping the fixed subject position allotted by the 'normal' engineering workplaces and on the other, an engagement with 'external concerns' such as environmental concerns which reflect a growing awareness of their own subjectivities and their role in producing these subjectivities in the engineering organisational context (Fenwick, 2006).

This complexity is again reflected in the patterns of occupational mobility that emerge from the stories. Ng *et al* (2007) argued that mobility is central to understanding how careers unfold. They further argued for the need to interrogate mobility discourses in career work to include both physical and psychological mobility. However, this paper focuses only on physical mobility. Sullivan and Baruch (2009) cautioned that in understanding occupational mobility we need to determine cause (voluntary or involuntary), origin (company or self-directed) and direction (up, down, lateral).

Despite entering from different qualifications and specialisation paths (Chemical Engineering; Landscape Architecture, Civil Engineering, and Bachelor of Science), the data show a strong preference for, and intention to, engage in an environmental work context, combined with engineering options of work. The data reflected two key types of

mobility patterns. Firstly, in all stories there was extensive intra-organisational movement, which can largely be viewed as lateral movement promoted mainly by project based work in engineering workplaces and the need for these organisations to use these individuals as the 'environmental person' in various projects. Secondly, frequent job moves between two organisational types – engineering consultancies and environmental consultancies – were observed. All of the stories show this visible occupational and organisational change which involved internal and external lateral movement to facilitate the development of specialist competencies. The extract in Table 1 below shows the job moves of one interviewee:

Work during	Work after university					
study	1	2	3	4	5	
Landscape	National	Environmental	Engineering	Environmental	Engineering	
Architects and	Department	consultancy	Consultancy	Consultancy	Consultancy	
Environmental						
Planners	Special Tasks	Environmental	Landscape	Associate	Director	
Vacation work	Division	Officer	Architect		 Head of 	
	Technician			Senior	Environmental	
			Associate	Associate	division	
	Design					
	Services			Director	Competency	
	Division –				Leader for	
	Landscape				Environmental	
	Architect				division	

Table 1: Job moves of one environmental engineer⁶⁵ (Source: Ramsarup, 2017)

The mobility pattern clearly depicts non-linear occupational progression. Unlike the official engineering learning pathway maps which show parallel ascending movements (undergraduate, candidacy to specialisation) these actual pathways show more time-consuming sideways movements to attain the levels of specialisation needed for high level environmental engineering work. This point is significant in relation to the stated intention of the SIPs programme to develop 300 environmental engineers in the 'short term' (DHET, 2013b).

Furlong, Cartmel and Biggart (2006:16) help us to understand the range of experiences that can be defined as linear and non-linear; they emphasised that "non-linear trans-

⁶⁵ While individually 'unique', the cases show a similar pattern.

itions involve breaks, changes of direction and unusual sequences of events. They can involve extended or repeated experiences of unemployment, frequent moves between jobs and returns to education and training after periods in employment" (*Ibid*.). The experiences in the case of the South African Environmental Engineers (as sampled in the cases for this study), however, do not concur with the Scottish experiences cited by Furlong *et al* (2006), who maintained that people with high levels of qualifications (especially Degrees or equivalent) are more likely to follow linear upward transitions. In South Africa, there are engineers with high-level qualifications following non-linear transitions to attain the necessary specialist competence in Environmental Engineering. This may also point to the consequences of lack of specialisation opportunities for Environmental Engineering (unlike in Civil or Chemical and other forms of engineering) in early qualifications. It also points to the associated lack of recognition of status of this form of engineering in the South African professional context.

These mobility patterns raise key challenges to the idea of a linear developmental trajectory for Environmental Engineering professionals envisaged in the institutional pathway and raises challenges for the normative pattern of an engineering pathway. There are complex lateral movements, which are catalysed by a broader environmental change, which has raised needs for different work contexts and experiences, seemingly not as yet adequately recognised within the professional context or in the qualifications system context. The HSRC (2009), DEA (2010) and more recent SIPs (DHET, 2013b) studies appear to show, however, that more substantive attention needs to be given to the systemic dynamics of this occupation.

Livingstone and Scholtz (2010:22) remind us that individuals "inherently cope with their changing environments by learning". The career stories illustrate the significant role of learning throughout the life course. As work practices begin to change and new work roles emerge, the need for supporting regular and continuous learning is exemplified. Glastra, Hake and Schedler (2004) proposed that all lifelong learning be understood as transitional learning. The quote below presents a useful orientation:

Transitional learning emerges when individuals are faced with unpredictable changes in the dynamics between their life course and the transforming context, and when they are confronted with the need to (learn to) anticipate, handle and reorganise these changing conditions. This situation triggers a continuous process of constructing meaning, making choices, taking up responsibilities and dealing with the changes in the personal and societal context (Wildemeersch & Stroobants, 2009:222).

The career stories in the study depict evidence of transitions between different forms of learning. Formality and informality in learning is a relational continuum (Colley, Hodkinson & Malcolm, 2003). However, for the sake of analytical discussion, it is necessary to make a distinction between these as this enables elaboration on the full range of learning processes in which these Environmental Engineering professionals engage.

Across the case shown in Table 1 above, work-based, experiential forms of learning were importantly supplemented largely by short course-based formal learning. The data reflect that across the nine interviewees⁶⁶, they had between them, completed sixty-six short courses. Of these, 44% of the courses were environmental; 30% were engineering-related and 26% were general (business writing; communication, computer, power speaking). The dominance of environmental courses reflects their interest and need to develop specialised environmental knowledge. The range of courses reflect different dimensions of specialisation within 'environmental knowledge' eg. green building technologies; environmentally sustainable design; environmental law; integrated environmental management; energy efficiency technology; environmental impact assessment; underground environmental control, and bioethics. The range of environmental courses also reflects the consulting work environments of the Environmental Engineers and hence an articulated need for a diverse mix of environmental knowledge and skills. Some also reflected that they were reluctant to enter a post-graduate specialisation as some of the Masters courses are too specialised in one area (eg. waste and water), which was not what they required for the more generally focused consulting industries they work in. Only two of the nine did a Masters in Environmental Engineering reflecting that the dominant institutionally perceived pathway for formal learning and specialisation was not the preferred option of the practitioners interviewed. This finding has potential implications for the Quality Council for Trade and Occupations (QCTO)/Sector Education and Training Authority (SETA)-led interventions for supporting skills programmes that contribute to the development of sectors; especially in the context of supporting transitioning into the Green Economy, which appears to be one of the intentions of the National Infrastructure Plan and the SIPs (DHET, 2013b), and South Africa's National Development Plan Vision 2030 (RSA, 2011).

The discussion illustrates that Environmental Engineers (in order to become Environmental Engineers) are, by necessity and choice, actively engaging in upskilling and re-skilling beyond organisational boundaries. The evidence indicates that they have taken active

⁶⁶ Note: of the nine participants, only seven submitted detail information on types of short courses attended – thus the sixty six courses were recorded from seven participants (Ramsarup, 2017).

responsibility for their own learning and have subsequently crafted a path across and into a newly emergent field of practice that appears to have relevance for the Green Economy and sustainable development in South Africa (Du Toit & Roodt, 2009; DEA, 2010; DHET, 2013a).

NEGOTIATING THE BOUNDARIES

The discussion above helps to contextualise the 'concrete universal' transitioning experiences of engineers into an Environmental Engineering specialisation in South Africa. As described by Fenwick (2006:23) in her work on boundary-less careers, there is a certain form of "freedom evident in the new practices and spaces of subjectivity that open in their [the engineers'] nomadic movements across organisations, knowledge's and working relationships".

This discussion highlights some of the dynamics of negotiating boundaries that have emerged. The career stories developed and analysed for this research have illustrated that these professionals engage in crossing boundaries between organisations; occupations and in the process, are creating new vocational identities.

While most research on occupational transitions has focused on initial career choice (Sullivan, 1999), this paper illustrates that adults make occupational choices throughout their working lives. The occupational focus in their careers is strengthened as their area of specialisation is concretised. Tolbert (1996) emphasised that, as organisations become less important in defining career pathways, occupations will become more important. This suggests an increasing centrality of occupations in career arrangements (and potentially also in skills development system planning and provisioning). This would mean that people's occupationally based careers provide a means for signalling their ability and competence. This in turn requires a social understanding of the clearly defined set of skills and knowledge (and values as shown in the Environmental Engineering occupation) with a distinctive set of tasks, against which these skills and knowledge can be applied in an occupation. This is the foundation against which an occupational group member can be held responsible. This, Tolbert (1996) argued, lays the foundation for the occupational labour market. All of this needs to be more carefully considered for Environmental Engineering. Although it is now designated as an occupation within the Organising Framework for Occupations (OFO), there are no clearly accepted occupational tasks and understandings defined. Interview data in this study revealed many differing

opinions on who, what and how Environmental Engineers can be viewed and trained within South Africa (*Ibid*.; Sullivan, 1999).

Fenwick (2006) recognised that boundary-less workers continually struggle with and balance the boundaries defining knowledge and scope of practice. These struggles are clearly depicted in the evidence of reversible transitions and the visible extended transitioning. All the interviewees in this career stories study showed that they experienced 'reversible transitions' where they moved in and out of education and paid work, engaged in work and full-time study at the same time and participated in learning in different ways and in different places.

The stories depict accounts of *extended transitioning* where some have taken up to eight years to gain their specialist subjective positions. For some, this involved multiple entry attempts, spells of unemployment and underemployment. The data used to compile the career stories for this analysis have indicated that numerous lateral movements are indicative of Environmental Engineering professionals choosing to gain experience in different work environments that enabled the development of specialist knowledge.

Blurred boundaries between education and work traverse these career stories and all illustrate how the boundaries between education and work are becoming blurred in modern society. The analysis showed the inseparability of work and learning relations, for understanding the fullness of occupational transitions. Learning-to-work transitions that occur after occupational entry are complex and diverse and also show that the nature of work cannot be separated from analyses of learning-to-work transitions especially in contexts where the occupational/work systems are undergoing transformation.

These stories illustrate that transitioning into work is not a single event, as all nine Environmental Engineers sampled were working while studying and the work experience gained during studies was critical for their occupational progression. While engaging in work, especially within new projects, the need for diverse forms of expert knowledge and specialised skill was highlighted that related to new environmental legislative, compliance and ethical demands. Greenwood (2008) outlined that an important area that needs to be reviewed when we look at skills specialisation in an occupation is the field of knowledge required. The career stories in this study indicate that critical to the skill specialisation and development of specialised knowledge is the interdependent roles of work and experience, complemented by forms of specialist training. All raise new demands so employees are engaged in learning informally, but also in formal learning through short courses. As boundary-less workers are not being developed to work for a particular firm, there is a need to support the development of transferable skills that can enable further movement across organisational and occupational boundaries. However, Breen (2005) also highlighted that despite calls for flexible and generalised skills sets, in detailed analysis it is specific skill and knowledge sets taught at schools on a consistent basis that appear to result in stronger youth employment.

This may have implications for critically reviewing the absence of specialisation options for Environmental Engineering in undergraduate engineering programmes, especially in light of the findings reported in this paper, that the current South African picture appears to show a dominance of extended transitioning as the key feature of how Environmental Engineers in South Africa develop. As noted in the introductory context section, this is not the same as in other countries, where Environmental Engineering is a recognised undergraduate specialisation option and a recognised engineering profession specialism.

The career stories all concur with the idea that boundary-less work emphasises the importance of networks as people take responsibility for their own career paths. There was a strong indication that interviewees sought to belong to common groups of people and associations and cultivate networks that helped them in providing information as well as assisting their career opportunities. Fenwick (2006) would argue that this helps them in defining their subjectivity and subject position. The data highlighted that although the Environmental Engineers belonged to their relevant engineering professional association (like all other engineers), they all additionally sought to belong to 'other' environmental networks (eq. International Association for Impact Assessment; Green Building Council, Association of South African Landscape Architects). Some were playing very significant roles in these organisations. Arthur and Rousseau (1996) also emphasised that networks serve as learning systems for gaining access to networks and access to other peoples' knowledge and resources. The ambiguity of transition is also mitigated within networks where individuals in transition have 'role models' and guiding figures that embody future possibilities, give advice and 'believe in the dream'. Sullivan (1999) further highlighted that networks provide boundary-less workers with a competitive edge in relation to career advancement, mobility and learning. Sullivan (1999), drawing on work done on the Silicon Valley careers, commented on how networks supported job mobility and continuous learning.

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Fenwick (2013) highlighted the need to pay attention to new work structures and drew attention to inter-professional work requiring collaboration, where specialist professionals bring diverse forms of expert knowledge to collaborative practice. This challenges the boundaries of professions as 'expert domains' and shows that boundaries may be recreated in new ways as practitioners are positioned to represent their specific area of expertise in collaborative work. This demands new capacities among professionals in patching together diverse knowledge and negotiating work infrastructures and governance quickly (*Ibid.*).

The stories of Environmental Engineers reflect that the transitional experiences of these engineers are made significantly more complex by the fact that working within consulting environments, their work is largely project-based. Reflecting on work in the construction sector in Sweden, Ekstedt (2007) raised some pertinent points related to the shift to project-based work. Project-based work is characterised by tight deadlines and a focus on results and performance demands which creates stress, as also described by one of the interviewees who explained his experience of transitioning into project work: "straight into consulting work was very difficult ... it meant you already had to be a specialist within, without having worked in the processes, so you are thrown in the deep end and you eventually discover how processes work". Ekstedt (2007) explained that individuals are learning throughout the project, based on tasks that are their responsibility, resulting in companies often forfeiting training outside project work in favour of 'on-thejob training' (*Ibid*.). This results in promoting an individual based knowledge focus rather than an organisation-based knowledge (Ekstedt, 2007). A critical consequence of this transition is that individuals must assume more responsibility for their careers. Ekstedt (2007) discussed further that a key feature is that this project-based work is focused on expertise and people have to market and profile their competence.

The stories also illustrate that knowledge development and the way knowledge is developed and circulated in professional communities needs to be acknowledged as an important criterion in understanding learning and work transitions. Fenwick (2013), drawing on Green (2009), eloquently elaborated this point:

As Green (2009:4) explains, part of the tension for professionals is the continuing distinction between 'practice-as-knowledge', and 'knowledge *per se'* which still tends to be understood in terms of scientific rationality. In professionals' knowing practice, for Green (2009), three

principles are entwined: *phronesis* (understood as practical wisdom, or embodied rationality), *praxis* (in its Freirian sense of action-full-of-thought and thought-full-of-action), and *aporia* (the 'perplexities and impossibilities' of professional practice) (Fenwick, 2013:4).

In an era of knowledge proliferation, knowledge conventions are increasingly contested and subjected to continual transformation in complex networks and resources.

SOME IMPLICATIONS FOR ORGANISATIONS, EDUCATION AND WORK SYSTEMS

Implications for qualifications design and professional development

Work, education and training systems in their role of supporting transitions need to acknowledge that the way people enact their careers is changing. The example of the Environmental Engineer outlined in this paper illustrates on-going transitions within 'occupational and organisational life'. The stories (as 'concrete universals') illustrate how environmental professionals undertake extended and differentiated career transitions, in the course of training and on-the-job informal learning. This has shown occupational transitions as non-linear, diverse, very complicated and deeply interwoven with the nature of work and economy (Sawchuk & Taylor, 2010).

This challenges ideas on linearity, with implications for qualifications design and for thinking about how to strengthen Environmental Engineering education and training (for a 'scarce skill occupation') within an NQF system involving three Sub-Frameworks and their Quality Councils (in this case specifically for occupationally directed training [OQSF context], and Higher Education and Training [HET] both of which clearly have a key role to play in conceptualising an 'articulated' qualifications pathway for Environmental Engineering in South Africa). However, as shown in this study, this cannot exclude the professional development and the professional association, ECSA.

Implications for career development advice

Boundary-less career practices raise questions on how we can envisage career development and career guidance differently. Pathways need signposts (entry; work-based; non-institutional and well as professional) and people must learn how to

navigate these, especially when destinations are not clear as is characteristic in boundary-less work. All the interviewees reported challenges in finding a path to a specialisation in Environmental Engineering, and except for one, all had little information on how they could specialise in this field as they entered the workplace.

Understanding access to the specialisms is a critical consideration for career guidance systems, as most emphasis is on entry into the generic occupations. Access into specialisms is not easy to represent, as detailed by a career guidance specialist interviewed for this study – as cited below. While this may be difficult to do, it does not mean that we should ignore this need, especially when the demand for the skill has significant development implications.

... more than one basic area of expertise they need to get under the belt, then a postgraduate and then you still needed to add something like short courses, or work experience *etcetera*. On top of that ... the researchers indicated that it was very difficult to plot and is not the advice you can give to a matriculant (Ramsarup, 2017 [study data])

Varied understandings of Environmental Engineering

Across the data generated for this study, the evidence presents incomplete and mixed messages. There does not appear to be a general systemic and clearly articulated understanding of what Environmental Engineering is in a South African context, what work they do, and what a candidate needs to study to become an Environmental Engineer. The data also show inconsistencies in career information both within the engineering sector as well as via the national career portal. Universities are unable to give learners clear information on what to study or how to get there. Within occupational frameworks, Environmental Engineering is now (very recently) regarded as an occupation, however observation data and field notes assembled for this study (Ramsarup, 2017), indicate that this is very differently understood in the general engineering sector. Some within engineering regard it as a specialisation of Chemical Engineering, some as a specialisation of Civil Engineering, and some regard it as an unnecessary job provision as it is said that Civil Engineering teams can work with an Environmental Manager (Ramsarup, 2017 [study data]). This reflects a complicated picture of how the labour market understands this occupation. The challenge that arises from this, is that if the labour market cannot clearly identify the occupation, then graduates are likely to struggle to get employment, as can be seen in one of the career stories that showed how a young graduate with a

Master's Degree in Environmental Engineering failed to secure a job for about eight months (despite it being increasingly seen as a 'scarce skill' occupation).

The following discussion by Breen (2005), reflecting on analysis of data from 27 OECD countries, is lengthy but very useful. He explained (*Ibid*.:126):

... two key aspects determine how people fare once they leave education [and training]; the degree to which educational systems inculcate specific rather than general skill, the extent to which there are direct links between [the] education system and employers ... a greater emphasis on specific skills and a closer link between schools and employers lead to an easier transition from education to labour market because they send a very clear signal to employers about the potential productivity of a given job seeker ...

The importance of signalling

Thus, the discussion illustrates the important role of signalling. To enable smoother transitions, people need information, guidance and 'systemic articulation' (ie. joined-up systems) that enable the education and training system to signal effectively to the labour market, the suitability of a particular job seeker for a particular job (Sawchuk & Taylor, 2010; Breen, 2005). A further consideration would be the need for a sector to signal into the education and training system. One could say that this study is an example of showing how a sector may be signalling into the education and training system (eg. through defining a scarcity of 300 Environmental Engineers in a major developmental context). This case also illustrates that the system has not been able, as yet, to anticipate the demand for this emerging occupation. Consequently, it seems that the education and training system was unprepared and is now faced with trying to develop new skills with a pathway that is reliant on the agentic processes of an individual, without adequate systemic 'infrastructure' to respond to this substantive scarce skill need, as expressed most recently in the context of the SIPs skills planning processes (DHET, 2013b). The wider issue here is that the education and training system in South Africa is re-actively orientated towards Green Skills development across a wide range of occupations and sectors, and thus requires substantive interventions to re-orient from a more *re-active* orientation to a more *pro-active* orientation (HSRC, 2009; DEA, 2010; Lotz-Sisitka et al 2013).

Policy perceptions of, and associated research into *educational transitions* remain of critical importance as explained by Te Riele (2004:247): "the way policy conceptualises
educational transition affects the structures and practices available to young people (through imposed reforms and funding), thus enabling some forms of transition and hindering others".

CONCLUSION

Vaughan (2003) explained that transition policy is generally focused on an endpoint as being a job or training and study towards a particular career or job. Underlying transition policy is the concept of 'pathways'. When we need to support a pathway into a specialist job that does not have a clear-cut route, the complexity raises several new challenges. The discussion of transitioning experiences from these 'concrete universal' career stories all illustrate how, once established, engineering transition routes have now become more protracted and unpredictable (Field, 2012) and that they are a coherent reflection of how the emerging environmental discourse is being appropriated and assimilated into an established field of practice. They all illustrate the complexity of transitions and the need to pay attention to learning and work transitioning across organisational and occupational life. Through this, they show implications for education and training system planning across NQF Sub-Framework boundaries. The stories provide a mechanism for researching coherence, collaboration and possibilities for communication across a system and its Sub-Frameworks, each with their own differentiated form and function (as is the case with the GFETQSF, OQSF, and HEQSF Sub-Frameworks of the NQF).

The stories raise the need to acknowledge that assuming linearity ignores the complexity of transitions, as many students who combine work and study, engage in transitions between different forms of learning. They also raise the issue of how an NQF system could respond in different ways to emerging demands for new skills. In this case, the issue of extended transitioning pathways *versus* a lack of available undergraduate specialisation qualifications may be an issue to discuss at systemic qualifications planning and provisioning levels, and within the associated professional body/bodies. To respond to the articulated demand of the SIPs (DHET, 2013b) for 300 Environmental Engineers in the *short term* raises questions as to which approach is most effective for developing these skills – concentrated articulated short courses for existing engineers to 'specialise', *or* specialisation options in undergraduate training, or post-graduate specialisation (or all of these). This issue will need to be more extensively debated in the relevant professional and policy forums.

Raffe (2003) has emphasised that to design effective education and training system policy (eg. articulation policy), we need to understand the real pathway – as experienced in society – so we can determine if the pathways on which policies are based correspond to the way pathways are actually experienced. If they are not, he argued, policy perceptions can be flawed. He further cautioned that official pathways can become inaccurate when there has been rapid change (*Ibid.*), and in the case of Environmental Engineers in South Africa, the experienced pathways may not reflect a realistic way (ie. via the extended transitioning route) to address the immediate demands of scarce skills and developmental priorities. This study, using the 'concrete universal' logic of Critical Realist research, has provided empirical evidence of the learning pathways of Environmental Engineers, and has also pointed to the underlying generative mechanisms at a structural level that are shaping the experienced learning pathways of the Environmental Engineers.

At a broader level, the study has demonstrated some of the problems with re-active approaches to skills planning that are linked to the complexities of the emergence of new occupations. It has shown that there is a need for more sophisticated processes of labour market and skills systems analysis to understand more fully the relational implications of these two systems that are intimately related to each other – but not in a linear-causal manner as this study has also shown. The study has also highlighted that there is a serious need to interrogate further, how people gain access to specialisms within professional work. The study has further pointed out how such research can potentially inform decision making that can contribute to sustainable development in society.

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NOTES	An In-depth Case Study of Environmental Engineering: Learning and Work Transitioning in Boundary-less Work

PAPER 7

Systems Elements Influencing the Emergence of Learning Pathways from a Green Skills Perspective

Dr Presha Ramsarup

INTRODUCTION

Sustainable development learning pathways in South Africa are increasingly being related to Green Economy development and discourse, with an associated notion of 'Green Skills' emerging in policy and practice circles (see Paper 6, in this Bulletin)⁶⁷. However, Green Economies, and associated climate resilient development pathways are in their infancy, and while widely talked about, these largely still need to be developed. Studies, both here in South Africa and internationally, all show that there are significant systemic issues that influence how learning pathways are/can be constructed for emergent Green Economies and sustainable development (Department of Environmental Affairs [DEA], 2010; Human Sciences Research Council [HSRC], 2009; International Labour Organisation [ILO], 2010; ILO, 2011; Rosenberg, 2015). In most of the documents projecting the growth of the Green Economy, issues linked to skills development emerge (United National Environment Programme [UNEP], 2013; United National Economic Commission for Africa [UNECA], 2012; Organisation for Economic Corporation and Development [OECD]/Cedefop, 2014; Maia *et al* 2011; Montmasson-Clair, 2012; Rosenberg, 2015).

In a recent Mail and Guardian newspaper reviewing a synthesis report on Green Economy growth projections for South Africa, Holmes (2013) noted, that a factor that would determine success was whether South Africa could meet the skills required to fill the jobs opened up by green growth. However, most reports on the Geen Economy and green growth (UNEP, 2013; Montmasson-Clair, 2012; UNECA, 2012; Maia *et al* 2011) tend to discuss skills-related issues in terms of the types and numbers of skills needed, rather than in terms of skills development system issues, ie. how the types of skills needed are to be provided, from a National Qualifications Framework (NQF)/education and training systems perspective. The ILO (2010; 2011) studies on Green Skills are an exception.

⁶⁷ See also www.greenskills.co.za.

The early research in the SAQA-Rhodes research programme, and case study data generated (see Papers 1 to 6, in this Bulletin, and in more detail in the studies of Maphinyane, 2014; Mohanoe, 2014; Dotwana, 2015; McKrill, 2015; Burger, 2017; Fourie, 2017; Ramsarup, 2017) have raised insights into various system elements that impact on the emergence of educational and occupational pathways in the sustainable development arena. Paper 7 deepens insights into these system elements, and provides an overview of some of the critical systemic issues that are influencing sustainable development and Green Economy educational and occupational learning pathways. It draws attention to related opportunities for systemic change.

In the SAQA-Rhodes University Phase 2 research programme, it was recognised that multiple system factors impact on environmental learning pathways; however this paper explores only a small selection of these system elements, selected for their relation to learning pathway provisioning and for their relevance to an exploration of the micro-meso dynamics that permeate learning pathway provisioning (See Paper 3 in this Bulletin). For each systemic element considered here in brief, I attempt to illustrate how the systemic element is related to the emergence of environmental education and occupational learning pathways construction (see Ramsarup, 2017 for further detail regarding system elements). Here, I firstly consider demand-side insights and then look at some of the supply-side systemic elements and responses to the demand for emerging environment and sustainable development educational and occupational learning pathways.

EXPLORING DEMAND-SIDE INSIGHTS

While technical details in different sub-sectors across the broad environment and sustainable development sector differ according to the methodologies, analyses and projections in each of the sub-sectors (eg. water, waste, energy, biodiversity), there is general agreement that the fields of environment and sustainable development in South Africa are characterised by the following skills demands (also referred to as 'Green Skills' demands):

 There are clearly identified scarce skill areas: Some are relatively broad, especially those relating to Environmental Engineering, Environmental Sciences, Environmental Economists, Environmental Lawyers, Environmental Management, and Environmental Education and Training/Human Capital Development. Other areas are more specialised, eg. Marine Climate Specialists; Long Range Climate Modellers; Soil Scientists; Water Quality Monitors, and so on. Within each of these occupations there are also particular specialist requirements, depending on the sub-sectoral needs (eg. waste management requires different engineering or science skills to water resource or biodiversity management). However, the general capacity for labour market analysis and accurate prediction of scarce skills is complex (due to the high levels of specialisation in parts of the sector, and due to generally poor quality Labour Market Intelligence [LMI] systems).

- There is a high demand for and scarcity of environmental technical skills (intermediate skill level) for critical delivery and development areas such as water quality management; Biodiversity Technicians; General Environmental Technicians; and Energy Technicians (see also Ramsarup, 2016; 2017). The exact number and nature of these technical skills require more refined definition and analysis. Support must be provided to Sector Education and Training Authorities (SETAs) and LMI units to undertake this kind or research and analysis.
- There are new projected green jobs possibilities in key sectors including energy (renewables); energy efficiency; natural resource management; and pollution control. These have been quantified (see Table 1 below), but there is still little or no skills planning or provisioning in place to ensure a sustainable supply of skills for these new projected job areas. At the time of this research programme, South African skills planning was 'out of sync' with its environmental policy, and inadequate attention was being given to learning pathways construction for the Green Economy since no co-ordinating structure existed to ensure cohesive skills planning across the South African NQF for this new area of skills development (DEA, 2010; ILO, 2010; Lotz-Sisitka *et al* 2013). Such a co-ordination structure is still absent, despite findings in recent studies that the environmental sector employs more than 500 000 people⁶⁸ (DEA 2010; Driver & Mukhadi, 2017)

⁶⁸ This is a conservative estimate. A recent biodiversity employment study indicates the biodiversity sector (a sub-sector of the environmental sector) employed in excess of 406 000 in 2014 (Driver & Mukhadi, 2017). This can be seen in perspective in relation to the mining sector, which employs approximately 500 000 people, and has its own SETA.

- Skills planning for projected green jobs within a 'futures oriented' Green Economy is not taking place with adequate rigour and careful analysis of future labour market demands. The capacity for futures oriented labour market analysis in South Africa's environmental sector is not well developed. There are, however, ways of projecting such labour market demands based on environmental information (eg. water scarcity projections; climate change projections) that could be developed and used more adequately⁶⁹. The technical sophistication of the scientific analyses are however not being matched by or linked to skills projections analyses. It may be for this reason that the National Climate Change Response White Paper (DEA, 2011) includes, as one of the national objectives for education and training, the need to undertake a comprehensive labour market analysis of the skills needed for a climate resilient development path.
- Green Skills demand is not only for new Green Skills for the projected and emerging new green jobs, but also involves re-skilling or upskilling of existing staff, in the private, but also and especially the public sector, to enable climate resilient and sustainable development implementation across all sectors. The National Climate Change Response Strategy (DEA, 2011) promotes mainstreaming of climate resilient development into all government sectors, as does the National Sustainable Development Framework and the National Development Plan (NDP) of South Africa (RSA, 2011). These have significant implications for public sector skills development initiatives and planning.
- There is potential to create new demand pipelines for Green Economy occupations. Further research into demand creation is needed, however, to ensure the success of this initiative, and other potentially similar initiatives. An example is the study currently taking place, led by the Department of Public Works (DPW) and the ILO (DPW & ILO, 2017) to establish demand pipelines for green jobs in the Expanded Public Works Programme (EPWP).

To date, the most widely used key demand indicator for green jobs is the Green Economy predictions (Ramsarup, 2017) illustrated in Table 1 below. Table 1 provides

⁶⁹ These are currently being explored via a National Environmental Sector Skills Planning Forum three-year research programme (2016-2018) implemented by Rhodes University, the University of Witwatersrand and the University of Cape Town, supported by the Development Bank of South Africa (see www.greenskills.co.za).

a detailed picture of current and potential employment in the main South African Green Economy sectors as projected for emergence by 2025. However, the Green Economy strategies emerging at present fail to highlight the skills development implications of these projections. They also fail to illustrate other occupational demands that will be necessitated by the re-skilling and up-skilling of staff needed in the Green Economy.

The discussion thus far has provided a brief illustrative picture that typifies a sector with a growing, yet generally poorly articulated demand scenario. In the following section, I explore this demand discourse a bit more critically in an attempt to illustrate the complex nature of the 'real' demand dynamic of green skills in South Africa.

Sector	Current employment	Potential additional employment (by 2025)
Waste management (including recycling)	36 960 to131 130 jobs (90% unskilled), including 40 000 in plastic recycling, 10 000 in scrap metal, 35 000 in metal beverage cans (DTI, 2009)	165 134 to 351 314 jobs (90% unskilled labour) (DTI, 2009) but only around 16 000 direct jobs (Maia <i>et al</i> 2011)
Biodiversity and natural resource management	73 392 biodiversity-specific personnel but 1 158 264 jobs in biodiversity-related sectors (Vass <i>et a</i> l 2009; SANBI and the Lewis Foundation, 2010) 23 000 full-time equivalent/ person-years employment for low-skilled workers in ecosystems restoration with the Working for Water programme (Peter <i>et al</i> 2010)	110 000 additional full-time equivalent per person-years employment with the Working for Water programme (Maia <i>et al</i> 2011) As much as 350 000 person-years in soil and land management through payment for ecosystem services (Blignaut <i>et al</i> 2008)
Sustainable/ public transport	Unknown	41 642 jobs in bus rapid transit in the long term (mostly in operations and maintenance after the decline of construction work) (Maia <i>et al</i> 2011) and 148 000 with the Gauteng mass rapid transit railway and bus system (Gautrain) (Naidoo, 2009)

Table 1: Synthesis of green job projections from a range of studies (Source: Ramsarup,2017)

Sector	Current employment	Potential additional employment (by 2025)
Wind energy	Negligible	5 000 jobs in long term (Maia <i>et al</i> 2011)
Solar energy	Very low	Minimum of 16 500 direct jobs (13 500 in photo-voltaic-and 3 000 in concetrated solar power) including 9 000 in manufacturing (Maia <i>et al</i> 2011)
Waste-to-energy	Unknown	37 000 direct jobs in the biomass industry, 10 000 in co-generation and 7 000 in landfill gas, anaerobic digestion and pyrolysis/ gasification, all essentially in operations and maintenance (Maia <i>et al</i> 2011)
Biofuels (bioethanol and biodiesel)	Unknown	More than 50 000 direct jobs, mostly from the growing of crops for raw material supply (Maia <i>et al</i> 2011)
Building and housing energy efficiency	Limited	6 500 direct jobs in building, construction and installation (Maia, <i>et al</i> 2011)
Solar water heating	Approximately 700 people (including 200 in manufacturing and 400 in installation) (Maia <i>et al</i> 2011)	17 620 new direct jobs, 16 278 of which in installation and 1 225 in manufacturing (Maia <i>et al</i> 2011)
Electric vehicles and lithium-ion batteries	Less than 100 people	10 000 in manufacturing (production of electric cars and buses, and of lithium-ion batteries) conditional upon government support (Maia <i>et</i> <i>al</i> 2011)

This perspective on demand is corroborated by the Environmental Sector Skills Plan (ESSP) (DEA, 2010:90) which also found "the environmental occupations within the economic cluster have a vacancy rate of 29%". Although demand is not the only criterion to consider in education-labour relations, it is an important indicator of a transitioning system that is working well (or not).

This section of the paper is intended as an illustrative background for the supply discussion that emerges in the rest of the paper. The discussion has provided a brief illustrative

picture of the demand scenario in the environmental sector in South Africa; it also raises some key challenges, many of which will be further illuminated in the discussion below, which explores the skills development supply platforms. This should help to build a picture of how the education and training system is responding to the emerging demand emanating from the wider social-ecological system change pressures.

CONSIDERING THE SUPPLY-SIDE

Understanding the qualifications currently available

The case study data in the SAQA-Rhodes research programme pointed to the need to develop better understanding of the presence and absence of qualifications for environment and sustainable development occupations and learning pathways (see also Papers 5 and 6 in this Bulletin). To understand the qualifications currently available, I undertook a study of data drawn from the National Learners' Records Database (NLRD) – the relational database of the NQF, housed at the South African Qualifications Authority (SAQA). As at 27 June 2013 (when the analysis was undertaken), a total of 14 093 qualifications were registered on the NQF, 896 of these (6.4%) were found to be environmentally related qualifications in a broad sense. These qualifications were found to be located across all 10 NQF levels with the bulk being registered at NQF Level 8 (234) and Level 9 (224) followed by Level 10 (89) (see Figure 1 below).



Figure 1: The distribution of environment/sustainable development qualifications across NQF levels (Source: Ramsarup, 2017 – based on an analysis of data in the National Learners' Records Database [NLRD], 27 June 2013)

NQF levels of existing environmental qualifications

Further analysis of Figure 1 shows that very few environmentally related qualifications were registered at the lower NQF levels (between Levels 1 and 4 there were 15 or fewer environment-related qualifications per level). At NQF Level 5 there were only four environmentally focused qualifications. There was a general increase in the number of registered environment-related qualifications as NQF levels increased, although qualification numbers tapered off again at NQF Levels 9 and 10. The increase in the numbers of these qualifications was the most dramatic between NQF Level 7 (75) and Level 8 (234). This pattern shows high levels of specialisation at Levels 8 (Honours level) and Level 9 (Masters level). PhDs and other Doctoral Degrees at NQF Level 10 generally tend to be specialised, but are not necessarily indicated as such in the NLRD⁷⁰.

⁷⁰ The 172 qualifications 'TBA' (to be announced) were qualifications positioned at NQF Levels 4 to 7 under the SAQA Act (RSA, 1995), and had not yet been assigned levels on the NQF under the NQF Act (RSA, 2008), at the time of this analysis.

Overall, the few environmental qualifications registered at NQF Levels 1-5 reflect the small number of options for learners interested in environmental or green occupations. Up to NQF Level 4, this lack could be explained by the dominance of the National Senior Certificate (NSC)⁷¹ and the National Certificate: Vocational (NCV) which are relatively generic qualifications with specialist curriculum options or subject contents embedded within them. Most learners studying at these levels register for either of these qualifications and the subject options they choose are indicative of enabling progression into an environmental career (or not). The system becomes restrictive, in terms of environment and sustainable development-related qualifications, (with only four registered qualifications), at NQF Level 5 – an important entry level into Post-School Education and Training (PSET).

While a considerable number of qualifications (75) were registered at NQF Level 7 – eg. three-year undergraduate programmes – many learners entering the PSET system gain access into environmental qualification studies at NQF Level 8 (eg Honours Degree programmes) and Level 9 (Master's Degree programmes) reflecting a dominant post-graduate entry-point into the sector. Most qualifications at these levels are also designed for specialisation.

From this analysis, it is possible to see that 51.1% of the environmental qualifications reside at post-graduate level. There were therefore limited options for access or for alternate pathways into the environmental sector, reflected by fewer qualification options, at Level 5, if supply-side specialisation at all levels is to be taken as an indicator of access into learning pathways.

A key implication of the scenario outlined in Figure 1 is that a learner who is unable to gain access to the traditional academic pathway will struggle to shape an alternative learning pathway or navigate into an environmental job. The data depict how qualifications shape who enters the sector, and where and at what levels. This is an issue of concern, as the DEA (2010) study, for example, identified up to 30 000 entry level employees working in local government alone. Case study-based empirical research has shown that there are almost no learning pathways available for these workers in the environmental sector (Mohanoe, 2014; and Paper 5, in this Bulletin). This is also a concern given the status of scarcity of environmental technical occupations noted above and in the DEA (2010)

⁷¹ School-leaving certificate.

study. It creates a 'missing middle' scenario, meaning that it is difficult to enter into or qualify at entry or technical levels for environment and sustainable development learning pathways, a scenario which is deliberated further in Ramsarup (2016).

Location of environmental qualifications in NQF sub-fields

The results of the qualifications-mapping exercise that was performed to establish where these qualifications are located in terms of sub-fields, are captured in Figure 2 below. In Figure 2, the sub-fields have been ranked in descending order from the one with the highest number of environmentally related qualifications to the one with the lowest.



Figure 2: The distribution of environment/sustainable development qualifications across NQF sub-fields [Source: Ramsarup, 2017]

The data showed that environment/sustainable development related qualifications cross several sub-fields of the NQF, including mining, forestry, agriculture, nature conservation, and environmental science, *etcetera*. Most qualifications were located in Primary Agriculture (157), followed by Life Sciences (97), with Nature Conservation third (95

qualifications), and Environmental Sciences fourth (89). Nearly 49% of the qualifications are located in these four sub-fields. The rest were spread out (albeit unevenly) across several sub-fields. The sub-fields with the least number of qualifications (one qualification each) were Rural and Agrarian Studies, Public Policy Politics and Democratic Citizenship, Procurement, and Curative Health. This distribution reflects the cross-sectoral nature of environmental education and training provisioning.

The location of most of the qualifications was in the Primary Agriculture field. This was to be expected given that in Primary Agriculture, there is direct use of natural resources and hence most of the qualifications would contain at least some content related to the environment. The same applies to Nature Conservation which ranked third. Generally, many qualifications were located in sub-fields that deal with environmental knowledge or application of knowledge in working with (conserving) natural resources or aspects of the environment. These qualifications were mostly in the science disciplines. Fewer environmental qualifications were found in the Social Science and Humanity sub-fields, for example, Justice in Society, Communication Studies, and Human Resources, to mention a few.

The data reflect a sector (Green Skills) that has overwhelming access points at NQF Levels 7 and 8, indicating that in the system environmental qualifications are viewed mainly as specialisations with post-graduate entry-points of entry. The data depict how qualifications shape who enters the sector, where and at what levels. The emerging pathway picture is one that favours single, traditional academic pathway trajectories, and one that constrains broad access, mobility and progression.

NLRD data (June 2013) reflected limited qualifications currently on the Occupational Qualifications Sub-Framework (OQSF), and no data were available on the possibilities of piloting new occupational qualifications. Data for the General and Further Education and Training Qualifications Sub-Framework (GFETQSF) reflected a scattering of environmental qualifications in three defined sub-fields: Agriculture, Water, and Wastewater and Mining.

This scenario of overemphasis on high skill qualifications constrains the emergence of a well-articulated provisioning system within the environmental sector by hindering the emergence of new or parallel learning pathways from technical into professional pathways, and by not providing connecting points for artisan pathways. It also reflects a lack of safety nets for students on an academic path and few options for second-chance pathways into the sector. This is an important point, too, given the large drop-off from the high numbers entering the Life Sciences, for example, who fail to graduate or enter post-graduate study and then cannot find employment (HSRC, 2009). This pattern relates also to an unsuccessful racial transformation project through improved education and training (since the start in 1994 of South Africa's democracy) as the drop out and drop off is mostly among those with poor primary education and these are in the majority, black students (Rosenberg, 2013, *pers com*).

Integral to a well-articulated and integrated system is the emergence of parallel and second-chance pathways, which learners can use to move through quality education and training provisions from Basic Education through the OQSF and Higher Education Qualifications Sub-Framework (HEQSF) contexts. Hoppers (2009) argued that they should be able to do this how, when and where they want to do so, to realise their chosen pathways.

The emergence of parallel and second-chance pathways is critical for enabling access to disadvantaged and marginalised learners, and is a matter of concern for education and training systems in Africa in general, and in South Africa in particular. At the *2008 Association for the Development of Education in Africa* (ADEA) conference, the importance of these alternate pathways within African deliberations on effective post-schooling systems, was raised (Hoppers, 2009). Broad access that caters beyond the 'privileged learner' (learners who gain easy access into Higher Education/PSET through quality schooling and adequate financial and system-wide support) is an important consideration in a country with 3,2 million youth 'out of education and work' (Cloete and Butler-Adam, 2012).

The data and discussion in this section have illustrated that the vision of the South African NQF has not yet been fully actualised in or for the emerging environmental sector, or for enabling wider sustainable development. There is a need to address the privileging of high skills clearly evident in the discussion. There is need to consider possibilities for access into the sector through qualifications at lower levels of the NQF, and for possible parallel and second-chance pathways into the sector as well as basic access into environmental learning pathways at worker level (Levels 1-4 on the NQF).

The next section considers another systemic niche area that has potential to enable or constrain the emergence of Green Skills learning pathways in South Africa and that also

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influences the emergence of multiple supply-side opportunities. This systemic niche area relates to the way that the occupational system is structured, and the following section explores the occupational framing of environmental occupations in more depth.

ORGANISING FRAMEWORK FOR OCCUPATIONS (OFO) ANALYSIS: DEFINING OCCUPATIONS

Occupations and the defining of occupations are a critical element in trying to understand learning pathways. As can be seen from many sectors other than the environmental sector (at present), underpinning seamless pathways is coherent occupational framing of sector-based occupations and skills provisioning. For the environmental sector, both occupational framing and skills provisioning are dependent on a coordinated approach to representing occupations in the environmental sector in the official systems of occupational framing.

To develop the data and insights reflected below, we studied the occupational data captured within the South African occupational framework known as the Organising Framework of Occupations (OFOs). We analysed the OFO database and its evolution over three years and shared observations from the data in various environmental forums (such as the National Environmental Skills Summit and the environmental sector's Human Resources Development network).

The OFO is a "coded occupational classification system" (DHET, 2012; 2010). Its emergence stemmed from the challenge of trying to find a common language and vocabulary to report, classify and describe occupations. Without a common language, it may be possible to get data on supply and demand from the labour market but it is not possible to interpret and analyse the occupational data to understand the patterns and skills development implications. The OFO is a key tool for identifying, reporting and monitoring skills demand and supply in the South African labour market, and its categories are used in the Labour Force Survey⁷² and in the collection of national census data.

Green jobs are not homogenous and have different skills needs. Understanding these skills needs in relation to the greening of work is difficult without consistent, coherent and comprehensive occupational information. To enable the research programme to develop a

⁷² A quarterly survey conducted by the state agency, Statistics South Africa (STATS-SA).

more nuanced idea of the dimensions of skills that need to be addressed when we look at greening occupations, we used Greenwood (2008) who outlined four areas that need to be reviewed when looking at skills specialisation in an occupation: (1) the field of specialised knowledge required; (2) the tools and machinery used; (3) the materials worked on or with; and (4) the kinds of goods and services produced. The concept of specialist skills is important as it enables the evelopment of a more nuanced idea of the dimensions of skills that need to be addressed when looking at greening occupational skills.

Reflecting on the emergence of green occupations in the OFO

The discussion in this section highlights some of the critical issues that underpin green occupations within the OFO.

The 2013 OFO (DHET, 2013) was substantially different from earlier analysis (DHET, 2010) with growing representation and recognition of green skills. A study of the 2013 OFO (DHET, 2013) reflects a growing emergence of new environmental occupations as compared to earlier versions as well as a very clear fore-grounding of environmental occupations within the OFO. The 2013 OFO draws on the American Standard Classification of Occupations (ASCO) to define and categorise 'green' occupations. The 2013 OFO makes the distinction between 'green occupations' and 'occupations needing green skilling'. Green occupations, of which there are 96 listed in the 2013 OFO, are described as follows ecosystems (DHET, 2013:12):

Green occupations have as their direct purpose the nationally identified priorities and initiatives of reducing negative environmental impact and contribute sustainably to environmental, economic and social sensitive enterprises and economies. This includes occupations with descriptors that directly reflect and contribute to the maintenance of processes related to national initiatives to:

- develop and adopt renewable sources of energy;
- reduce consumption of energy, fossil fuels and raw materials;
- enhance energy and resource efficiency;
- reduce greenhouse gas emissions;
- decrease waste and pollution;
- · recycle materials; and
- prevent the loss of biodiversity and restore ecosystems.

Despite this reflected progress between 2010 and 2013 in including green occupations on the OFO, it is critical to note that throughout the study period we were not able to source aggregated data on environmental occupations in South Africa, hence the need to draw on the American Framework. Although this has been useful in bringing green occupations to the fore, it has also resulted in several issues identified in further analysis including the following (Ramsarup, 2017):

- Game Ranger (which is actually not an occupational title used in South Africa, where the title 'Park Rangers' is used) is classified as a Skill Level 5 professional occupation. South Africa has approximately 3 000 Park Rangers employed in national and provincial parks that do not have a Grade 12 (school-leaving) qualification (as South African conservation organisations are committed to drawing labour from neighbouring communities). These individuals cannot be mapped to the existing occupation and no intermediary or lower skill occupation exists.
- Environmental Engineer (which was added from the international framework) has no designation currently in South Africa apart from a specialisation in Civil Engineering, thus the sector was unprepared and unaware of how to respond to this occupation.
- Some environmental occupations have emerged organically, and continue to operate from the periphery of the education and training system eg. Environmental Educator which is an established community of approximately 2 000 employees in South Africa. This, however, remains an uncategorised occupation. Environmental Educators need a combination of skills from the sub-fields of environmental sciences and education. Thus, two patterns of emergence are observed in the OFO framing of this occupation: officially some regard Environmental Educators as miscellaneous educators, and some regard them as an alternative specialisation of an Environmental Manager. This has subsequently resulted in a split in terms of where the occupation could be located with the Culture, Arts, Tourism, Hospitality and Sport Sector Education and Training Authority (CATHSSETA) or within the Education, Training and Development Practices Sector Education and Training Authority

(ETDPSETA) respectively⁷³. Within the transitioning system, sector initiatives have hence endeavoured to apply for two differentiated occupations:

- Environment and Sustainability Practitioner (CATHSSETA)
- Environmental Training and Development Professional (ETDPSETA)

However, this application process has not yielded any success in the last two years affecting the provisioning of training for this occupation, especially at entry level, which in the past has provided for environmental education in community education contexts

Owing to the 'newness' as well as the lack of a co-ordinated approach to environmental occupations, there is very little available knowledge on the profile of environmental occupations and the systemic integration of these into broad occupational frameworks. This has resulted in considerable contextual variance in occupational titles, occupational tasks, entrance requirements and general sectoral knowledge of an occupation. This variance has created difficulty in finding a common language or reference framework for discussions on employment trends and statistics in the sector, a problem also experienced when conducting research for the Environmental Sector Skills Plan (ESSP). Current occupational listings are very operational and require a strategic review with futuristic perspectives that are currently absent.

In the 2013 OFO, new emerging occupations, eg. Environmental Impact and Restoration Analyst, and Environmental Engineer, are reflected mainly at the high skills/professional levels (DHET, 2013). What emerges is a picture of a highly skilled sector, and there is fairly extensive coverage of highly skilled professional occupations reflecting growing specialisation in the environmental sector.

Of concern, however, is the fact that in the 2013 OFO (DHET, 2013), there is still *very little representation of environmental occupations at intermediate and elementary skill levels* (Ramsarup, 2016). Environmental occupations appear scattered and are not visible across skills levels. The occupational descriptions and titles listed under Environmental Science Technician (which is the primary environmental occupation in the technical major group) suggest unclear connections to higher and lower skill levels. This reflects an imprecise picture of feeder occupations; currently the only

⁷³ The qualifications that lead to these occupations need to be linked to a SETA for quality assurance purposes

possible feeder elementary occupations listed are Rubbish Collector, Refuse Sorter, Waste Material Sorter, or Environmental Practices Inspector – and there are unclear linkages into professional occupations eg. Environmental Scientist. In the career pathing within a provincial park, for example, the Environmental Technician position requires a National Diploma according to organisational career paths, and is career pathed to an Environmental Scientist, which requires a Master's degree according to the organisational career paths. Thus, it is possible to see the carry-over of this problem into the Human Resources practices within workplaces.

This lack of clarity reveals poor knowledge of the systems of practice at intermediary occupations levels, and poor occupational differentiation. Discussions at practice level reveal that there is, as yet, a poor knowledge of the scope of occupations at these levels⁷⁴ so they are often mapped incorrectly by Human Resource personnel.

What is important about this is that this clear differentiation enables a sector to plan and plot clear connections within occupational families; it enables better Human Resource practices in terms of career pathing, and enables the collection of coherent labour market information.

An issue that has also not been addressed is the poor representation of social-ecological occupations. This is despite the environmental sector being recognised as an interdisciplinary sector and the environmental sciences essentially being oriented towards social-ecological systems approaches (Steffen *et al* 2011). In addition, national policies require social-ecological responses to environmental concerns eg. the National Climate Change Response White Paper of government, (DEA, 2011). Many environmentally linked occupations currently represented are scientists requiring a science learning pathway. Occupations linked to community conservation, social ecology, stewardship, rural development, climate change adaptation *etcetera*, are not represented on the OFO. This restricts the visibility of Green Skills and opportunities for movement for students with a social sciences pathway.

Furthermore, the systemic knowledge and flow of information from the labour market (employers) was found to be problematic. The flow of information from employers through Workplace Skills Plans, into Sector Skills Plans, into a framing of systemic information,

⁷⁴ Workshop observations of ten days of the Environmental Sector Human Resources Development Network (Ramsarup, 2017, study data).

is a process which has inherent flaws (see further detail in Paper 5, in this Bulletin).

The data presented and discussed here suggest that key starting points for addressing the need for improved learning pathways for Green Skills or environmental jobs in the sector involve:

- 1. clarifying environmental occupations by getting accurate reports received from employers on the demand and supply of jobs;
- 2. consolidating information on environmental occupations that can be mapped to the OFO and used to correct erroneous mappings as outlined above;
- comprehensive representation of environmental occupations on the OFO, based on clear descriptors of differentiated occupations and associated progression pathways (as is the case in other sectors such as Agriculture and Mining); and
- 4. ensuring the availability of different education and training options within a more co-ordinated systemic framework for Green Skills development, that address the imbalance between existing high skills and the rest of the skills system.

UPSKILLING – SHORT COURSE CULTURE

Environmental employees are constantly faced with new challenges in old jobs. These new challenges relate to increased environmental degradation, growing organisational mandates and decreasing budgets and capacity to respond, new legislation with inadequate capacity to implement it, and new concepts, processes and technologies as well as new issues (Ramsarup, 2017 [study data]; Mohanoe, 2014 [study data]; Maphinyane, 2014 [study data]). The demand for skills upgrading is also related to inadequate quality and relevance of provisioning in the existing qualifications streams (DEA, 2010). Practitioners, for example, report that environmental management degrees are too 'theoretical' and there are inadequate linkages between what is taught in courses and what happens practically on the ground (*Ibid*.). Rosenberg (2013, *pers com*) proposed the need for 'T-shaped professionals' which are professionals with depth in one area and breadth in another.

Short courses have been used to 'upskill' or 'keep up' with rapidly changing skill needs, and there is an on-going proliferation of these in the sector (DEA, 2010). Few of these environmental skills programmes are funded or supported by SETAs as reflected in Sector Skills Planning and as also reported in the ESSP research (*Ibid*.). Elementary occupations seem to be relatively neglected in terms of environmental skills development as already noted, and as found in related empirical studies (Burger, 2017; Fourie, 2017; Maphinyane, 2014; Mohanoe, 2014). Short courses are so widely utilised in the sector that one can describe the sector as being characterised by a 'short course culture'. It appears to be the only mechanism for development of new skills in the sector (DEA, 2010). Figure 3, based on research undertaken for the ESSP in 2010 (*Ibid*.), illustrates this.

What is important regarding short courses, is that they need to be 'articulated short courses' (SAQA-DUT, 2017). Articulated short courses are part-qualifications that could be undertaken as stand-alone courses, while at the same time being integral parts of full qualifications. The danger of *not articulating* short courses, is that they might lead learners to 'dead ends' in learning-and-work pathways.



Figure 3: Short courses offered in the environmental sector (Sample of 155 environmental short courses), according to broad categories⁷⁵ (Source: DEA, 2010)

<u>KEY:</u>

ERM – Environmental Risk and Management

Law - Environmental Law, Compliance and Enforcement

EIA – Environmental Impact

Tourism – Eco-linked Tourism

Agric - Environment and Agriculture/soil related

Water - Water, Wetland, Coastal and Marine

Biod. - Biodiversity, Ecology, Geology

Waste - Waste Management

CCRM - Community, Conservation, Resource Management

EE – Environmental Education

SD – General Sustainable Development

Poll. - Pollution (air, water); Environmental Chemistry

Energy – Renewable Energy

GIS – Geographic Information Systems

Stats - Environmental Statistics

Heritage - Natural Heritage

Rhab. – Rehabilitation

Field – Field Assistant, Ranger

It is critically important for occupations to undergo substantial changes for the transition to a Green Economy, as reported in international studies such as those undertaken in the European Union for Cedefop (Cedefop, 2013), and the ILO studies on Green Skills (ILO, 2011). These changes will have skills development implications. The depth of the training needed will be proportional to the extent of skills change needed. Firstly, there will be a qualitative change where an increased demand is observed in some occupations; this will require increased training in existing occupations (*Ibid*.). Changing established occupations will require on-the-job training or short course training. New and emerging occupations will require initial degrees/training and longer term formal learning programmes (*Ibid*.).

The ILO (2011) has provided a framework for understanding the type of skilling intervention that will be required in the transition to a Green Economy, shown in Table 2 below.

Degree of Skill Change	Occupational Change	Typical Skills Response
NONE	None or only quantitative	None or increased training in
		existing occupation
LOW	Changing established	On-the-job learning or short
	occupation	training courses
MEDIUM	Changing or emerging	Short courses or longer
	occupation	continuous training
HIGH	New and emerging	Initial training, university
	occupation	Degree or longer continuous
		training

Table 2: Training needs for changing and emergent green occupations (Source: ILO, 2011)

Reflecting on the extensive skills needs outlined in Table 2 will require coherent articulation between environment and skills development systems to ensure the skills remain responsive to the rapidly changing work and job roles.

RELIABILITY OF OFFICIAL STATISTICS

In the absence of reliable national statistics on the environmental sector employment and skills demands, the ESSP research (DEA, 2010) information on employment and skills demands in the sector was constructed from a variety of sources including:

- studies of the size and shape of the environmental goods and services sector;
- PERSAL data;76
- annual reports and annual training reports to SETAs from parastatals which are key employers in the sector;
- Small, Medium and Micro Enterprises (SMME) employment data,
- local municipality data on the skills required for levels of environmental management functions, and
- corporate employment data relating to sustainability reporting and environmental management functions.

Through triangulation of the composite mix of these data sources, it was possible to develop a fairly rough perspective on Green Skills demands and learning pathways in the environmental sector (Lotz-Sisitka, 2012 *pers com*).

This work illustrates that there is no one source of official data in this regard in South Africa, and even with the availability of multiple sources of data "it is very difficult to be categorical in the absence of clearly defined professional or occupational boundaries" (Lotz-Sisitka, 2012 *pers com*) and associated official sources of data regarding labour market analysis, monitoring and reporting. As already argued, for rigorous and comprehensive data, a systemic approach to Green Skills development and planning are needed.

An additional systemic element influencing Green Skills learning pathways is the efficacy of career guidance and development systems.

ENABLER FOR SEAMLESS PATHWAYS: CAREER DEVELOPMENT SYSTEMS

The OECD (2000) has identified career guidance as a key feature of effective transition systems and thus learning pathways. This raises the importance of career guidance as an institutional factor impacting on the character, quality and effectiveness of learning pathways. Effective transition systems have well organised pathways that connect initial education/training with work and further study, and widespread opportunities to combine workplace experience with education/training. Thus, international best practice

⁷⁶ State personel employment and salary system data, which includes data on environmental occupations and vacancies in key occupations.

frameworks advance the importance of good information and guidance and tightly knit safety nets for those at risk (OECD, 2004; OECD, 2000).

The provision of professional career guidance services remains a central tenet of the NQF in South Africa. Prior to the new NQF Act promulgated in 2008, the responsibility for career guidance was shared between the Departments of Education (DoE) and Labour (DoL) (Crossland, 2006). The National Skills Development Strategy III (DHET, 2011:5) provides a clear mandate for career guidance as it aims to "encourage the linking of skills development to career paths, career development and promoting sustainable employment and work progression". A Memorandum of Agreement between SAQA and the DHET in 2010 led to the establishment of the NQF and Career Advice Services Project which provided expanded affordable (free public access to) information, advice and guidance on the NQF and careers by means of a multi-channel service that included walk-in, telephone, email, career exhibition events, radio, television, print, and social media channels. The Project was funded by the National Skills Fund, commenced on 01 September 2010 and continued to 31 October 2013, in which time it reached over two million people per year. It has since been located within the DHET, as the National Career Advice Portal. Learners can key in learning programmes/ courses, and the Portal will identify which occupations these learning offerings lead to, alternatively, learners can key in occupations, to see which gualifications are needed to feed into the occupation chosen.

Reviewing career development of environmental careers

This section considers environmental career development in two key areas – schoolbased and university-related. There are little information and data on career information in work progression, a gap that Ramsarup (2017) aimed to fill in the context of two occupational trajectories. This study (*Ibid*.) potentially provides a methodology or way of beginning to review, other environmental occupations, in terms of how the occupations are structured and currently and potentially constructed, which may provide useful career orientation resources, especially for career information in work progression contexts.

School-based environment/sustainable development career advice

Insights from an assessment of a school-based career programme (Green Matter, 2012), show that mainstream career guidance resources tend to include mainly basic

and common environmental careers. An example is the examination of science and technology careers by Sci-Bono Science, a technology education centre in Johannesburg, South Africa, which revealed that no major environmental careers had been integrated into their career resources (GreenMatter, 2012).

In 1991, the Department of Education (DoE) endorsed the PACE⁷⁷ career package produced by a private company, which had a relatively extensive range of all careers; however, the careers were all high-skilled, scientific and tended to imply the need for a Bachelor of Science (BSc) degree. This, it can be argued, suggests to learners that the broader scope of careers in the environmental sector reside within a science-related pathway. No intermediate-level (artisan or technical) careers featured except for the Environmental Technician. Furthermore, no Social Science or Community Conservation careers were highlighted – areas of work that encompass the social-ecological dynamics of environmental occupations such as Social Ecology or Community-Based Natural Resource Management or community conservation were not featured. This reflected systemic patterns and absences which remain dominant.

Available resources on environmental careers have been developed largely by environmental sector partners, for example the DEA careers booklet, *Enviroteach* magazines, and Mpumalanga Parks booklets. These items rely heavily on the capacity of the partners to reach schools. They are often distributed during teacher workshops. A key challenge in the distribution of the resources was locating an appropriate teacher for the resources (Rosenberg *et al* 2009; Togo, Ramsarup & Malema, 2012). Interview data (Rosenberg, 2013, *pers com*; Ramsarup, 2017 [study data]) showed that often career guidance in schools is regarded as the responsibility of the Life Orientation teacher but the environmental career resources were being distributed to Science and Geography teachers in environmental workshops.

Rosenberg *et a*l (2009) raised the challenge that due to its 'newness', teachers and department officials have very limited knowledge of the current scope of environmental careers. Thus, they receive resources from environmental agencies but are often unable to mediate them appropriately. It has also been found by career orientation studies (*Ibid*.) that knowledge and awareness of environmental careers in the environmental field is one the most significant factors limiting student choice (*Ibid*.). This affects not only students

⁷⁷ PACE was founded in 1991 and provides accredited career guidance training for career practitioners. It offers a wide range of career related products and services.

in high schools but also students in Higher Education Institutions (HEIs), as shown in the recent study by Dotwana (2015).

Environment/sustainable development career advice in Higher Education Institutions (HEIs)

Dotwana (2015) found that Honours Degree level Botany and Zoology post-graduate scholars had little information on biodiversity careers or scarcity in the sector. This lack would affect their decisions as to whether or not to continue into Masters level studies.

The 'newness' aspect is important to consider more carefully as many entrants into the environmental sector will be first generation entrants; they have little social capital on these careers and the type of work people do in the field. In historically disadvantaged households in particular, there may not be many social network examples of people involved in these careers beyond conservation jobs like Park Rangers. This highlights a need for more job shadow programmes and coherent career guidance at all levels of the system, particularly if the sector is to address its transformation imperatives. This is especially the case at professional employment levels but also to create more equitable forms of access and entry to the Green Economy as proposed by Death (2014).

Insights from an assessment of university-based career programmes by Togo *et al* (2012) found that career guidance initiatives were focused on school-going youth, and that many Higher Education students lacked information about biodiversity careers and were unable to map suitable study and career pathways for themselves. Eksteen (2013, *pers com*), the co-ordinator of the World Wide Fund university careers programme, supported these findings and further highlighted that limited information for study and career planning among students may be a factor in graduate unemployment. The discussion below (*Ibid*.) highlights some of the issues:

... Students particularly struggled to see entry routes into the sector. Particularly those with first Degrees. As a result, they often take jobs according to opportunity rather than preference. Most people's career paths are not strategically mapped. Some students try to 'tailor make' their Degrees according to what the sector needs; in their postgrad year they are not sure which specialism to select or whether it is useful to specialise. They are advised by lecturers but it would be nice if they can hear this from sector experts ...

The Togo *et al* (2012) research found that university career centres lacked resources and counselling staff with expertise to advise university students on environmental careers. In this study (*Ibid.*), we sent interns into five urban university career centres with questions on how to become an Environmental Economist, Environmental Engineer, or Biodiversity Planner. It was alarming to see that none of the five university career centres were able to provide coherent career information or resources on the named careers. The interns were advised to study for a generic BSc Degrees and then specialise, and were given no clear guidance on options. Two universities referred interns to faculties to gather career information.

Dotwana's (2015) study, involving black women Honours Degree graduates in Eastern Cape universities, confirmed that there was little understanding of biodiversity careers or why these might be valuable amongst black women graduates at Honours level, a factor also impeding their choices to continue to Master's level studies in this field/sector.

McKrill's (2015) study showed that knowledgeable lecturers who were concerned with students' well-being and career prospects were important for guiding university students into scarce skill occupations, and they played significant roles in orienting students to the professions. However, this relies on the 'good will' of a good lecturer, and it cannot be assumed that all lecturers are willing or able to play strong career guidance/mentoring roles, hence there is a need for more systemic interventions for career guidance. Such guidance could also exacerbate inequality as not all universities or lecturers would do this equally and hence perpetuate unequal access to information and opportunity – hence the need for an open access national source of career information that gives clear environmental information. The DHET's National Career Advice Portal is ideally placed to offer such advice.

Environment/sustainable development career advice across NQF Sub-Framework contexts

In 2014, the Energy and Water Sector Education and Training Authority (EWSETA) commenced a two-year research project to investigate all the learning and occupational pathways linked to the Energy and Water sector. This information was later fed into the National Career Advice Portal within the DHET. The extent to which these pathways accommodate Green Skills is not known.

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The insights highlighted in this paper relate significantly to how pathway elements signal learners, which, as discussed earlier (in Paper 6, in this Bulletin), is an important element of pathway construction. This section has raised the need for continued focus on availability of career information across the whole pipeline. It also raised evidence on the paucity of information for students seeking specialisations and guidance towards end of their Degree studies, as they seek access to specialisms.

RESHAPING SUPPLY SYSTEMS FOR GREEN SKILLS PROVISIONING TO SUPPORT ENVIRONMENTAL LEARNING PATHWAYS

Across this paper, I have presented data to illustrate some of the *patterns of emergence* that are visible in the context of key systems level elements and related interventions and dynamics. As indicated, these are selected elements of mainly the supply systems supporting Green Skills learning pathways construction and development. The system elements discussed are not static, but are emerging in response to the wider emergence of a Green Economy and the demand for sustainable development in South Africa, and also in response to increased concern about the social-ecological condition shown in the discourse around the need for skills for climate resilience (DEA, 2011). Understanding these as dynamic and emergent niche level system elements with emergent properties within a wider laminated system⁷⁸, can potentially facilitate improved and more proactive approaches to Green Skills planning and development (Ramsarup, 2017).

This paper has highlighted the absence of clear understanding of the complex multifaceted nature of the environmental sector and the nature of the different jobs needed across the sector (now and in the future) coupled with an understanding of the system that produces and uses environmental professionals. The ESSP for South Africa (DEA, 2010) identified the need for better skills information. Without this labour market information, we cannot enable improved or more pro-active skills planning and/or systemic articulation, a point which has been made in the papers across this Bulletin and elsewhere (Ramsarup, 2017; Rosenberg *et al* 2016).

Based on the discussions above, enhanced systemic capacity to provide for good labour market information will enable a better understanding of the skills mix (across levels of skills) needed in the sector. This recommendation is strongly supported by the ESSP for

⁷⁸ Paper 8 in this Bulletin includes a detailed explanation of 'laminated systems'.

South Africa (DEA, 2010) and it provides the impetus for the recently established National Green Skills Research Programme funded by the Green Fund and the Development Bank of South Africa⁷⁹. It is well understood that the environmental skills needed today may not be the same as those needed in future, given the rapidly changing social-ecological context. This may require innovation with a futures perspective, in labour market intelligence system designs (Cedefop, 2012; Rosenberg *et al* 2016)⁸⁰.

Another key finding of the studies (DEA, 2010;Rosenberg *et al* 2016) is that South Africa's environmental sector is a significant employment sector that currently has almost no formal system of skills planning – and it remains a viable employment sector with almost no skills development co-ordination. If it includes water occupations, the sector is comparative in size to the Mining sector: approximately 230 000 or more people are employed in specific environmental occupations, *excluding* water sector employees, and new emergent green energy and Green Economy occupations and skills, which as noted, could rise by approximately 380 000 in the near future. If water sector, new Green Economy projected employees, and existing environmental sector employees, are to be consolidated, *we could be looking at a sector of up to 800 000 employees*. As mentioned, a recent study undertaken for the biodiversity sector indicates 406 000 employees in biodiversity-related occupations alone (Driver and Mukhadi, 2017).

As already noted, the environmental sector is generally poorly quantified from an employment perspective because of inadequate labour market analysis instruments. The Statistics South Africa (STATS-SA) systems do not capture the diversity of environmental occupations, owing to their poor definition in the OFO and other systems for national statistics, due to their emergent and 'new' nature: few of these occupations existed in their current form 15-20 years ago.

In addition, the sector is complex. It involves two types of skilling, for (1) new Green Skills development for specific occupations, and (2) the 'greening' of existing skills and occupations. It is both cross-disciplinary and cross-sectoral. In addition:

 crosses disciplines and education/training sectors (General and Further Education and Training; Technical Vocational and Education Training [TVET], Higher Education and Training, and other learning for Trades and Occupations);

⁷⁹ See www.greenskills.co.za

⁸⁰ See also www.greenskills.co.za

- crosses industrial sectors (all industrial sectors have a 'Green Skills mandate' and it thus has implications for all SETAs);
- crosses sectors of society, a large public 'social good' sector, and the private sector, and
- from a public sector perspective, crosses public sector institutions and involves all levels of government: most government departments have a responsibility for mainstreaming environmental concerns, ensuring sustainable development and contributing to a green, climate resilient development path.

Despite this extensive and complex mandate, to date no adequate co-ordination mechanism has been established for the national planning and development of Green Skills in South Africa. This has implications in terms of demand and supply analysis and provisioning, and is leading to substantive mismatches and a general situation of inadequate coherence. It has significant consequences for South Africa's longer term capacity to implement the Sustainable Development Goals (SDGs).

CONCLUSION

Paper 7 has explored priority systemic elements and raises several key potential leverages for further change and development of the already dynamic emerging Green Skills system in South Africa, for example, occupational differentiation; better labour market information; improved skills planning; improved environmental career guidance; effective coherent provisioning that could all enable multiple entry and multiple exit points, and support for an improved learning pathways model.

The paper has outlined the innovative emergence of Green Skills elements in the provisioning of occupations; qualifications; career guidance and skills sector information flow. The paper thus provides a context for how these Green Skills developments within the mainstream education and training system can be understood. It has further illustrated some of the key lock-ins in the different system elements and thus provides a leverage point for understanding transformative praxis possibilities.

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NOTES

PAPER 8

An Expanded Methodological View on Learning Pathways as Educational and Occupational Progression: A 'Laminated Systems' Perspective

Dr Presha Ramsarup and Professor Heila Lotz-Sisitka

INTRODUCTION

As shown across the collection of papers in this Bulletin, the central question that the South African Qualifications Authority (SAQA)-Rhodes University research programme tried to explore was to understand the nature of environmental learning pathways and the systemic and agentive factors that shape their emergence. This was based on an emerging understanding of the demand for environment and sustainable development occupations and greening of existing occupations (see Introduction, and Papers 1 and 7 in this Bulletin; Department of Environmental Affairs [DEA], 2010; International Labour Organisation [ILO], 2010; Rosenberg *et al* 2016).

In attempting to characterise the complex nature of environmental learning pathways we a used a mix of theoretical perspectives as outlined in Papers 1, 2, 3 and 4 in this Bulletin, with Critical Realism (see Paper 2) as the constant underlabourer. The Critical Realist work deepens the systemically articulated view and understanding of learning pathways emergence, in the context of the transversal issue of environment and sustainable development, in the South African National Qualifications Framework (NQF). The methodological and theoretical perspectives enabled us to portray environmental learning pathways as encompassing educational and occupational progressions. Using this approach ensured that we engaged meaningfully with learning pathways as complex social phenomena within open systems⁸¹.

As noted in Papers 2, 3 and 4 of this Bulletin, a central methodological concern that we uncovered in learning pathways research was the difficulties of empirically researching learning pathways in a way that crossed the micro-macro divide, and that could overcome the bifurcation of research foci on the empirical career story versus the wider system study.

⁸¹ For a discussion on open and closed systems, see Paper 1 in this Bulletin.

To do this, we explored boundary crossings and the mechanisms that hold boundaries in place, dialectical Critical Realism and Bhaskar's (1993) notion of absence, as is reflected across the papers in this Bulletin. We worked with these perspectives across several different case studies (not all the detail is captured in this Bulletin). Below is a summary of the key findings across the research programme's case studies, and a synthesis towards a model for learning pathways research, which offers a way of synthesising educational and occupational learning pathways conceptualised within a laminated system framework.

SUMMARY OF KEY FINDINGS ACROSS THE RESEARCH PROGRAMME'S CASE STUDIES

In all of the case studies in the research programme we identified the following dynamics associated with learning pathways.

- It was important to gain an in-depth understanding of the learning and • occupational pathway experiences of workers, supervisors, managers, and specialist practitioners in a range of environment and sustainable development occupations to understand how people were/were not progressing along the pathways. There was also a need to investigate the 'voices in the workplace' to understand how boundaries were being crossed, or not, and to understand the absences and constraints that were impeding movement along, or access to viable learning pathways for sustainable development. We shared examples of the significance of taking account of the 'voices from the workplace' in Papers 1, 4, and 6 in this Bulletin. Noting that while many people were aware of the potential of environment and sustainable development learning pathways for improving their work, their careers, and society more broadly, they were suffering from various difficulties in constructing these learning pathways from an agencycentred perspective. This indicated that learning pathways construction is not a voluntarist activity, but requires often quite complex agentive navigations of structural conditions (Archer, 2000). Enabling these structural conditions to be less cumbersome, as discussed in Papers 5, 6 and 7 in this Bulletin, could enhance agentive possibilities for uptake in such learning pathways.
- It was also important to develop an understanding of the changing nature of work and occupations, as environmental legislation and other influencing factors such as climate change, water scarcity, zero waste policy, and rehabilitation policy

in the mining sector influenced and generated the demand for new practices and occupations more widely. For example, in the study by Maphinyane (2014), the need for more coherent approaches to learning pathways development for rehabilitation practices in the mining sector was acknowledged. Burger (2017) identified the need for more coherent and better supported learning pathways development for entrepreneurs emerging out of managing ecosystems in the Working for Ecosystems Programme, while Fourie (2017) identified the need for more coherent and better articulated links between environmental training in the Expanded Public Works Programme (EPWP) programmes and viable Green Economy job opportunities.

Equally important was to develop an understanding of how the Post-School • Education and Training (PSET) system was operating in response to the emerging demands for environment and sustainable development learning pathways. Here we found many initiatives that were supporting the emergence of environment and sustainable development learning pathways, especially articulated short courses, and some gualifications mainly at Higher Education level. We also found that professional associations were very influential in structuring especially the high skills learning pathways such as those for the Environmental Engineer and the Environmental Scientist (Ramsarup, 2017; see also Figure 2 below). At the systemic meso level, we found a 'missing middle' (Ramsarup, 2016; Ramsarup, 2017; Paper 7 in this Bulletin) or significant absence of gualifications and provisioning for environmental and sustainable development technical occupations. This finding was pointed to in the DEA Environmental Sector Skills Plan (ESSP) (DEA, 2010), but was confirmed through the case study research and systems analysis work in this research programme. Additionally, we found a fragmented approach to systemically responding to the emerging demands for environment and sustainable development occupations, with significant consequences, especially a pattern of extended transitioning ie. it was taking people much longer to access environment and sustainable development learning pathways than would have been the case if the education and training system had been more prepared for this transversal issue. There was a general lack of systemic planning involving demand analysis, occupational provisioning, adequate gualifications development, professional association engagement and more, which hampered (and is still hampering) the emergence of learning pathways for environment and sustainable development work and

learning in South Africa. This pattern was visible in all the case study sites, and affected Environmental Engineers and Environmental Scientists (Ramsarup, 2017, and Paper 6 in this Bulletin), workers, supervisors and managers in local government (Mohanoe, 2014), rehabilitation practitioners in the mining sector (Maphinyane, 2014), EPWP training beneficiaries and contractors (Fourie, 2017) and EPWP entrepreneurs and entrepreneurial managers (Burger, 2017) equally. The poignant implications of this reality are captured in this paragraph from the study by Fourie (2017) writing in the EPWP context:

Beneficiaries expressed that they did not know how to progress from one job to another, or specifically into environmental (green) work ... This is a major social constraint the uncertainty of how to move forward, in particular when combined with the social constraint of not having a matric exemption was mentioned by beneficiaries. "I just don't know where I can apply for it (plant nursery work), so it is difficult ... ja. I do want to go to school too, and I also like to do lesson training. Because it's starting at Grade 10, Home Based Care. I'd love to do it. But, I have no money and now I'm not working again" (Fourie, 2017 [study data])

- We have, through emerging studies in the green skills research programme, discovered that this affects other sectors and a wider range of occupations including in the mining sector, the paint sector, public procurement and others⁸². Overall, this has significant implications for South Africa's ability to address the recently proclaimed Sustainable Development Goals (SDGs)⁸³, which form a key part of the National Development Plan (NDP) (Republic of South Africa [RSA], 2011). Critical system elements that can be improved to 'fast track' to synergise a more coherent approach to learning pathways for environment and sustainable development occupations were found to include: the Organising Framework for Occupations (OFO), the Career Information System, qualifications design and development, and improved demand analysis at sector and workplace levels (see details in Paper 7 in this Bulletin).
- All the above could not be understood without a wider macro-level understanding of the changing environment, and the emergence of green work and learning

⁸² See www.greenskills.co.za

⁸³ See www.globalgoals.org

demands which were being generated through increased national and international understanding of the severe crisis that is being generated through ongoing environmental degradation, pollution, inequality, climate change and other issues that hold unsustainable and injustices in place (DEA, 2010; DEA, 2011). These are the wider 'drivers' of environment and sustainable development learning pathways in workplaces, and more widely also in civic engagement contexts. These same issues gave rise to the need for a national Environmental Sector Skills Plan which highlighted the important relationship between a pro-actively oriented skills system and wider capacity for sustainable development (DEA, 2010). Here we found that developing an understanding of the role of the PSET sector in transitioning societies (towards sustainability) to be a helpful lens (Ramsarup, 2017).

These broader findings show that learning pathways research needs to take account of these multi-leveled dynamics all of which are ultimately 'joined up' in the individual learning pathway (albeit in a variety of different configurations), but which also systemically provide perspective on how to support improved learning pathways into new transversal areas of demand in an NQF. These overview insights led us to reconceptualise our earlier systems thinking where we initially drew on Luhmann's (1995) differentiated system which emphasizes boundaries and boundary crossing (see Paper 2 in this Bulletin), to a Critical Realist laminated system framework which emphasised relationality across boundaries via dialectical processes of emergence (see below). This gave us with a way of providing a more in-depth perspective on how these multi-level dynamics, in a national education and training system oriented to educational and occupational learning pathways, interface and create emergence.

We therefore end this collection of papers in this Bulletin with an overview of the laminated system framework. It offers a further deepening of the Critical Realist methodological framework which we developed over the life of the research programme, as reflected across Papers 1-7 in this Bulletin).

LEARNING PATHWAYS – SEEKING A DEPTH ONTOLOGY

Through the literature work, the research programme was able to raise some of the theoretical limitations in the research into learning pathways (discussed in Paper 3), such as the dominance of an actualist ontology (focus on experiences and events) which

means that causal laws are defined in terms of empirical regularities and a 'logic of immediacy', with a focus on an actualist (event focused) ontology within the learning and work transitioning ideas. This ontological view is found wanting in terms of its explanatory power (Cruickshank, 2006; Bhaskar, 1993; Sayer, 2000). Furthermore the research programme sought to address the macro-micro dilemma evident in the field of research practice, without surrendering to reductionist conceptualisations of learning pathways.

Engaging the critique outlined above, the research programme needed to use conceptual tools that allowed for stronger engagement with a depth ontology, emergence, historicity, causality and possibilities for transformative praxis (Bhaskar, 1993; Shipway, 2010). To do this, we drew on the recommendations of Price (2007), Lotz-Sisitka (2009) and Schudel (2012) who emphasised that environmental education research needs to have a stronger, wider ontological referent for its environmental, educational and social change concerns. It was important to note that both the generative mechanisms of the real and the events of the actual are not necessarily reflected in the experiences of the empirical. Therefore, one cannot rely on the empirical to reveal the causal effects of the research phenomenon (see Papers 2 and 4 in this Bulletin).

This allowed us to reflect on the limitations of using only middle range theory (transition theory, life course, learning pathways) (captured mainly in Paper 3 in this Bulletin) that would keep the research confined to the empirical contexts of the research with an ontology that is constituted by the realm of empirical events and the experience of these events, with no account for underlying causes or transfactual explanations. We thus continued to draw on Critical Realist meta-theory, which further enabled us to relate to the complex open systems context of environmental systems and to transcend the limitations of the middle range theory normally used in learning pathways research (see Papers 3, 4 and 6 in this Bulletin).

As mentioned in Papers 1, 3, 4, 5, and 6 in this Bulletin, Critical Realist underlabouring offered theoretical tools to work with the social world as a complex, open system (an idea that resonates with the multi-level perspective of transitions – see Paper 3 in this Bulletin). A closed system actualist ontology would imply that causal laws are defined in terms of empirical regularities as can be seen, for example, in the dominance of the large-scale tracer studies used in transitioning work. Through the Critical Realist stratified ontology of emergent properties, Bhaskar (1993) explained that causal laws exist *qua* emergent properties that exist in open systems. According to Critical Realism, causal

laws can interact in a number of ways in open systems, so the observed effect of causal laws are always contingent upon a particular configuration of causal laws having effects at a particular point in time (Sayer, 2000; Cruickshank, 2006). An important implication of this ontology is that powers can exist unexercised; thus what has happened or has been known to happen does not define what could happen, as explained by Sayer (2000:12): "... the nature of the real objects present at a given time constrains and enables what can happen but does not pre-determine what will happen … makes it possible to understand how we *could* be or become many things which currently we are not."

The Critical Realist layered ontology helped to create a more accurate depiction of learning and work transitioning as a social phenomenon. Thus, in summary, in the research programme the empirical work and domain theory was used to demonstrate the key problems, issues and inefficiency within learning pathway transitions in the selected occupations and the metatheory helped to develop a transfactual theory of why that is and how learning pathways for environmental skills could be re-imagined.

RECONFIGURING LEARNING PATHWAYS AS A LAMINATED TOTALITY

Critical Realists argue that reality is both stratified (real, actual, empirical) and differentiated; they are able to envisage structures and mechanisms operating at non-actual, but nevertheless real levels. Price (2012:4) explained that "in open systems a multiplicity of mechanisms (conditions, agencies), emergent at different layers of reality, is always involved"; it is this multiplicity that generates the complexity suggestive of open systems (see also Price, 2016; Bhaskar, 2010). Within this open system there are no laws with uniform effects, event regularity is rejected and key actors and their environments are changing constantly.

Bhaskar and Danermark (2006) described laminated systems as seven connected interactive levels. This Bhaskar (2010:7) further explained as various resolved components of a complex phenomenon which must in general be themselves analysed holistically ie. "precisely as components of the whole of which they are component parts". We hence used the Critical Realist notion of laminated systems to understand the complex nature of environmental learning pathways as constituted by several ontologically different and irreducible levels. This allowed us to resolve a complex situation into its separate yet related and emergent components so as to identify and relate the various mechanisms

as different levels of reality which enable and constrain emergence of learning pathways (Nunez, 2014).

Bhaskar and Danermark (2006) further argued that conceiving of social phenomena as laminations would help researchers contend with reductionism, as no one ontological level should be privileged in research (ie. we should not privilege system elements or career stories in learning pathways research, we should privilege both equally, along with other laminations). Laminated explanations he argued, would provide a rich variety of perspectives of the same object as they force researchers to examine different dimensions of phenomena as being constellationally connected (the career story and individual learning pathway, as clearly shown across the papers in this Bulletin, are constellationally connected to the system of education and training provisioning, and to the wider social-material context). Bhaskar and Danermark (2006) recommended case-specific disciplinary *ensembles* depicting laminated totalities. Nunez (2014:104) suggested that there is no *apriori* way in which reality produces complexity. Thus, the building of a laminated system does not follow a particular ordered approach; rather its formation is in direct relation to the explanatory concerns and the reality that determines them.

This Critical Realist underlabouring with laminated systems enables us to underpin a critique of the colloquial currency that the concept of learning pathways has gained in South African education policy, which has focused mainly on 'pathway engineering' which represents fairly "flat, actualist accounts ...", or a "purely positive account of reality" (Bhaskar, 1993:400) and inherently relies on a form of reductionism. The Dialectical Critical Realist perspective necessitates in-depth research and deliberation that enables us to look beneath what we see ie. the way a learning pathway is shaped or not shaped.

In Ramsarup's (2017) study this meant that to understand the nature of the environmental learning pathway within a transitioning system, she needed to conceptualise the learning work transitions in their laminated totality (Bhaskar, 2010:9-10). This is depicted in Figure 1 below which illustrates how the programme used the seven levels outlined by Bhaskar to reconfigure a conceptual framework for learning pathways research (Ramsarup, 2017). The reconfigured conceptual framework outlines four levels or laminations that, across the studies (as outlined above in the introduction to this paper) appeared to be crucial for including in learning pathways research within a 'constellational' open systems perspective involving emergence and boundary crossing practices. The laminations (levels) are (see also Figure 1 below):

- the level of the transitioning professional, which is constellationally related to;
- the level of **transitioning work systems and jobs**, which is constellationally related to;
- the **transitioning post-schooling system of education and training**, which is constellationally related to; and
- a transitioning society oriented towards sustainable development and a Green Economy, which is constellationally related to all the other levels in the laminated system.

The levels were conceived as transitioning so as to acknowledge the rapidly changing nature of the environmental sector and the reality congruent nature of changing work in the sector.



Figure 1: Understanding the learning and work transitions that shape environmental learning pathways as a laminated system (Source: Ramsarup, 2017)

A LAMINATED VIEW OF LEARNING PATHWAYS IN TWO CASE STUDY EXAMPLES

In structuring the case study examples of the Environmental Engineer and Environmental Scientist (Ramsarup, 2017) as illustrated in Figure 1 above, we tried to build a picture beyond the physical levels of reality, implying that pathways are constituted by these interdependent planes but also foregrounding the internal relations between the levels of a system. We thus began collecting data at the lowest level of analysis possible ie. we began by collecting data about individuals' career stories in each occupation and tried to develop a context-specific idea of how each person developed a learning pathway, the

decisions and choices, and transitioning experiences into their environmental jobs. We then mapped the career stories onto the laminated framework together with data from the key aspects of supply linked to each occupation (qualifications available, defining of occupation, career systems, representation in national education and training systems). This analytical work enabled us to raise generative mechanisms in the occupational and educational progression (linking the concrete singular to the concrete universal⁸⁴ within a laminated systems perspective).

By putting the parts together, we were able to discuss the learning pathway as a laminated totality which, from a Critical Realist perspective, would be a product of complex, context dependent interactions with what was present and what was absent as outlined in our exploratory Paper 4 in this Bulletin. Working with different levels of data together ensures that explanation is not reduced to a single level. The unit of analysis for the research shifts the analysis of the dynamic and dialectical processes of emergence and change that exist between the different levels. This ensures that the research focuses on the emergent processes in the macro-micro link, so the individual and the qualifications are not studied in isolation but together in the laminated totality of specific educational and occupational learning pathways. It is important that learning pathways are not reductively collapsed into an assemblage of their component elements, but rather that the dialectical relations in the laminated totality of the learning pathway be held together in the analysis.

Figure 2 below further illustrates how data at different levels of reality enabled us to deal with the multiplicity of causes and hence multiplicity of mechanisms to counteract coherently, issues of reductionism in the construction of the two occupational cases developed in more depth in Ramsarup's (2017) PhD study, one of which is described in Paper 6 in this Bulletin.

⁸⁴ See the descriptions of 'concrete universal' and 'concrete singular' in Papers 4 and 6 in this Bulletin.



Figure 2: Framing the cases within a Laminated System Framework - occupational cases (Source: Ramsarup, 2017)

In this research programme, the Critical Realist lens enabled us to shift focus from events that can be empirically observed and experienced, to developing a clearer picture of the mechanisms that have produced the events and experiences. Drawing from (a) the history and context, (b) the empirical reality that emerged from the career stories and (c) the systems overview, we used retroductive analyses from Critical Realism and tried to establish the causal mechanisms that could be influencing the learning pathways (as explained in Paper 3 in this Bulletin).

The nature of the learning pathway was then characterised as dialectically emergent. Emergence, as explained by Bhaskar (1993:397) is a relationship between two terms such that the one term diachronically or perhaps synchronically arises out of the other but is capable of reacting back on the first and is in any event causally and taxonomically irreducible to it. This means that the learning pathway that emerges is not reducible back to the qualifications/training/occupational mobility from which it emerged (so the emergent actual cannot be reduced to the real).

DRAWING THE THREADS TOGETHER

Learning and work pathways as 'constellational wholes'

The argument developed in this research programme has shown that environmental learning pathways are best conceived as a complex phenomenon, constituted by dialectically interdependent planes (dynamic interplay between what is present and what is absent and their interdependence). We have tried to illustrate that for a full understanding of environmental learning pathways, it was essential for us to refer to multiple levels of reality that exist, relate to and impact on each other as an articulated totality. As Bhaskar (2010) explained, there is not one level of causation for explaining phenomena; hence it is necessary to explain different mechanisms, structures and agencies and their relational emergence within a constellational whole.

Paper 6 in this Bulletin offers an illustrated case of the 'constellational whole' which makes up the Environmental Engineering learning pathway involving motives and experiences of the *individual transitioning professional* who shows an interest in Environmental Engineering; the *transitioning workplace*, where Environmental Engineering skills are in demand; the *transitioning post-schooling system* (with as yet inadequate provisioning for Environmental Engineering training); and *transitioning society* where social-ecological issues are driving a demand for Environmental Engineering. As shown in Paper 6, all these dynamics are *equally important* in the formation of the Environmental Engineering learning pathway. There are evident processes of emergence across these levels, and also absences, which could be addressed through transformative praxis at any one of these levels (which in effect is in the relational space of existing or potential emergence between the constellationally related levels).

Thus, across the various papers, we have attempted to provide a laminated explanation of the macroscopic (or overlying) and less macroscopic (or underlying) kinds of structures or mechanisms that shape and influence environmental learning pathways (both as a provisioning system for green work and through the analysis of occupational case studies).

Unlike Heinz (2009:400) who stated that "transition biography can be reconstructed as a sequence of expected and unexpected outcomes of choices", our case studies (Mohanoe, 2014; Maphinyane, 2014; Ramsarup, 2017; Fourie, 2016; Burger, 2017) and the research

programme as a whole (captured in the collection of papers in this Bulletin), has illustrated the structural shaping of agentive action embedded in the shaping of learning pathways.

Both educational and occupational progression

We have further illustrated that many environmental occupations are specialised occupations. Understanding the nature of the learning pathway associated with an environmental occupation is thus contingent on the proper understanding of *both educational progression as well as occupational progression* and the education and training platforms and system elements that support this. The learning pathways are also socio-historically, socio-materially and socio-ecologically shaped. We contend therefore that this framing of learning pathways has proved to be a useful conceptualisation of environmental learning pathways. This conceptualising further emphasised the need to see learning pathways as necessarily laminated systems. This framing, as illustrated across this Bulletin, has implications for how one conceptualises and executes learning pathways research oriented towards sustainable development in open systems.

Environment and sustainable development learning pathways as 'emergent'

Environment and sustainable development learning pathways can be described as being emergent, i.e. in most cases these were still in development from a systems perspective; hence the use of the multi-level devices, which enabled us to outline the levels of reality necessary to develop more satisfactory non-reductionist explanations of environmental learning pathways. The discussion enabled the development of a holistic picture that illustrates the "relations of emergence and dependence" (Parker, 2010: p.208) that are integral to environmental learning pathways. This helps to clearly illustrate that environment and sustainable development learning pathways are constituted as emergent phenomena across interdependent planes (see Figure 2).

Figure 3 below illustrates some of the multi-mechanisms at play across the different levels of scale explored across the studies and helps to emphasise environmental learning pathways as totalities comprised of "intra-actively changing embedded ensembles" (Bhaskar, 1993:117). The depiction of elements across levels of scale that emerged as

relevant to the nature of environment and sustainable development learning pathways is consistent with Bhaskar's notion that totality is itself structured, and so may contain or be contained by dialectically contradictory or, on the other hand, mutually reinforcing or supporting relationships (Bhaskar, 1993).

Thus, our research programme, and especially the work of Ramsarup (2017) within the programme, has shown that sustainable development occupation learning pathways are relevant to different 'parts' of the education-training-workplace system and include: learning in the activity systems of the workplace; interacting systems of workplace learning and training; and the system of providing of training which is differentiated into Sub-Frameworks in the NQF. Significantly, within the context of this study at this time in South Africa, the research programme hopefully enables a transitioning education and training system to see the elements integral to joined-up implementation that can support the emergence of a more pro-active framing of environment and sustainable development learning pathways. These pathways are crucial for the achievement of Green Economy objectives as outlined in the Green Economy Accord (RSA, 2011a), the SDGs which South Africa is implementing along with most other nations on Earth⁸⁵, the related objectives of the NDP (RSA, 2011b), and the National Climate Change Response White Paper (DEA, 2011) which sets out a path for climate resilient development for South African society.

Figure 3 uses Bhaskar's (2010) seven scalar laminated framework to consolidate some basic emergent elements of environmental learning pathways (at different layers of scale), which are named below as analytically separate but are, in reality, systemically whole, consolidating the *inter-related* meta elements relevant to learning pathways construction.

The laminated system synthesis of environment and sustainable development learning pathway elements presented below in Figure 3 depicts important elements at various levels: the global societal level, the level of post-school education and training, the level of work systems at employer levels and lastly, the individual level, all of which we found to be pertinent to learning pathways construction across all of our cases as reported on above.

Figure 3 further highlights that at the level of societal landscape, environment and sustainable development learning pathways construction is influenced by the environmental

⁸⁵ See www.globalgoals.org

condition itself, new legislation and compliance demands, resource efficiency and cost saving, emerging opportunities associated with the Green Economy, and historical and contemporary political economies of education/training and environment, and emerging political ecologies that relate environmental degradation and exploitation to well-being and social justice for current and future generations (Martinez-Alier, 2002; 2012).



Figure 3. A laminated explanation of environmental learning pathways (Source: Ramsarup, 2017)

The role of the transitioning individual agent, also shown in Figure 3, is an important consideration in learning pathway construction. Educational experiences, willingness to learn, lifestyle choices, education/training history, historical advantage and/or disadvantage, and reflexivity at career level as depicted in career stories across the studies, are significant elements of learning pathways. However the learning pathway cannot be reduced to this, as is the case in some career story based learning pathways research (an approach critiqued in Paper 3 in this Bulletin).

Figure 3 further shows that learning pathways are relevant to different 'parts' of the education-training-workplace-environmental system in South Africa. Policy coherence between environmental and sustainable development policy coordination and the

education and training system is essential to ensure a more responsive, pro-active approach to skills development and learning pathways for sustainable development in South Africa. We noted for example in Papers 3 and 5 in this bulletin, that inadequate workplace skills planning systems and inadequate professional recognition of environmental and sustainable development work in workplaces is a severe constraint to environmental and sustainable development learning pathways.

At the level of the PSET system, emergent important factors include articulation across the Sub-Frameworks of the NQF and across levels of skill, viewed within a systemic perspective, and as a learning process, as we argued in Papers 1, 4, 5, and 6 in this Bulletin. Here we also drew attention to the significance of absence (eg. The absence of functioning Adult Basic Education and Training [ABET]/Adult Education and Training [AET] programmes or relevant bursaries or career guidance) in enabling learning pathways for sustainable development. This supports the argument for *articulation as a significant 'relational element'* within a systems approach to learning and work to actualise the progression of learners. We have, across this Bulletin, and along with Wheelahan (2009), argued for developing a wider systems perspective on the notion of articulation. This raises the need for conceptualising *systemic articulation* across contextual, work and education and training systems, and we have promoted the broader idea of articulation as complementarity within a laminated system perspective.

Adopting a transitioning systems perspective (as shown in Figure 3) without a Critical Realist lens could have resulted in simply *describing* what is happening and seeing this as adequate. As shown across the research papers in this Bulletin, and across the studies in the research programme, adopting a Critical Realist dialectical vantage point in this research has helped to identify both what is happening and how, but also to point more clearly to the absences ie. to what is *not* (*yet*) *happening* and how it might be possible to develop the system in ways that are more pro-active. It thus allows for a *system development vantage point* that is situated and contextually informed, but which also traverses the problem of the local empirical.

In closing

In conclusion, we provide one example of how an analysis of absence may facilitate movement towards transformative praxis for environment and sustainable development learning pathways construction in the NQF. In Table 1 below we describe one system

element (which has been discussed in more detail in Paper 7 in this Bulletin). Through this we show the reasoning process for engaging with absence, drawing on Bhaskar's (1993) dialectic which is discussed in more detail in Paper 4 in this Bulletin. Further examples of analysing absences to map out pathways for transformative praxis in skills planning are presented in Ramsarup's (2017) PhD thesis. Important in this analysis is to differentiate between nominal and real absences (see Collier, 2001; Lotz-Sisitka, 2016).

Nominal absences are those absences that are often most obvious in the empirical domain (ie. they can easily be named, such as for example, 'the absence of a training programme for workers'). Real absences are those absences that are associated with deeper level generative mechanisms (eg. an absence of equality in society) that may be holding the boundary making processes in place (see Paper 5 in this Bulletin). Real absences often act as constraining factors that produce the nominal absences (see Paper 4, in this Bulletin, for Bhaskar's dialectical approach in more detail, and Paper 5, which illustrates some of these absences in a real life case study context).

Table 1. Example of how system analysis can be taken further with absence analysis to
map out transformative praxis pathways for skills planning and development within the
NQF (Source: adapted from Ramsarup, 2017) ⁸⁶

Working trough the MELD ⁸⁷	System element: (Supply side) Occupational differentiation
What exists? (What is the case	Information on occupations is scattered and fragmented,
as it currently manifests?)	with mainly a concentration on high skills (see Paper 7, in
	this Bulletin).
What is absent? (Thought	Nominal absences: Absence of clear occupational
experiment)	pathways. Absence of clear distinct information that
	distinguishes occupations from adjacent feeder
	occupations. Absence of adequate occupational families
	to describe environment and sustainable development
	occupations. Technical, intermediate and low skill
	occupations absent from the OFO.
	Real absence: System wide knowledge of, and
	commitment to, environment and sustainable
	development occupations.

⁸⁶ The focus in Table 1 is only on one system element (see also Paper 7, in this Bulletin) and is offered in an 'introductory' sense only. The same type of analysis can be used for a range of other dynamics associated with learning pathways development within the laminated system framework outlined above.

⁸⁷ Critical Realist analytical technique - see Paper 4 in this Bulletin for more explanatory detail.

Working trough the MELD ⁸⁷	System element: (Supply side) Occupational differentiation
What is possible? (Look elsewhere to see what has been done)	The agriculture and mining sectors have clearly developed occupational differentiation examples. These provide examples of what is possible for environmental occupations (ie. occupational differentiation processes are possible). Additionally, one could also draw on the findings in the DEA's (2010) ESSP study which noted that the environmental sector employs as many people as the mining sector, yet it lacks the dedicated skills planning support systems, or Sector Education and Training Authority (SETA) structure. Theoretically therefore if the mining sector has a SETA with approximately 500 000 employees, then one could surmise that the environment and sustainable development sector could also have a dedicated skills planning structure which could take on the work of occupational differentiation to address the absence
What can be done? (Agency)	Map out low, and intermediate level occupations for environment and sustainable development (which currently are under-developed and under-represented in the OFO, and in qualification-based systemic elements of the NQF – see Paper 7, in this Bulletin; and Ramsarup, 2016) and determine occupational families for inclusion on the OFO and for implementation during National Skills Development Strategy (NSDS) IV.

CONCLUSION

As noted in the Introduction and in Paper 1 in this Bulletin, our intention in this research programme was not to provide specific 'technical answers' for NQF development, but rather to *explore technical issues in a broad sense*. The idea was to seek to understand some of the key concerns of the NQF community, and SAQA in particular, such as articulation and quality, and how to contribute to enabling these aspects across the three Sub-Frameworks of the NQF – as they relate to the transversal area of environment and sustainable development learning pathways. The research was therefore *not* constituted as a set of technical studies on for example a credit transfer system relevant to a specific qualification for a specific potential occupational learning pathway (this would form a Phase 3 of the research). This is because *many of the conceptual, contextual*

and methodological issues associated with learning pathways research for sustainable development were under-developed when we started the research programme.

This concluding paper, and the Bulletin overall, therefore need to be read more as a *'roadmap' for learning pathways research*, rather than as a study that provides immediate technical answers for specific occupational learning pathways (although some useful insights have been gained here, from the occupational case studies). For South Africa to address its many challenges associated with environmental degradation, poverty, inequality, education/training and climate change, and to develop a strong sustainable development pathway into the future, there is clearly a need for further research on specific environmental and sustainable development learning pathways across the range of economic and social sectors in the country.

Our hope is that the work we have mapped out in this Bulletin and the associated studies which have pioneered what we have been able to present here, can provide starting points for researchers to approach learning pathways research in non-reductionist ways, and in ways that can map out emancipatory possibilities for transformative praxis at all levels of the open and emergent system that must be our collective future.

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PAPER 9: INTERNATIONAL PAPER

Dr Mutizwa Mukute and Mr Tichaona Pesanayi

INTRODUCTION

This paper discusses how the climate change education/training needs of Park Managers, Ecologists, and Community Development Officers in Southern African Development Community (SADC) Transfrontier Conservation Areas (TFCAs) were established through contextual profiling. It subsequently analyses how a curriculum that was designed in response to a contextual profiling process was recontextualised during implementation by the SADC Regional Environmental Education Programme (REEP), with support from the German Federal Enterprise for International Cooperation (GIZ). The paper's purpose is to trace the trajectory of contextualised curriculum development and implementation with a view to identifying how the twin concepts of contextual profiling and recontextualisation were utilised and lessons were learned. The paper has potential value for educators/ trainers interested in increasing the relevance of protected area workplace learning and its congruence to learners' realities. It also has relevance for learning pathways in the environment and sustaninable development arena and elsewhere.

The authors were involved in developing the contextual profile, designing the course and training the course participants, who were organised in two groups of about 20 each. The participants comprised Ecologists, Park Managers and Community Development Officers from SADC TFCAs.

A TFCA is a component of a large ecological region that straddles the boundaries of two or more countries encompassing one or more protected areas, as well as multiple resource-use areas, for example, the Great Limpopo Transfrontier Conservation Area that covers adjacent parts of Mozambique, South Africa and Zimbabwe. SADC TFCAs

are underpinned by two philosophies that are based on ecological and socio-economic integrative perspectives respectively (Mombeshora, 2005). The ecosystem philosophy seeks to enhance ecosystem integrity and natural ecological processes across political boundaries. The integrative perspective intends to enhance partnerships among the state, civil society, communities and the private sector to conserve and benefit from wildlife and related natural resources, and enhance inter-state collaboration for regional peace and security.

CONCEPTUAL FRAMING

The three main concepts that shape this paper are: contextual profiling; learning needs Identification, and curriculum recontextualisation.

Contextual profiling

Contextual profiling is a process by which contextual factors and complexities that have a bearing on a course/study programme are identified and utilised to inform curriculum or course design (Schudel *et al* 2008:453). Such contextual complexities and factors are considered at multiple levels, ranging from the international and national to the local (*Ibid*.). Hall and Kidman (2004) also identify three different levels of contextualisation:

- the wider community contexts comprising the international, national and local;
- the institutional context, which refers to the organisation that designs the curriculum, and its associated sub-contexts; and
- the teaching-learning contexts comprising the learner, the content and the teacher.

Contextual profiling allows for policy transfer and translation at multiple levels while at the same time enabling responsiveness to environmental risks and issues in diverse contexts (Schudel *et al* 2008). The value of contextual profiling resides in increasing the congruence between learning and reality, and the effectiveness of what is learned.

Learning needs identification

Learning needs identification is achieved through identifying the learning needs of potential learners by establishing the gaps between the knowledge and skills that they have and those that they need in order to perform their tasks effectively. Such needs often vary from place to place, and from individual to individual.

In this case study, the contextual profiling process identified some of the climate changerelated learning needs of Park Managers, Ecologists, and Community Officers largely through a climate change dialogue workshop that was attended by the TFCA and protected area leadership from most SADC Member States. At a later stage, the specific learning needs of the selected learners were identified through workshop expectations that were generated at the beginning of the course. Using this assortment of methods to generate the data needed for curriculum design was intended to achieve the necessary depth of learning needs and contextual relevance.

Curriculum recontextualisation

Curriculum recontextualisation is based on Bernstein's (2000) theory of curriculum translation from the designed, to the implemented, and the enacted curriculum. Bernstein (2000) identifies three main levels of how curriculum is contextualised and re-conceptualised from (1) the societal/ideological, to (2) the curriculum, and to (3) the teaching and classroom levels; or from (a) the transnational curriculum scripts, to (b) the national, and (c) the local school (Daniel, Jan & Carl-Henrik, 2013).

Recontextualisation refers to how the substance and nature of knowledge that is *produced* at one site – such as an environmental and environmental education policymaking body (eg. the United Nationas Educational, Scientific, and Cultural Organisation [UNESCO], African Union or SADC) – is *recontextualised* by curriculum designers (eg. at an educational institution such as SADC REEP/Wildlife and Environment Society of South Africa [WESSA]), and *reproduced* by teachers/trainers when they interact with learners (Bernstein, 2000). This process involves the 'de-location' and 'relocation' of a discourse from the field of production to that of reproduction (Jenkins, 2007; Bertram, 2012).

In the process of curriculum recontextualisation, curriculum designers choose the content, pedagogy, and sometimes how learning is to be assessed. Teachers and trainers on the other hand interpret the curriculum or course documents and decide on the pedagogic practices and assessment tools to work with to reproduce what is intended by the curriculum or course. The whole process involves various stages of selective appropriation and ideological transformation (*Ibid*.).

Several African scholars have worked with the concept of curriculum recontextualisation and found it useful for enhancing curriculum coherence and educational relevance, effectiveness and quality (eg. Nsubuga, 2006; Jenkins, 2007; Bertram, 2012; Hewlett, 2013).

This paper uses recontextualisation lenses to examine the trajectory of a newly developed course on climate change and mitigation in SADC TFCAs. The trajectory starts from the contextual profile and ends at the end of the first series of one-week workshops because it was in this space that the major contextualisation and recontextualisation took place. Quality checks and improvements of the translation process were made at three levels, through: (A) course coordination meetings of the team that comprised SADC REEP/ WESSA, GIZ representatives and the course designer/facilitator; (B) the change project mentoring team, which comprised trainers from SADC/WESSA and the course designer/ facilitator; and (C) course participants' feedback and evaluations.

BACKGROUND

Studies that have been conducted in southern Africa have shown that climate change and biodiversity are SADC priority sectors for capacity development (IRM, PASS & University of Dar es Salaam, 2007; Ziervogel *et al* 2008; Chishakwe, 2010; Mukute *et al* 2012a). Consequently, SADC REEP developed a GIZ-funded project called: *Stepping-Up to Trans-boundary Sustainability: Human Capacity Development for Climate Change Adaptation in SADC Trans-frontier Conservation Areas.* The objectives of the 16.5 month project, which went on for nearly one and a half years, were to:

• identify trans-boundary capacity gaps, needs and development measures related to climate change adaptation in the 18 SADC TFCAs;

- facilitate climate change adaptation learning and actions to contribute towards improved livelihoods; and
- foster trans-boundary collaboration, networking and cultural understanding in a community of practice of climate change adaptation alumni to support climate resilience.

SADC REEP, which commissioned the contextual profiling, course design and implementation, works with a social learning approach that is practice- and solutionoriented (Mukute *et al* 2012b). More specifically, SADC REEP works with an emergent, reflexive model of capacity development that seeks to achieve improved professional knowledge and changed institutional practices. This is achieved through: review of context of practice; on-course interactions based on appropriating new knowledge and practice (that is regionally recontextualised); and subsequent site-based applications using the change projects (SADC REEP, 2012:49). SADC REEP's capacity-building approach is consistent with contextualisation and recontextualisation as discussed above because it takes account of realities that learners live and work in, is change-oriented and is designed to take place at the individual professional level, at institutional level, and at the environment–education–society nexus (*Ibid*.). The approach works with situated learning ideas, which encourage learners to acquire and incorporate new ideas into their own social-ecological and workplace contexts through a change project⁸⁸.

SADC REEP, through its programme manager, played the role of overseeing the contextual profiling process and coordinating the development and implementation of the course. An external consultant conducted the contextual profiling, designed the course and facilitated part of its implementation as workshop facilitator.

CONTEXTUAL PROFILING OF CLIMATE CHANGE IN TFCAs

Data generation for contextual profiling was done through document analysis and a literature review, and a TFCA leaders' dialogue workshop that was attended by 19 SADC representatives. The document analysis and the literature review focused on policy and strategic documents that gave direction to climate change adaptation education/training

⁸⁸ A change project is a reflexive, action-oriented intervention through which course participants institutionalise and externalise new knowledge and practices with the aid of co-workers and supervisors

as determined by international, Pan-African, SADC and Member States policy-makers. These documents carried the framework that was to shape the content and nature of the course material. Data generated from the TFCA leaders' dialogue workshop focused on the local, individual and institutional climate change issues in SADC TFCAs. These provided a map of the learning needs of prospective learners.

The main international policies and treaties that shaped the content of the designed course were the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC), which provide for strategies to deal with biodiversity and climate change issues. Education for sustainable development (ESD) thinking and the United Nations Decade of Education for Sustainable Development (UNDESD) provide ideas on how education and training can contribute to a more sustainable world (UNESCO, 2009).

At Pan-African level, ESD is anchored in Education for All, the New Partnership for Africa's Development (NEPAD) Environment Action Plan and human resources development, which is underlined by the importance of context, and which includes African cultures, knowledge systems and experiences (Lotz-Sisitka, 2006). The African Union (AU) decided to green its economies by tackling poverty, unemployment, food insecurity and environmental risks while tapping into its natural capital assets (United Nations Economic Commission for Africa [UNECA], 2011). The AU's African Ministerial Conference (AMCEN) of 2007 prioritised the UNFCCC and recommended that regional economic communities (RECs) such as the SADC should develop and implement climate change programmes.

The main SADC biodiversity-related policy documents that informed the contextual profiling were the Wildlife Policy of 1997, the Wildlife Sector Protocol of 1999, SADC Regional Biodiversity Strategy, the SADC TFCA Programme and the SADC Regional Indicative Strategic Development Plan (RISDP) (SADC, 2003). These provide for using TFCAs as a means for regional cooperation and peace building, biological conservation and economic empowerment of rural communities through tourism. The Southern African Regional Universities Association (SARUA), on the other hand, provides a *methodological argument* for a multi-disciplinary approach to research, learning and teaching of climate change and related matters while encouraging collaboration within and between universities, policy-makers and practitioners (Climate and Development Knowledge Network, 2012). The national policies that informed the profiling include the National Capacity Self-Assessment reports, the National Communications to the UNFCCC reports,

and National Adaptation Plans of Action (NAPAs). These documents identified the priority issues and capacity development areas which informed the course.

The ideology that runs through the policies described above is that of sustainability. But it is also an ideology that is characterised by tensions between different interests and actors, between the social, economic and ecological. The dominant societal issue revolves around how to deal with the causes of climate change (mitigation) and its effects (adaptation). African states, including SADC Member States in which the TFCAs under review are found, argue that their contribution to climate change is low but they bear the burden or effects of climate change. Therefore, they should invest more of their energies in climate change adaptation.

RESULTS AND NEEDS IDENTIFICATION

The contextual profiling and needs identification process identified several topics for inclusion in the course. The course designer developed a coherent set of topics from these to produce a course curriculum. The selected topics were as follows.

- Basics of climate change and related issues and concepts: including climate change adaptation, mitigation, resilience, adaptive capacity, ecosystems-based adaptation, and scenarios (past, present and future).
- *Planning, managing and monitoring TFCAs in the context of climate change:* including ecological monitoring and evaluation for adaptation and mitigation, indicator species and trends, and associated data analysis.
- *Climate change adaptation and mitigation in TFCA sectors:* covering wildlife, forestry, water, agriculture, and marine and coastal areas.
- Building social-ecological resilience in the context of climate change: including livelihood strategies suited to the different settings, disaster risk reduction and management knowledge, habitat manipulation, climate proofing possibilities, and climate-sensitive income-generating projects.

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 - Documenting and sharing best practices in climate change adaptation and mitigation across sectors: including emerging best practices in TFCAs, and traditional coping mechanisms;
 - Facilitating multi-stakeholder linkages, joint planning, learning and action processes: such stakeholders including TFCA structures, policy-makers, government institutions, education and research organisations, the private sector, Non-Governmental Organisations (NGOs) and international development partners; and
 - *Design and implementation of change projects*, where these projects should be informed by the respective TFCA contexts.

The course designer used several criteria to select topics, which included topics that:

- provided the necessary conceptual foundation on climate change, climate change adaptation and mitigation;
- revealed the social, economic and ecological dimensions of climate change issues and responses;
- linked climate change, climate change adaptation and mitigation of TFCAs;
- fostered relationship-building among TFCA stakeholders with potentially different and conflicting needs; and
- developed practical and context-specific solutions that reduce human impact (mitigation) and enhance resilience (adaptation).

The course designer's choice of topics was largely informed by recommendations on how climate change education curricula should be designed. For example, Vogel (2010) suggests that climate change curriculum development should weave together sustainability thinking, transdisciplinarity, and knowledge co-production that draws from different systems and perspectives. The designed course curriculum had the following three objectives, to:

- enhance SADC TFCA practitioners' awareness and knowledge on climate change, climate change adaptation and mitigation concepts, issues, policies and programmes;
- develop TFCA practitioners' methodological knowledge and skills to incorporate climate change adaptation and mitigation in their workplaces and TFCA management plans and activities; and
- deepen cross-border, multi-stakeholder collaborative work in SADC TFCAs through joint work among TFCA practitioners (through joint change projects and the development of communities of practice).

The process of designing the course curriculum from the contextual profiling and needs identification constituted what Bernstein (2000) calls: 'de-location' – selecting a discourse or part of a discourse from the field of production where the knowledge is constructed, and 're-location' – where the original discourse(s) is/are transformed in the field of recontextualisation, which is found between the fields of production and reproduction respectively.

The process of the recontextualisation of the curriculum involved negotiation between the consultant, SADC REEP, and GIZ, through the course coordination structure. Sustainable development thinking, which is based on social justice, ecological sustainability and economic viability⁸⁹, was the 'ideology' that determined course content (SADC REEP, 2012). The political choice of what to include was partly shaped by the intentions of the project and the SADC position of prioritising climate change adaptation measures over climate change mitigation. The course design's pedagogical coherence was achieved through a Cultural Historical Activity Theory (CHAT) conceptualisation of learning, which includes acquiring knowledge from those who know more than the learners, linking everyday knowledge to concepts, and the creation of new knowledge (Engeström, 1987; Edwards, 2005).

⁸⁹ See www.unesco.org/desd

IMPLEMENTATION OF THE CLIMATE CHANGE EDUCATION CURRICULUM

The course curriculum was implemented in two one-week workshops for each group of participants. The workshops were held at the national office of WESSA, which had officially hosted the SADC REEP since its formation. Workshop trainers were mostly drawn from the WESSA office, which is also a SADC Centre of Excellence in Environmental Education.

Several tools were developed to aid curriculum implementation in order to foster the achievement of the course intentions. SADC REEP produced and shared facilitators' notes, which prepared the trainers to implement the course in a coherent manner. The course designer drafted a workshop programme (for the first workshop), the content and flow of which was negotiated through the course coordination structure. The workshop programme was made available to trainers to help them contextualise their sessions. The workshop was structured such that the learning processes moved from theory to practice, from the concepts to concrete actions. For example, the concept of climate change adaptation was introduced and discussed, followed by practical examples of how communities in Southern Africa are adapting to climate change. The workshop moved from relatively conceptual and abstract to more concrete and practical topics. The emphasis of the last part of the workshop focused on planning future-oriented actions such as developing climate change adaptation activities. At the same time, the workshop was structured to facilitate the appropriation of new knowledge, for example through lectures and group exercises, and the externalisation or application of what was being learned through the development of change projects. Participants brought change project ideas, which were enriched as they acquired new knowledge and skills during the course of the workshop.

Curriculum implementation was also shaped by participants' expectations. One of the two groups' expectations were summarised as follows (See Box 1).

Box 1: Synthesis of participants' expectations

a. Learning about concepts and meanings of:

- climate change, climate change adaptation and mitigation; and
- change projects.

b. Acquiring information and knowledge about:

- climate change issues and trends;
- available financial support mechanisms for climate change adaptation and mitigation in TFCAs; and
- sources of information on climate change adaptation and mitigation in TFCAs.

c. Learning about strategies and techniques regarding how to:

- apply and integrate climate change knowledge in TFCAs;
- identify climate change policies, issues and concerns and integrate them into TFCA strategies and plans, and monitor climate change and its associated impact;
- work with climate change adaptation and mitigation strategies in the context of TFCAs;
- involve local communities, and stakeholders, including politicians, policy-makers and business-people in projects that tackle climate change; and
- mobilise resources to support the integration of climate change into TFCAs plans and activities.

d. Building relational agency:

- network and collaborate with TFCA practitioners from the same TFCA but different countries; and
- plan for continued collaboration with one another, beyond the workshop and the project.

The above expectations, together with the needs that were identified through the TFCA leaders' climate change dialogue workshop and responses to a questionnaire, provided the bottom-up input to the designed course and workshop programme; while contextual profiling provided the top-down input into the same. The former provided the institutional and individual perspective, while the latter provided the international, Pan-African, SADC and SADC Member States perspective. Some of the issues revolved around environmental protection, community responsibilities, access to and benefit from the TFCA, and cross-border collaboration. Examples of mitigation issues included fire and fire control, and alternative energy, while adaptation issues included habitat change and the implications for some plant and animal species.

In summarising the net effect of multiple sites of sources for the course content, and consistent with challenges that are likely to be found in the process of recontextualisation, the course designer and workshop facilitator (Mukute, 2013:9) wrote:

Inevitably, the different orientations and interests of the three sources [policy documents; GIZ resource materials on climate change; and participants' expectations] created some tension in the programme in terms of what to include and exclude This partly explains why the workshop was overloaded. The topics that were dropped are: Whole Systems Approach to Decision-making; Participatory Learning and Action; Integrating Climate Change Adaptation in TFCA Planning; and Proposal Development The main addition was an educational tour of the WESSA centre, which is implementing adaptation and mitigation measures that create co-benefits.

The trainers, who had diverse backgrounds because of the nature of the topics in the course, used a range of teaching/learning methodologies to implement the course. These were:

- knowledge and information transfer, through presentations to course participants;
- *deliberative and dialogical interactions,* through group work, group assignments and mentoring sessions on change projects;
- *investigative tasks,* through individual and group tasks to generate relevant data from selected documents and internet searches;
- *experiential learning,* through a learning tour of the WESSA Centre and the uMngeni Valley Nature Reserve, which incorporate mitigation and adaptation practices; and
- *learning by doing,* through the joint development of change projects.

It is important to note that knowledge and information transfer did not only take place between the trainers and the learners, but it also took place among the learners. This was especially the case because of the range of topics covered and the diverse professional backgrounds of the participants, which created knowledge gradients. For example, the Ecologists took the lead on ecosystem and biodiversity topics, while the Park Managers took the lead on the development of park management plans, and the Community Development Officers led on multi-stakeholder involvement. This approach is characteristic of good practice in participatory Adult Learning (see for example, Walters & von Kotze, 2017). The educational methodologies were grounded in the contexts and realities of the trainees, that is, the TFCA employees. The methodologies also recognised and built on existing knowledge, skills, experiences and resources (capabilities); they were changeand practice-oriented; and were designed to cause change at individual and institutional levels. The change projects assisted participants to connect park conservation priorities with the collaborative integration of climate change adaptation/mitigation with both local and cross-border interests.

Change projects

The change project approach was particularly central because it enabled participants to link the context of work and the context of learning iteratively. Participants generated project ideas at their respective workplaces; then they shared these with fellow learners who came from the same TFCA, and agreed on the idea(s) to convert them into a joint change project idea. They then collaboratively developed strategies and action plans which were subsequently shared with colleagues back in the TFCAs, and shared again in the second course workshop.

Mandikonza (2012:4) defines a change project as:

An [Environmental Education (EE)/Education for Sustainable Development (ESD)] project that one embarks on, together with colleagues in one's workplace, in order to respond to an environmental/sustainability issue In this way it supports one's practice as an environmental education practitioner. A change project may bring a totally new approach or it may enhance initiatives already in place.

According to the Sida-funded International Training Programme on ESD in Higher Education Change Project Guidelines (Rhodes University & Swedish International Centre of Education for Sustainable Development, 2012; Lotz-Sisitka & Hlengwa, 2013), change projects respond to the learner/trainees' professional development needs, organisational priorities and to the field of ESD. They should be relevant to institutional mandates and sustainable development issues and be theoretically and practically defensible.

FEEDBACK FROM LEARNERS AND HOW IT INFORMED COURSE IMPLEMENTATION

Learners in both groups had opportunities to give feedback on the course implementation at the start of each day, and at the end of the workshop in the form of an evaluation, which was both quantitative and qualitative. For example, the feedback at the end of the first workshop of Group A (which had 18 participants) had dual purposes: it helped in the redesigning of the workshop for Group B (with 21 participants), who were still to attend their first workshop; and in the design of the second and final workshop for the first group.

Listening to learners' feedback appeared to have improved the recontextualisation of the implemented course. This was partly evidenced by the improved ratings of the workshops over time: Group A rated workshop achievement levels as follows: 53% 'Excellent', 41% 'Good' and 6% 'Not Entirely Satisfied'; and Group B's ratings were as follows: 80% 'Excellent' and 20% 'Good'.

The learners' ratings of how different topics were covered by different trainers also prompted the course designer to compile guidelines for the resource people, and share these with the resource people ahead of Group B's first workshop. This process can be seen as part of the recontextualisation process. The other improvement arose from time allocations per topic, which were increased through two strategies, namely (1) covering even fewer topics than those covered by the first group; and (2) starting the workshop 30 minutes earlier each day in order to have more time. The allocation of more time per topic enabled the resource people to cover the conceptual, policy-related and practical matters in one session and not to have them spread over a number of sessions. The blocks of time that were allocated per topic ranged from two to three hours, compared to an initial average of 30 to 90 minutes. The additional time improved the coherence and flow of the workshop.

CONCLUSIONS

The journey regarding the contextualised curriculum design, and the recontextualisation of curriculum implementation discussed in this paper shows that potentially creative tensions emerge throughout the translation process; and that these have to be dealt with reflexively by multiple stakeholders. Tensions arise, for example, from having to engage

with the international and the local, the abstract and the concrete, the socio-economic and the ecological, the short-term and the long-term, the mitigation and adaptation. The prevalence of such tensions suggests the importance of working with conceptual, philosophical and theoretical frameworks that enable contradictions to be used to stimulate learning and action-taking. These frameworks are dialectics, as described in dialectical Critical Realism and CHAT, respectively.

The main educational lesson from this case study is that curriculum designs that are informed by contextual policy, theory and practice analysis, and stakeholder needs-identification, are likely to produce more adequate results than when one of these is used in isolation. For example, focusing on stakeholder needs analysis carries the danger of overlooking what the potential trainees are unaware that they need to know; while focusing mainly on policy and theory, could lead to leaving out the more nuanced and specific training needs, and lack the ethical credibility of the participatory involvement of those who matter. Such a lesson is worth considering in the design of short and long course curricula as educators take forward the complex challenge of sustainable development in the context of climate change. The curriculum development process (and subsequent implementation) is likely to galvanise joint planning and action among stakeholders, and contribute to learning that is more grounded in the strategic and practical needs of the learners, their institutions, and society. The ability to recontextualise the curriculum designer, the institution of learning, the trainers and the learners.

The change projects that were jointly designed and progressively improved upon, stimulated action research, and reflexive professional practice in situated learning – something that Schudel *et al* (2008) encouraged as a way of building on the insights generated from the review of the Advanced Certificate in Environmental Education. The change projects also served as an important mechanism for not only applying and reproducing what had been learned, but also for mobilising the distributed cognition of learners and co-workers in creating innovations to deal with complex sustainability issues.

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EDITORIAL COMMENT

The SAQA-Rhodes University Partnership Research: Significance and Implications for Further Learning Pathways Research and Development

Dr Heidi Bolton

BACKGROUND COMMENT

Following the promulgation of the National Qualifications Framework (NQF) Act (Republic of South Africa [RSA], 2008) in June 2009, the South African Qualifications Authority (SAQA) was tasked with refining and re-developing the NQF policies from the SAQA Act (RSA, 1995) era, and developing the new policies required, after consultation with, the Quality Councils.

SAQA proceeded using a strong developmental model which it had tried and tested under the SAQA Act. This model involved working with the Quality Councils and democratically elected representative stakeholder groups from the fields of education, training, development, and work. SAQA provided clear leadership in the policy development workshops, writing teams, and various types of public comment processes. As the policies were developed, the model involved working through the contestations that arose, in systematic ways, and taking care to integrate the inputs from the different NQF partners and stakeholders in an authentic but mediated way, in the spirit of, and in line with, the agenda of the NQF Act.

In this way, the following 'NQF policy suite' was published:

- ---Level Descriptors for the South African NQF (SAQA, 2012a);
- ---Policy and Criteria for Recognising Professional Bodies and Registering Professional Designations (SAQA, 2012b);
- ---National Policy for the Implementation of the Recognition of Prior Learning (SAQA, 2013a; 2016);

- ---Policy and Criteria for Registering Qualifications and Part-Qualifications on the NQF (SAQA, 2013b);
- ---National Policy and Criteria for Designing and Implementing Assessment for NQF Qualifications, Part-Qualifications, and Professional Designations in South Africa SAQA, 2014a); and
- ---Policy for Credit Accumulation and Transfer within the National Qualifications Framework (2014b).

In this period the three NQF Sub-Frameworks were also published⁹⁰, and the White Paper for Post-School Education and Training (PSET) (Minister of Higher Education and Training [MHET], 2013) was developed and widely disseminated. The intention was that the integration of the education and training system begun under the SAQA Act. would be deepened under the NQF Act, through the 'articulation' of the three NQF Sub-Frameworks and enabling learning within and between the Sub-Frameworks to take place in a 'seamless' way (MHET, 2013). The term 'learning pathway' was widely used - in the NQF Sub-Framework contexts, and also in the advocacy and implementation contexts of the NQF policy suite and the White Paper for PSET. However, the concept had not been interrogated in a systematic way. SAQA set up the SAQA-Rhodes University partnership in order to explore the idea conceptually, as well as to investigate - in the emerging area of Green Skills and sustainable development – what kinds of pathways existed in the sector, and what the challenges were in taking these pathways to scale⁹¹. The idea was that the research would illuminate these issues, and also inform understandings of similar issues in other NQF contexts, especially in areas in which learning and work were emerging or transforming.

INSIGHTS GAINED AND USED

The SAQA-Rhodes research – as is evident in this Bulletin – has provided exceptionally rich insights regarding learning pathways research, and into how this research could inform policy development and implementation.

⁹⁰ The General and Further Education and Training Qualifications Sub-Framework (GFETQSF) overseen by Umalusi; the Higher Education Qualifications Sub-Framework (HEQSF) overseen by the Council on Higher Education (CHE), and the Occupational Qualifications Sub-Framework (OQSF) overseen by the Quality Council for Trades and Occupations (QCTO).

⁹¹ A detailed description of the project is provided in the Introduction to this Bulletin.

Crossing the macro-micro divide in learning pathways research

The project showed that research into learning pathways was 'bifurcated' into 'systems research' and 'individual learning pathways research' (see Papers 1 and 3 in this Bulletin). The research went on to provide a way to cross this macro-micro divide by drawing on Bhaskar's (1993) Dialectical Critical Analysis, in which context as well as individual life stories feature (see Papers 2 and 4).

Concepts of 'boundaries', 'boundary crossing', and 'transitioning'

The research highlighted two useful sets of concepts – those of 'boundaries' and 'transitioning' in learning pathways. Firstly, the ideas of '*boundaries*', 'deeper *mechanisms* that hold boundaries in place', and '*boundary crossing*' – and the careful reasoning that delineates these concepts (see Papers 2 and 4 in this Bulletin) are useful for conceptualising, researching, and seeking to address, the barriers encountered by individual learners or institutions as they seek to effect learning pathways/progression in the system for education, training, development and work. The importance of focusing on *transitioning* in learning pathways (Paper 3 in this Bulletin) has proved useful for empirical (actual) learning pathways construction – visible both in the Rhodes research (see Papers 4, 5, and 6 in this Bulletin), and in the further research that draws on these ideas as highlighted immediately below.

Using the theoretical insights

These insights began to emerge from the first year of the SAQA-Rhodes study, and were immediately taken up amongst the NQF partners. SAQA, in seeking to further its leadership in deepening articulation in the NQF system, set up the SAQA-Durban University of Technology (DUT) research partnership to investigate learner progression between Technical and Vocational Education and Training (TVET) and Higher Education. This project involved a National Articulation Baseline Study (SAQA-DUT, 2017) as well as six in-depth case studies. It drew directly on the theoretical insights from the SAQA-Rhodes partnership in its conceptualisation of articulation as follows (*Ibid*.:7).

- First, articulation can be understood broadly, as 'systemic articulation' or 'joined up' qualifications and various other elements aligned to and supporting, learning pathways. Systemic articulation is based on legislation and the steering mechanisms available to the state, such as planning and funding in the education and training system.
- 'Specific articulation' is based on the formal and informal agreements within the system for education and training – between institutions – as guided by policies, accreditation principles, and mechanisms like Credit Accumulation and Transfer (CAT) or Memoranda of Understanding (MoU).
- Third, articulation exists through the **addressing of boundary-making practices and the support of boundary-crossing practices** as individuals encounter 'boundary zones' between the different elements of learning pathways, and adopt 'boundary-crossing practices' in their transitioning along their pathways⁹². This support includes reducing the gap between learning pathway-related policy development and implementation; strengthening specific pathways and enhancing the opportunities to access and progress along these pathways; the quality of education and training; Flexible Learning and Teaching Provision (FLTP)⁹³; appropriate and timely career development advice, and the various types of support for learning needed in workplaces, amongst other aspects.

Ministerial Policy for Articulation (MHET, 2017), developed between 2014 and the end of 2016, adopted similar definitions.

The SAQA-DUT research focused on actual existing articulation initiatives across the public TVET and Higher Education institutions in South Africa – for both the baseline, and case studies. These initiatives were categorised as 'developed' (established, with transitioning students), 'emerging' (in the process of being set up, or in the early period of commencement), and 'latent' (had been operating but had ceased to function). The ideas of 'boundaries', 'mechanisms keeping boundaries in place' and 'boundary crossing' were used to find, describe and categorise the barriers, the various causes of barriers, and

⁹² The ideas of 'boundary zones', 'boundary-making and boundary-crossing practices' and 'transitioning along learning pathways' were taken from SAQA-Rhodes University Partnership Research reported by Lotz-Sisitka (2015).

⁹³ Related articles showing how institutions can transform towards being increasingly flexible in order to support individual learning pathways (See for example Walters, 2015a; 2015b).

how blockages had been, or could be addressed, in the different articulation scenarios, in systematic ways. Conceiving of the learners as 'transitioning' along their learning pathways enabled the SAQA-DUT researchers to look for transition origins, transition points, transition destinations, and ways in which transitioning was *supported*.

Extensive literature review

Paper 3 in this Bulletin focuses on an *extensive literature review* of approaches to learning pathways research, and conceptual aspects linked to learning pathways and learning pathways research. This literature review covers new ground and would be useful for all scholars and policy makers and implementers working with learning pathways.

Methodology for learning pathways research

Paper 4 sketches a *methodology* based on *career stories*, for researching articulation through learning pathways. The method draws on Bhaskar's (1993; 2010) 'Dialectical Critical Realism' which can be used to make visible both 'presences' and 'absences' in learning pathways. By addressing the absences in one context, through modelling based on the 'presences' in another context, 'absences can be absented'. As the authors rightly note in Paper 4, this method opens the way for action, 'agency', and 'transformative praxis'.

The SAQA-DUT (2017) research drew on this methodology. It included in-depth surveys with all 26 public Higher Education Institutions (HEIs) and TVET Colleges in the country, obtaining a 98% response rate and thus a relatively full picture regarding strongly operational articulation initiatives as well as initiatives at various stages of development, and absences. The researchers were able to draw on some of the strong and desired 'presences' to make recommendations that would enable the support of emerging and latent articulation initiatives. The recommendations were workshopped along with the findings at a recent SAQA-hosted national seminar for all the study participants, and key NQF policy-makers. In closing the workshop, those present were able to endorse a set of guidelines for enabling articulation within and across the NQF Sub-Framework contexts. Delegates were also able to agree on a general way forward for articulation. These events show some of the beginnings of the kinds of agency and actions enabled by the SAQA-Rhodes research.

Interacting systems

In this Bulletin, Paper 7 shows the interaction of two systems – those of the 'educational, training and occupational support system elements and their emergence' in response to changing environmental concerns and sustainable development (the supply side), and the emerging demand for 'Green Skills' and the 'greening of occupations' (the demand side). The paper also shows the need to consider the 'matching' of these two systems, or to work with, research, and address together, the two parts in the articulation system.

Laminated systems

The articles in this Bulletin close with Paper 8, a synthesis of the theoretical and methodological work covered in the Bulletin – and research programme – and a call to look at learning pathways systems from a 'laminated perspective' (Ramsarup, 2017). This perspective allows for engagement at the levels of (1) transitioning individuals, (2) transitioning work environments, (3) a transitioning PSET system, and (4) a transitioning social-ecological context – where all of these levels interact and are related to each other. In considering learning pathways, both 'presences' (what exists) and 'absences' (what does not yet exist) need to be considered. Further, presences, where these exist, need to be used to drive transformational praxis in contexts where such aspects are absent.

INTERNATIONAL VOICE

The paper by Mukute and Pesanayi also draws on the Critical Realist and CHAT paradigms that inform the eight papers from the SAQA-Rhodes Phase 2 research project. It *provides an example of the type* of contextual profiling and recontexualisation needed when engaging the tensions in the 'international/local; abstract/concrete; socio-economic/ecological; short-term/long-term; mitigation/ adaptation continuums that arise in the translations needed for curriculum design and implementation. It shows that curricula which take into account the contextually appropriate policy, theory, practice, and 'stakeholder needs-identification', are stronger than when curricula are based on one of these aspects in isolation. The approach to curricum development and implementation shown in this paper has great potential to enable and inspire the stakeholder involvement and joint planning and work needed, to enable learning pathways and articulation.

CLOSING CALL TO NQF POLICY <u>MAKERS</u>, <u>IMPLEMENTERS</u>, AND <u>BENEFICIARIES</u>

SAQA refers to NQF stakeholders in the three categories of policy makers, policy implementers, and policy beneficiaries (the learners) (**M-I-B**). This Editorial Comment closes with a call to all NQF policy makers, implementers – and beneficiaries – to use the robust theorising and empirical examples in this Bulletin, for further conceptual work and research, and for NQF and institutional policy-making and implementation relating to articulation. The Bulletin provides a very sound base for further articulation-related research, as well as for strengthening existing articulation work, and developing articulation where it needs to be developed.

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⁹⁴ THis reseearch chair is supported by the National Foundation (NRF) and the Department of Science and Technology (DST). More colloquially known as SARChI Chairs, research chairs such as this one are established by the NRF and the DST to continue to the national system of innovation.

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Acronyms

ARET	Adult Basic Education and Training
	Acception for the Development of Education in Africa
	Association for the Development of Education in Airica
AEI	Adult Education and Training
AU	African Union
CAI	Credit Accumulation and Transfer
CATHSSETA	Culture, Arts, Tourism, Hospitality, Sports Sector Education
	and Training Authority
CDKN	Climate and Development Knowledge Network
CEDEFOP	European Centre for the Development of Vocational Training
CET	Community Education and Training
CHAT	Cultural Historical Activity Theory
CHE	Council on Higher Education
CPD	Continuing Professional Development
DBE	Department of Basic Education
DEA	Department of Environmental Affairs
DHET	Department of Higher Education and Training
DoE	Department of Education
DoL	Department of Labour
DPW	Department of Public Works
DTI	Department of Trade and Industry
ECSA	Engineering Council of South Africa
EE	Environmental Education
EIA	Environmental Impact Assessment
EPWP	Expanded Public Works Programme
ESD	Education for Sustainable Development
ESSP	Environmental Sector Skills Plan
ETDP SETA	Education, Training and Development Practices Sector
	Education and Training Authority
EU	European Union
EWSETA	Energy and Water Sector Education and Training Authority
FET	Further Education and Training
GET	General Education and Training
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GFETQSF	General and Further Education and Training Qualifications
	Sub-Framework
GIZ	German Federal Enterprise Cooperation
HCD	Human Capital Development
HEI	Higher Education Institution
HEQSF	Higher Education Qualifications Sub-Framework
HET	Higher Education and Training
HRD	Human Resource Development
HSRC	Human Sciences Research Council
ILO	International Labour Organisation
IRM	Institute of Resource Management
LG SETA	Local Government Sector Education and Training Authority
MDG	Millennium Development Goal
MHET	Minister of Higher Education and Training
MoU	Memorandum of Understanding
NCV	National Certificate: Vocational
NDP	National Development Plan
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NLRD	National Learners' Records Database
NQF	National Qualifications Framework
NRM	Natural Resources Management
NSC	National Senior Certificate
NSDS III	National Skills Development Strategy III
OECD	Organisation for Economic Cooperation and Development
OFO	Organising Framework for Occupations
OQSF	Occupational Qualifications Sub-Framework
PICC	Presidential Infrastructure Co-ordinating Commission
PSET	Post-School Education and Training
QCTO	Quality Council for Trades and Occupations
REEP	Regional Environmental Education Programme
RPL	Recognition of Prior Learning
RSA	Republic of South Africa
RU	Rhodes University
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institute

SAQA	South African Qualifications Authority
SARUA	Southern African Regional Universities Programme
SDG	Sustainable Development Goal
SETA	Sector Education and Training Authority
SIPs	Strategic Infrastructure Projects
SMMEs	Small, Medium and Micro Enterprises
SSP	Sector Skills Plan
SUS	Supporting Urban Sustainability Programme
TVET	Technical and Vocational Education and Training
UMALUSI	Council for Quality Assurance in General and Further Education
	and Training
UN	United Nations
UNDESD	United Nations Decade of Education for Sustainable Development
UNDP	United Nations Development Programme
UNECA	United Nations Economic Community for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Emergency Fund
VET	Vocational Education and Training
WfW	Working for Water Programme



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