

Advancing Human-Centred Education in Complexity

The background features a hand reaching out from the left side, with a glowing network of nodes and lines overlaid on it. The nodes are represented by small circles in various colors (blue, white, orange, purple) and are connected by thin lines. The network is set against a dark blue background with a faint hexagonal pattern. The overall aesthetic is futuristic and technological.

Edited by
Saloshna Vandeyar



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ESI Press

University of Pretoria, Lynnwood Road, Hatfield, South Africa

<https://www.esipress.up.ac.za>

Publication © ESI Press 2026

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Cover design: Stephen Symons

Typography and design: Stephen Symons

First published by ESI Press 2026

ISBN: 978-1-0483-0140-3 (Print)

ISBN: 978-1-0483-0173-1 (Digital)



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Saloshna Vandeyar



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Foreword: Envisioning Human-Centred Approaches as Diasporic Tellings

Professor Vaughn Watson

Michigan State University, USA

watsonv2@msu.edu

Reflecting, contemporarily, on our current *posts* era—postmodern, posthuman, postdigital instantiations enacted as research design, curriculum design or teaching practice (for example, Bacalja et al. 2024; Gee 2024; Lankshear and McLaren 1993; Leander and Burriss 2020), emboldened synergies that envision complexity beyond singular popularised narratives of what we *know*, how we *do*, or might yet *be* (Chilisa and Ntseane 2010; Dei et al. 2022)—what might it mean to *yet*, *always* and *already* centre the necessary complexities of humanity of each of us: individuals, children, youth, families, communities, educators, teacher educators, researchers and the range of our social identities; living, teaching and learning within and across varied contexts. Authors across this consequential transdisciplinary volume, *Advancing Human-Centred Education in Complexity*, urgently prompt understandings of human-centred education across a breadth of theoretical, empirical, philosophical and practice-informed examples.

In an educational era in which youth and young adults—globally, in South Africa and throughout the African continent—lead such vibrant movements as calls for lower taxes, reliable and affordable access to electricity and water and a decolonised and affordable university curriculum (for example, Bartlett and Akinwotu 2025; Magcaba 2025), authors in this volume situate their timely inquiries in and offer forward productive, necessary implications for envisaging *human-centred approaches* across the range of educational contexts: curriculum; teaching *and* policy; within and across community- and school-based early childhood, elementary, secondary and higher-education contexts.

Moreover, amid global and local educational landscapes characterised

by standardised testing and market-driven education policy undergirding curriculum design and teaching practices (Au 2022) and AI increasingly present in policy, curriculum and teaching (Smith et al. 2024), authors across this volume detail pressing instantiations of a human-centred education approach—for instance, extending meanings of the interplay of care, empathy, adaptability and creative thinking (Chapter One). Care and empathy unfold, for example, as collaborative, dialogic pedagogy extending nuanced meanings of linguistic diversity and cultural relevance (Chapter Eight). Empathy and care are further envisioned as preparing students for work and life amid complex global challenges in contemporary times (Chapter Three) and arts education broadening critical thinking and possibilities of social expression, participation and communication (Chapter Nine).

Adaptability is underscored in the asserting of human-centred practices in supervisory roles in doctoral or post-doctoral study (Chapter Two), the intersections of human learnings and computational models (Chapter Six); frameworks for leadership that notably account for diversity and complexity across school communities (Chapter Twelve) and the interplay of human-centred education across nuanced meanings of complexity (Chapter Thirteen). Creative thinking is illustrated in participatory action research approaches engaging play, joy and mathematics word problems (Chapter Five); action research and coding as an innovative extension of a mandated curriculum (Chapter Seven); uses of “adaptive reasoning” in school mathematics teaching and learning (Chapter Four); proactive approaches to early childhood education practice and policy (Chapter Ten); and fostering gender awareness in early childhood education contexts through challenging teacher perceptions and practices (Chapter Eleven).

With urgency, across the range of human-centred education approaches detailed in this volume, possibilities and enactments of research, curriculum design, teaching and policy evoke what I have reflected on as “diasporic tellings” (Watson, Smith et al. 2024; Watson and Knight-Manuel 2020). A notion of diasporic tellings dynamically extends into research, teaching and policy framings considerations of how novelists, essayists, poets and educators, Ngūgĩ wa Thiong’o to Chimamanda Ngozi Adichie, have long envisaged and named daily, human-centred moments, beyond singular,

popularised, deficit narratives—of Africa, individuals, communities and contexts. Consequently, Achebe recalled to an *Atlantic* magazine writer:

The last four or five hundred years of European contact with Africa produced a body of literature that presented Africa in a very bad light and Africans in very lurid terms. ... This continued until the Africans themselves, in the middle of the twentieth century, took into their own hands the telling of their story. (Fetters 2013: para. 6–7; cited in Watson, Smith et al. 2024: 135).

As illustrative examples of diasporic tellings (Watson, Knight-Manuel et al. 2024), scholars have asserted the ways in which diasporic tellings counter deficit narratives of immigrant youth as youth assert roles of ‘inquirers’ of their lives (Wright and Xiao 2023: 16), and examined the intersections of diasporic tellings and ‘race, literacies, joys, and geographies’ across the lived experiences of Black African immigrant youth (Watson, Smith et al. 2024: 133; see also Afolalu 2024; Kiramba, et al. 2024). In short, as enactments of human-centred education approaches, evoking diasporic tellings engages the intentional work of centring human-centric ontologies and epistemologies in frameworks, methodology, policies and practice (Watson, Smith et al. 2024, Osei-Tutu 2024). Authors across *Advancing Human-Centred Education in Complexity* engage a range of dynamic diasporic tellings. Such renderings enrich and inform contours of early childhood, elementary, secondary and higher education teaching, learning, research and administration, notably given the necessity for transformative research, teaching and policy approaches in navigating today’s landscapes of funding and economics in higher education and society (Demirjian et al. 2025); demographic shifts in enrolment and demands for (re)presentations in curriculum and teaching practice (Magcaba 2025) and the simultaneous ubiquity of educational technology and the ‘quantitative debt’ to African contexts for such labour and material resources (Stewart and Uanhoro 2023: 121). Ultimately, authors across this volume invite your attention, curiosity and engagement in this imagining of a multitude of diasporic tellings of, and as, human-centred approaches past, present and yet to come.

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Part One

Setting the Context

Chapter One: Advancing Education in a Complex World: A Human-Centred Approach

Saloshna Vandeyar

Faculty of Education, University of Pretoria, South Africa

Setting the context

South Africa's social and educational landscapes are marked by persistent turbulence, complexity and unpredictability. In South Africa and across much of the African continent, entrenched poverty and inequality intersect with frequent disruptions, all unfolding against a backdrop of systemic societal challenges. In such a context, education must be profoundly human-centred—rooted in an understanding of interconnected ecosystems and their dynamic interdependencies. Educators today, must navigate this complexity by integrating critical thinking with practical action. Their role is to foster resilient individuals and communities through education systems that not only adapt to change, but also actively shape it for the betterment of society.

A human-centred education (HCE) approach places people at the core of all educational decisions, processes and designs (McGill 2021). It is grounded in the belief that human needs, relationships and well-being must be prioritised in every learning context. As Gill and Thomson (2017) assert, this perspective challenges traditional norms, reimagining the purpose of education, the nature of learning and the relationships that define educational spaces. HCE serves as a powerful alternative to an overemphasis on standardised testing. It champions a holistic, well-being-focused philosophy that upholds academic excellence while advancing inclusivity and personal development. As Shum et al. (2019) explain, human-centred systems are those deliberately designed with consideration for stakeholders, their interrelations and their contexts. This paradigm promotes lifelong, inclusive and emancipatory learning.

At its essence, HCE redefines education by elevating human values—

care, empathy, adaptability and creative thinking. It nurtures the development of individuals who can contribute meaningfully to both their personal futures and the broader society. As Gill and Thomson (2017) note, emerging pedagogies emphasise care, positive relationships, and well-being, offering a counter-narrative to market-driven educational models. Increasingly, learning analytics and AI are embracing this human-centred turn, highlighting the need for pedagogies that engage learners personally and meaningfully. These pedagogical approaches focus on developing essential soft skills such as communication, adaptability, assertiveness, empathy and creative problem-solving. These interpersonal competencies are vital to preparing learners for life in a rapidly changing world (Shum et al. 2019). HCE is ultimately about empowering young people to lead purposeful lives and contribute to a flourishing, equitable future (Thomson et al. 2020). It equips individuals with the knowledge and professional skills necessary to build compassionate, inclusive societies.

In an increasingly complex and uncertain world, responsive education systems must account for interactions among multiple ecosystems—political, legal, social, economic and biophysical. These systems are deeply interwoven, with feedback loops that amplify complexity. The ability to navigate such complexity depends on embracing transdisciplinary approaches grounded in disciplinary and multidisciplinary excellence.

Higher education must evolve in response to shifting economic paradigms, changing student demographics, the proliferation of start-ups and the imperatives of addressing inequality. Furthermore, the rise of artificial intelligence (AI) and the metaverse brings profound implications for research and education. Educational technologies that were once peripheral—such as learning management systems, virtual classrooms and serious games—have now become foundational.

Emerging technologies like generative artificial intelligence (AI), intelligent tutoring systems, chatbots and blockchain are poised to transform educational practices (Adeshola and Adepoju 2024; Büyükzkan and Mukul 2024). These innovations are reshaping not only teaching and learning, but also the workplace (Chiu 2024b; Martins et al. 2023). Chiu (2024a) proposes the CRAFT framework—Care, Reinforcement

Learning, Assessment, Future Competencies and Transdisciplinary Learning—as a strategic response to guide AI’s integration in education. Human-centred design (HCD) aligns closely with this vision and offers a methodology that embraces learning by doing, reflection, critique and future-oriented thinking. HCD supports the development of systems that are not only efficient, but also empathetic, context-sensitive and responsive to human complexity (Boy 2013; 2020).

For academic leaders, the rapid pace and breadth of change are often disorienting. The notion of “business as usual” is no longer tenable. Higher education requires a transformative approach—one that reimagines teaching, research and institutional administration. Leadership must be capable of understanding broad trends and developing systemic, anticipatory responses to complexity (Dawson et al. 2018).

Education intersects with all ecosystems and their various interfaces, and advancing education in complexity is at the heart of the model. Effectively advancing education in complexity inherently requires a balance of hard (techno-centric) and soft skills (fundamental values of care, compassion, relationship and well-being) characteristic of those needed in transdisciplinary initiatives.

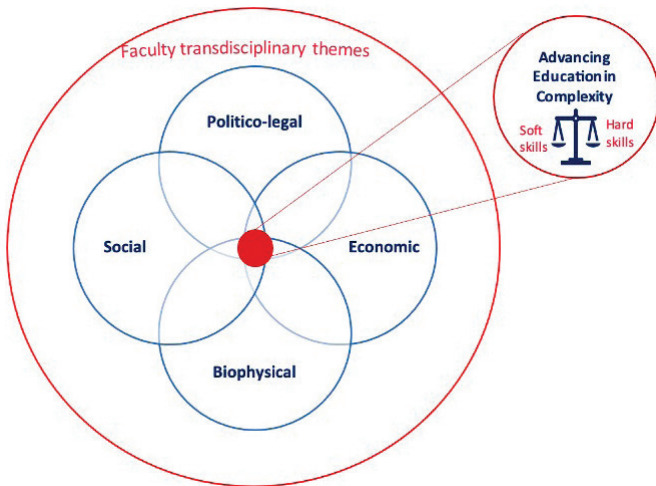


Figure 1.1: The research ecosystem model

In today's complex and interdependent world, the value of a broad skill set is indisputable. The ability to identify, cultivate and apply one's skills plays a crucial role in achieving both personal and professional success. This success hinges on the development and continual refinement of both hard and soft skills (Cimatti 2016; Laker and Powell 2011).

In technology-driven environments, hard skills refer to the specialised knowledge and technical abilities required to effectively interact with digital tools and systems. These competencies—such as programming, data analysis, software use and network management—are typically gained through formal education, training and experience, and can be measured or demonstrated. Hard skills are essential for driving innovation, enabling automation, improving efficiency and meeting the needs of an evolving job market (Lamri and Lubart 2023).

However, the importance of soft skills cannot be overstated. Abilities like communication, collaboration, adaptability and problem-solving are equally critical in tech-centric settings. These interpersonal and cognitive skills empower individuals to manage complexity, collaborate across disciplines and remain agile in response to emerging challenges. Unlike hard skills, which are technical and job-specific, soft skills are often honed through lived experience and are applicable across diverse professional contexts (Andrews and Higson 2008).

In recent years, there has been a growing acknowledgment of the value of soft skills within education and beyond (Succi and Canovi 2020). Studies suggest that workplace effectiveness is increasingly reliant on a blend of both hard and soft skills (Lyu and Liu 2021; Van der Vleuten et al. 2019). Moreover, some researchers have identified overlapping elements between the two, suggesting a continuum or “bridge” that links them (Kuminov et al. 2019; Pieterse and Van Eekelen 2016). This intersection offers a promising avenue for educators and trainers to adopt a more integrated approach—fostering a holistic understanding of the technical and human dimensions of skill development (Webb et al. 2022).

One way of developing soft skills is by implementing a pedagogy of compassion, which rests on three core principles (Vandeyar and Swart 2019): dismantling polarised thinking and questioning entrenched belief systems; shifting mindsets through compassionate engagement with diversity in

educational spaces and fostering hope and the foundations for sustainable peace. Dismantling polarised thinking involves disrupting received or inherited knowledge. Jansen (2009) emphasises the need to expose polite silences and unspoken grievances, to articulate implicit knowledge and to openly discuss both its real and potential harm. Facilitating dialogue and fostering interaction between opposing perspectives is essential to unsettling entrenched ideologies and catalysing transformative change (Vandeyar and Swart 2019).

Shifting mindsets calls for a deliberate and compassionate engagement with diversity within educational spaces. Vandeyar and Swart (2019) advocate for the integration of multiple perspectives, including Jansen's (2009) concept of pedagogic dissonance, Boler and Zembylas's (2003) ethic of discomfort inspired by Foucault (1994), Freire's (1992) critical democratic outlook and knowledge of lived experience and Postma's (2016) notion of educational spaces. Creating inclusive educational environments means amplifying diverse student voices and responding to them not just with warmth and care, but with genuine empathy—a deep emotional understanding accompanied by a strong commitment to alleviate suffering through concrete actions.

Hope, as Jansen (2009) asserts, underpins post-conflict education. Freire (1992) describes hope as an embodied experience encompassing emotion, desire, dreams, thought and intuition. According to Webb (2010), the educator's role is not simply to instil hope, but to awaken it and provide meaningful direction. A critical post-conflict pedagogy acknowledges both the pain and the power embedded in educational and societal systems, recognising their impacts on youth and asking how things might be improved (Jansen 2009). Freire (1992) maintains that the true liberation of individuals is deeply connected to societal transformation—a process that holds the potential for achieving sustainable peace (Vandeyar and Swart 2019). In essence, pedagogy of compassion seeks to challenge accepted knowledge, cultivate an ethic of discomfort, break through silences and inspire action—empowering educators to become transformative thinkers and agents of meaningful change.

This scholarly volume advances the proposition that HCE is not only timely, it is essential. It reconsiders the aims of education, reshapes learning

processes and centres the needs of learners. HCE honours the intrinsic worth of each individual, fosters curiosity, compassion and responsibility and envisions an education system that prepares people to thrive—intellectually, emotionally and socially—in a rapidly evolving world.

Structure of this scholarly volume

This scholarly volume presents papers that offer studies on advancing HCE in complexity, and aims to bring together several perspectives and debates on this topic. The papers reflect a variety of approaches, from critiques of extant systems, to efforts to identify emergent commendable pedagogical practices in a class of diverse learners. This scholarly volume is divided into three sections. The first section '*Setting the Context*' (Chapters One and Two) presents a brief outline of the theoretical grounding which underpins a human-centred approach to education and an outline of the ensuing chapters in this volume. The second section turns our focus to '*Human-Centred Education in Action*' (Chapters Three–Twelve). This section is divided into five sub-sections that attempt to show how a human-centred approach to education impinges on and transforms practice. The third section draws ones attention to '*Monitoring, Evaluating and Amplifying Impact*' (Chapters Thirteen). The scholarly volume closes with some '*Concluding Thoughts*' (Chapters Fourteen) on how to advance HCE in complexity.

About the chapters

Section 1: Setting the context

HCE is a valuable and effective approach for people, however, due to complexity and indeterminacy, it is also often difficult to practice. In a rapidly transforming world, how might one *design* educational experiences that enable young people to attain human agency, take on responsibility and develop a passion for learning? Change is accelerating. Society is undergoing transformation, driven by technology, demographic shifts and climate crises. Amid such great change, one hopes young people can learn useful capabilities and develop moral responsibilities to redesign systems for a positive future.

Part One of the book, aptly titled “**Setting the Context**” comprises of two chapters (Chapters One–Two). Chapter One, *Advancing education in a complex world: A human-centred approach* by Saloshna Vandeyar presents a brief outline of the theoretical grounding which underpins a human-centred approach to education in complexity, and an outline of the ensuing chapters in this scholarly volume. Chapter Two of this section, *Human-centred research: Navigating personal, political and paradigmatic worldviews* by Michael Samuel tackles the complexity of the agenda for human-centred research. The chapter begins by elaborating the complex relational ecologies that expose the connectedness between personal, structural and educational agendas. It then explores why an entanglement of complementary and paradoxical forces must be accommodated. This is followed by an exploration of a comparative perspective to researching human individual experiences, suggesting that human-centred approaches to research are paradigmatically bound. A commentary on the kinds of supervisory care and critique required to enact a more complex iteration of a human-centred supervisory practice is subsequently presented. In closing, the chapter provides a synthesis of the overall argument and suggests new directions for further research.

Part Two of the book “**Human-Centred Education in Action**” presents a collection of papers that demonstrate HCE in action. The section is divided into five sub-sections, namely “**Centring Humanism in STEM Education**” (Chapters Three–Five); “**Human-Centred Learning Analytics and AI in Education**” (Chapters Six–Seven); “**Redefining Human Centric Skills through ‘Quality Talk’**” (Chapter Eight); “**The Art(s) of Human-Centred Education**” (Chapter Nine); and “**Advancing Inclusive Adaptive and Equitable Education for Sustainable Futures**” (Chapters Ten–Twelve).

Chapter Three, *Evholution infused science education empowers students to navigate their way in the current global storms of change* is the first paper in the sub-section “**Centring Humanism in STEM education**”. In this paper Philip Mirkin argues that the South African education system mostly ignores the “why”, despite the desperate need for personal meaning in the modern world where people are being forcefully pushed and pulled by tribal, national, cultural, political, religious, technological, media and economic

forces. Structures which support traditional cultures are collapsing at a rate possibly never seen in history, often with the consequence of threatening, undermining or destroying the very things that make people feel at home in the world. An approach that can prepare students for the modern world of life and work while giving them the spiritual human-centred stability with the power to retain the highest of human values is needed. This chapter explores some often-overlooked aspects highlighted by the holistic understanding of evolution that can point one towards a deeply meaningful “why”. Results of evolutionary science education research conducted with high school and university students are presented as an expression of learner and student responses.

In Chapter Four, the second paper in this sub-section, Roger Mayani, Ugorji Ogbonnaya and Fru Akuma explore *Grade 11 learners' adaptive reasoning proficiencies in solving Euclidean geometry problems*. The study utilised a qualitative approach based on an interpretivist philosophical stance and was underpinned by a five-strand mathematical proficiency framework. A sample of 200 learners was selected from ten schools in Limpopo, South Africa. A Euclidean Geometry Proficiency Test (EGPT) was used as a starting point towards the acquisition of qualitative data for this study. The study then used the Rubric of Mathematical Adaptive Reasoning (RMAR) as a framework for analysing the learners' solutions to the problems in the EGPT. Findings show that 89 per cent of the learners were poor in adaptive reasoning, 4 per cent were found to be moderate and 7 per cent were categorised as excellent. There appears to be a need to improve the teaching and learning of this aspect of mathematical problem-solving. Future research may examine other dimensions of the problem-solving proficiency and the adaptive reasoning proficiency of learners in districts around the country to uncover the general trend. This will better inform school mathematics education in South Africa.

Chapter Five, *Using participatory action research to change the landscape of mathematics word-problem-solving instruction* by Nadia Swanepoel, highlights the importance of play in implementing critical instructional practices to elicit joy and fun in mathematics word-problem-solving. Mathematics word-problem-solving was made accessible to teachers and learners by means of using alternative practices for the instruction of

mathematics word-problem-solving. This study offers insights into the renewed importance of creativity and critical thinking in mathematics word-problem-solving practices. “Play” as an umbrella term, allowed for peer and group teaching, the use of humour and the implementation of the multiple intelligence theories. A new way of teaching mathematics word problems emanated from this research. As agents of change, teachers can now make mathematics word-problem-solving accessible to all and eliminate the fear of solving mathematics word problems.

The second sub-section turns the focus to “**Human-Centre Learning Analytics and AI in Education**”. Celeste Combrinck’s paper *Using binomial logistic regression and receiver operating curves to identify at risk learners* (Chapter Six), explores methodologies for scientifically setting cut scores in educational assessments when traditional resources such as expert panels, are unavailable. A practical demonstration is provided using the Rasch partial credit model, logistic regression and receiver operating characteristic (ROC) curves to identify academically at-risk learners in South African schools. Key findings reveal that binomial logistic regression and ROC analysis effectively set cut scores, with logistic regression offering greater accuracy in identifying at-risk learners. Mathematics and Science assessments were significant predictors of tertiary access, while the English test was not. The combined use of these methods demonstrated predictive accuracy, with the logistic regression model achieving 96.3 per cent correct classification. Although slightly less precise, ROC analysis provided useful benchmarks for setting cut scores.

Soene Botha, Maryke Mihai and Pieter du Toit’s paper, *Revolutionising coding and robotics curriculum design for Grade 4 through Whole Brain® thinking and action research* (Chapter Seven) investigated the development of a coding and robotics curriculum for Grade 4. This research study was prompted by the inadequacy of the curriculum developed by the Department of Basic Education (DBE) for a private school’s specific needs and educational environment. The study aimed to develop a Whole Brain® curriculum that effectively harmonised with the school’s resources and learners’ needs, using qualitative methods such as iterative design, real-time implementation and reflective analysis. The main research question concentrated on how the researcher could use principles of action research

to self-monitor the design and continual development of a Whole Brain[®] coding and robotics curriculum for Grade 4. This research in technology education introduced a new scholarly perspective combining creativity with scholarly rigour, utilising a dual methodological approach to develop learners critical thinking.

In the third sub-section, “**Redefining Human-Centric Skills through ‘Quality Talk’**”, Marisa Leask’s paper *‘Quality talk’: Human-centred education in a complex rural school space* (Chapter Eight) explores the adaptation of Quality Talk (QT), a structured dialogic pedagogy, as a means of advancing HCE in under-resourced rural South African schools. Grounded in sociocultural learning theory and dialogic pedagogy, QT fosters student agency through authentic questioning, collaborative reasoning and student-led discussions. The chapter examines the local co-design of *Inkbulumo*, a model developed with teachers and students to address linguistic diversity, cultural relevance and systemic constraints. Through peer-led discussions in home languages, *Inkbulumo* cultivates interpretive authority and supports cognitive, social and emotional development. Unlike traditional teacher-centred instruction, *Inkbulumo* encourages student autonomy and co-construction of knowledge. The chapter concludes with recommendations for embedding *Inkbulumo* in teacher training, supporting school-level adaptation and prioritising language inclusivity, emphasising the need for systemic support to sustain context-responsive, human-centred pedagogy.

The fourth sub-section “The Art(s) of Human-Centred Education” presents Raita Steyn’s paper *Inclusive pedagogical approaches to human potential in South African arts education through meta-research lenses* (Chapter Nine). This chapter explores the pedagogical role of arts education to human development in circumstances of physical limitations. To this end, the quest surveys the dynamics of arts as an empowering means for individual expression, social participation and communication, both intellectually and professionally, beyond a person’s physical constraints. Through a meta-research lens, and within the framework of the Ubuntu philosophical concept, this study promotes socio-cultural inclusion, aligned with a broader research project titled *We and the Others*. Educationally, the application of such integrated teaching/learning interaction has brought to

the fore the benefits of human potential, its diversity and resourcefulness. Socially, the research demonstrates that the development of different human aptitudes through inclusion, can motivate positive social transformation by promoting changes to conventional worldviews, such as irrational stereotypes.

The fifth sub-section “**Advancing Inclusive Adaptive and Equitable Education for Sustainable Futures**”, comprise three papers. *High levels of adaptability, proactivity and resilience as skills in line with the Sustainable Development Goals in early childhood education* (Chapter Ten) by Wietske Boon reports on the preliminary findings of the post–doctoral study *Early childhood education teacher educators’ values and perceptions in context of the sustainable development goals and Agenda 2030*, which is conducted within the Teach4Reach 2.0 project. The preliminary qualitative findings from vignette research, based on a phenomenological approach, and four semi–structured interviews conducted in early childhood education departments in South Africa, point to the importance of high levels of resilience and proactivity as skills in different contexts to promote professionalism and strengthen education for sustainability. In addition, teacher educators have a responsibility to be willing to change, foster high–quality relationships, take part in professional development activities and adjust the curriculum based on recent findings and literature. Although further research is recommended in terms of resilience and proactivity in early childhood education departments in higher education institutions, these findings can contribute to the foundation for future research in terms of professionalism in context of the sustainable development goals.

In the second paper “*The development of a gender awareness programme that challenges teachers’ perceptions and pedagogical practices in ECE* (Chapter Eleven) Renisha Singh and Keshni Bipath explore Early Childhood Development (ECD) teachers’ perceptions and pedagogical practices regarding gender in South Africa. Drawing from post-structural theory, the paper used the concepts of discourses to frame the study. Findings reveal that by challenging teachers’ perceptions and pedagogical practices, learning environments became more gender aware and that teachers’ development programmes are paramount to gender-equitable transformations at ECD centres.

The third paper *Contextual intelligence and educational policy: Evaluating the influence of the Basic Education Laws Amendment Act on South African Schools* (Chapter Twelve) by Rene Beyers-Prinsloo examines the Basic Education Laws Amendment (BELA) Act through the lens of contextual intelligence theory, focusing specifically on the amended provisions related to language and admissions policies in public schools. Employing a document-based, theoretical critique grounded in a contextual intelligence framework, the chapter argues that the BELA Act centralises decision-making authority within provincial education departments, thereby undermining the contextual responsiveness of individual schools. The chapter advocates for a more nuanced and responsive implementation model and interrogates the shifting dynamics of power and governance within the South African education system. Ultimately, it contributes to the discourse on education reform by demonstrating the need for context-sensitive leadership and governance frameworks that recognise the complexity and diversity of school communities. It underscores that meaningful transformation requires more than central oversight, it requires contextually intelligent policymaking to ensure equitable and sustainable educational change.

Part Three of the scholarly volume **“Monitoring, Evaluating and Amplifying Impact: A Strategic Approach to Human-Centred Education”** reveals how a human-centred approach to education, informed by robust monitoring and evaluation, aims to amplify positive impact by continuously adapting to individual learning needs and ensuring effective practices. This strategy focuses on understanding the needs of students, tracking their progress, evaluating the effectiveness of interventions and using these insights to refine educational practices and policies. Brian Chicken’s paper *A strategic approach to advancing human-centred education in complexity* (Chapter Thirteen) explores HCE in the context of complexity, the leadership and culture imperatives that create the conditions for a human-centred approach and proposes a possible framework to advancing HCE in complexity.

This scholarly volume (Chapter Fourteen) concludes with some insightful thoughts, reflections and suggestions by Saloshna Vandeyar on the way forward to ensure inclusive, equitable and sustainable futures.

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Chapter Two: Human-Centred Research: Navigating Personal, Political and Paradigmatic Worldviews¹

Michael Anthony Samuel

School of Education, University of KwaZulu-Natal, South Africa

Introduction: Turning the human-centred turn

It is not surprising in the aftermath of the years of apartheid subjugation that South African higher education research foregrounds how to advance the voice of the voiceless. Alternative selections of research topics and focused phenomena have been tabled to challenge the rituals, habits and practices of dominant hegemonic disciplinary discourses, as new epistemologies, methodologies and representations are probed. On the one hand, this exploratory stance could be considered part of a transformative discourse that endorses the fundamental human rights of the post-apartheid 1996 Constitution of South Africa (RSA, 1996). Equity and social justice research considerations are flaunted as improving the quality of a dignified life for all, thereby laying the foundations for a united and democratic country. The principle underpinning such a legislative mandate is that no one may be unfairly discriminated against (directly or indirectly) based on race, gender, age, disability, marital status, sexual orientation, ethnic origin, social origin, religion, conscience, belief, culture or language. Human-centred education is embedded within these campaigns for the affirmation of especially those who were historically marginalised. Promoting self-worth, respect and dignity for all is foundational to the ethics of care, relationship-building towards bolstering well-being and the value of the holistic growth of individuals (Chapter Thirteen) humanising-centred research agenda is

¹ This chapter draws on a keynote address presented in 2024 at the University of Pretoria, Faculty of Education, Research Lekgotla: A celebration of research in the Faculty of Education. *Theme: Advancing human-centred education in complexity*. Pretoria. 04 October 2024.

expected to critique what we research, who we research, how we research and why we research. Such authentication is not confined to South African research systems, but could be generative for broader contexts, questioning the motivation for our research approaches and practices.

However, on the other hand, this chapter presents a cautionary note to these laudable pronouncements of a reparative gesture in post-apartheid South Africa. It reviews how, in the practice of the promotion of an affirmative stance, new exclusionary discourses have emerged that negate respect for a quality, dignified life for all. A further turn towards individualism and narcissism emerges that aligns itself with a neoliberal complicity, competition and selfish promotion. Are human-centred research pedagogies promoting a collusion with narrow views of self-boundary protectionism?

This chapter tackles the complexity of the agenda for human-centred research. The first section elaborates the complex relational ecologies that expose the connectedness between personal, structural and educational agendas. The second section explores why an entanglement of complementary and paradoxical forces could be accommodated. It draws on an interpretation of how radical ideas become co-opted towards maintaining preservative conservatism. The third section explores a comparative perspective to researching human individual experiences, suggesting that human-centred approaches to research are paradigmatically bound. Expanding human-centred research from its interpretivist roots towards a recommended critical paradigmatic perspective involves paying attention to systemic power, injustice and discrimination. Nevertheless, the chapter explores how paradigmatic proliferations could activate a broader spectrum of possibilities. The fourth section offers a commentary on the kinds of supervisory care and critique required to enact a more complex iteration of a human-centred supervisory practice. It argues for a pedagogy of disruption, rather than a pedagogy of comfort. This opens new possibilities for exploring supervisory models and redefining individual and collective agendas in research. The closing section synthesises the overall argument of the chapter and suggests new directions for further research.

Section One: When affirmation becomes oppression

In the name of a human-centred strategy, many research centres have adopted an approach encouraging student researchers to draw on their personal circumstances and incorporate their stories of success or failure, obstacles and triumphs into their research studies. This is seen as a form of affirmation as students place on record their silenced stories. This agenda is sometimes naively considered as a purely *descriptive* exercise of celebration and vainglorious representations of contextual circumstances that have given rise to the specific chosen focus of study (Samuel 2016b). For example, students are encouraged to report on the constraints and opportunities in realising alternative policy expectations in everyday practice. Their analysis is often confined to externalising the sources of their disquiet and suggests a valorisation of victimhood. Paradoxically, this kind of analysis leads individuals to deflating their own agencies and expecting solutions to derive from sources which are usually out of their parochial ambit. Sometimes, unconsciously, a degree of conservatism underpins the motivation of such research purposes. The researcher summons a lost golden age, a nostalgic quest to return to habits and practices with which they have become comfortable. Thus, while at face value such research appears to be about affirmation, it indirectly promotes a consolidation of remaining within the boundaries of the conventional. Ironically, it retains patterns of older oppression. The research reports of this kind of simplistic individualist research approach become obsessed with fault-finding and blame.

The concern is that these approaches are often limited in their *theorisations of the phenomena* they describe. For example, extensive literature already exists exploring the multiple explanations related to the gap between policy and practice, even suggesting the limits of whether macro-policy can generate alternative practice (Sayed 2001). Some even argue that policy is merely a symbolic rhetorical strategy to direct the system to think of the ideals towards which they may aspire (Jansen 2001; Jansen and Sayed 2001). The lack of infrastructural scaffolding to activate the policy implementation is a well-argued critique of perfectionistic designs (Jansen and Taylor 2023; Mogale and Malatji 2025). Hence, what new does the affirmative research

attempt beyond providing an opportunity for individuals to provide contextual insights into their operational circumstances? How does this contribute to a scholarship about how the phenomenon of the study is extended in various ways? Does the research turn in on itself to question how, as a researcher, one might also be complicit in bolstering the lack of movements towards alternate ways of being?

From reflection to diffraction

Drawing on the anthology by Dison et al. (2024) entitled *Pedagogic innovation beyond disruption*, the suggestion is that a humanising pedagogy is not about a simplistic reflective exercise. These authors suggest that a theorised critical reflection constitutes a form of practice of thinking about knowing, learning and doing that works to examine how individual researchers/practitioners themselves, and their preferred practices become the focus of their analysis. The authors reference this as a form of ‘bring(ing) the self into visibility’ (Bozaleck and Zembylas 2017: 114) that acknowledges the complex relational ecologies between the personal, the structural and theoretical abstractions. Critical reflection is not a form of narcissistic mirroring of one’s own circumstances, but a metaphor of diffracting into the world drawing from the positionality one occupies and ‘embracing the forward momentum of emerging different understandings and enactments with each act of revisiting’ (Bozaleck and Zembylas 2017: 114–115). Further, Haraway (2023) argues that this evolving redefinition involves an act of returning to one’s own stories, to revisit how memory-making has been constructed and then reconsidering the self-in-action in situated contexts.

While the above research study was focussed on examining the kinds of pedagogical strategies undertaken by academics as teachers within the social sciences and humanities disciplines of a particular higher education institution, reflecting on their practices during the emergency remote teaching and learning strategy of the COVID-19 period, I believe that this diffractive examination can be transposed more broadly into the *world of research* and how student researchers and their supervisors construct research agendas. The original Dison et al. (2024) study mediated the

process of *ex-post facto* critique, drawing from the disruptions of the COVID-19 era within their teaching environment. Their prospective agenda is evident in the provocative question, ‘When it (the COVID trauma) is all over, how do you want the world to be different?’ (Dison et al. 2024: 21) Through extrapolation, one could explore how and why humanistic discourses have emerged in research spaces. One could focus on the effects that have diffracted into emerging varied understandings and enactments of human-centred research on a broader scale with the South African and Southern scholarship landscape. Human-centred research approaches should expand beyond parochial, illustrative studies, and re-enter and re-visit the intersecting realms of the personal, political and the paradigmatic worldviews embedded in its choices. What do we hope to be different through choosing a human-centred research approach?

Enacting a diffracted humanising research agenda

One such example of diffractive analysis could be to examine the effects of what a humanising focus could unintentionally promote. It could be argued that as the voice of the oppressed begins to assert its rightful place, new forms of marginalisation and silencing of other voices take hold.² For example, as institutional research topics aim to challenge white racist privilege, it could have the effect of promoting a view that only research on Black ways of seeing, being, doing and acting is considered valuable. This approach undervalues the interconnected relational elements of race as dialogical and constructed through changing historical times and spaces. It further promotes views of a hardened boundary between the self and others. It legitimises one form of oppression to be replaced by another, as the subjugation of the previously privileged is seen as paramount. Moreover, it consolidates definitions of race itself as *a priori* pre-existing constructs. It reifies socially and politically orchestrated constructs as naturalised.

A further agenda as a diffractive quality of human-centred research could be to suggest that the self is more important than the wider social system from which the self originates. ‘Now-is-my-time’ is often a phrase

2 It is acknowledged that such a counter-oppression stance could be considered as an ideological political struggle.

that condones individual personal prioritisation over the collective public good. It becomes yet another form of oppression of self over others and colludes to gain access to the organs and trappings of power to which the historically disadvantaged were not previously permitted admittance. The phrase does not question the assimilationist agenda to become part of the extant systemic power. Furthermore, this stance supports the clambering ascendancy over others and sees competition (and its potential slippery slope to endorsing corruption) rather than collaboration as an acceptable ethical driving force for personalistic greed. Paradoxically, this demotes the broad conception of affirmation and transformation, limiting it to only matters of selfish interests.

Broadening conceptions of transformation

Research agendas could also be examined through the lens of what paradigmatic worldview of transformation they promote. Dison et al. (2024: 240) suggest that a '*pragmatic critical transformation*' attends chiefly to matters of surface demographic changes and tends to remain within existing frameworks of superficial econometric performativity discourses. It does not change the power hierarchies structurally, and is often the favoured preferences adopted by a managerial perspective, which seeks to demonstrate manifested evidence of change, whilst limited amendments might be happening at a deeper level. It often complies with broader nationalistic policy rhetoric, however, may not deal with more saturated conceptions of transformation. Oftentimes, the structural elements remain intact while posturing frills create semblances of commitment to transformation.

Further, one could adopt a theoretical view of countering axiological beliefs and values and exposing hegemonic parameters within the human-centred approach. However, this logico-scientific view, aligned with the European enlightenment theoretical movement, tends to promote, at a largely abstract rhetorical level, the rights of neoliberal individualism from a narrow humanist perspective (which has been critiqued above). Instead, Dison et al. (2024: 241) argue that '*utopian transformation*' focusses on the role of agents within the system and the priority of finding both theoretical

and practical redesign to existing social systems. The agentic responsibilities of researchers/practitioners are foregrounded here.

More complex versions of a transformation consider that the progression towards social equity and justice is not a linear, rational and chronological sequence (Samuel 2025). Instead, multiple expressions of time, space, context, agents and the victims, perpetrators and the resisters iteratively collide in a *forcefield of competing perspectives*. No one group or context is considered completely stable, since each force acts upon and influences reactive responses from the other. Neither are all responses identical: rejoinders shift too, as they are based on evolving ecologies of relationships (more of this later). Simultaneously, the past, the present and the future are dialogically intertwined in contested and fluid possibilities. Such a state of being and becoming is considered by Australian indigenous peoples as a recognition of the ‘infinite present’ (aManathunga 2014: 2).

The above theoretical framing makes a case for locating human-centred pedagogy and research at the intersection of complex and competing agendas. It presents human-centredness not as a personalistic agenda but locates the role of researchers and their supervisors to connect knowledge-making within place and geography, time and history. This is best captured by Manathunga’s (2014: 46) notion of ‘in-between-ness’. Manathunga (2014) comments about Fazal Rizvi’s assertion that discourses about the East meeting the West (or even the Global South meeting the North) are couched in already over-determined categories, whilst the matter of the “meeting” is most significant. In the book titled *Intercultural postgraduate supervision: Reimagining time, place and knowledge*, Manathunga (2014: 2) recommends:

- (a) re-theorisation of colonial frontiers enabled (by) the full range of intercultural contacts (needs) to be investigated, incorporating not only the exploitation, violence, appropriation evident in contact between different ethnicities, but also the opportunities for creative exchange, ironic mimicry, sharing technologies and practices and developing innovative ideas. Thinking about intercultural supervision as a contact zone allowing us to investigate both the challenging tensions and deconstructive possibilities evident in the space across and between cultures.

This section has argued that a humanising research agenda should bring the *self into visibility*, should attend to the construction of time and space within an *infinite present* and reimagine the vibrancy of the *in-betweenness* of research practices, not only between students and supervisors, but also in relation to how research topics are chosen at a personal, structural and theoretical level *relationally and iteratively* (see Manathunga 2014: 79–83). The relationship between research participants continues this respectful interaction.

Section Two: Institutions as human personages

The previous section has argued about the self within time and space in a broad conceptual way. Section Two focuses on the *situated nature of the higher education institutional contextual* landscape, as a particular kind of spatiality. This section argues that academics (as teachers, researchers and managers) and their students (as aspirant members of disciplinary communities) are constructed by and construct the kind of institutional spaces within which they operate. Institutional theorists foregrounding the sociology of institutional space critique the view of structural determinism that positions individual academic identity at the mercy of structural forces (Du Preez and Simmonds, 2018; Soudien, 2018). Instead, institutional spaces are constituted via multiple and diverse perspectives of agentic human voices. In this way, the institution is seen as a living entity impregnated with personage and humanity. Institutions are not monolithic abstractions, they are personages in a perpetual drama of foregrounding, silencing and mutating conceptions of themselves. A humanising research approach would be limited if it did not attend to this dialogical intercourse between multiple contracting agents, each with different degrees of control, subversion and transformatory potential. Humanising research also entails an examination of the academic syntaxes of how higher education institutions operate, not just as disciplinary entities, but as *spaces* which aim to generate resilience and robustness in concert with the broader social-cultural and economic forces.

The quest for epistemic relevance and innovation, in relation to the social system that institutions serve, is not separate from a humanising

research agenda. Universities usually profess that their mandate is one of service to the society within which it is located. Yet these humanising affirmatory ideals might become sidelined, co-opted and recast if one did not attend to the power dynamics that direct a higher education institution's internal and external agenda. Various forms of power are at play: the power of the disciplinary interests; the power of students' voice and its interest to complete their studies; the power of managers to ensure efficient use of available funds; the power of institutional structures and committees within the organisation and the political and economic power of funders who steer the financial viability of an institution. These powers are always in interactive dynamism.

Radicalism co-opted

One such example of exploring the relationality of the institutional personage is a study exploring how radical ideas travel through an institution. The current study was motivated by an interest in understanding why radical organisations and agendas become co-opted into watered-down versions of themselves and look opposite to what was initially intended. The study by Jansen and Walters (2022) titled *The decolonization of knowledges: Radical ideas and the shaping of institutions in South Africa and beyond*, set out to explore how the radical idea of decolonisation, initially at the forefront of South African student protests in 2015 and 2016, became institutionalised within the institutional curriculum of ten universities.³ Engaging with over two hundred academic teachers, the study explores the uptake of decolonisation at universities where the most intense protests and demands for decolonisation were heard. These institutions' senates and councils responded in varied ways to the need for change.

It is not the intention to engage deeply with the study's findings, indicating the permutations of choices exercised, since the intention is

3 One notes that these ten sampled institutions did not include historically disadvantaged institutions (HDI). The authors claim that HDIs considered the specific agenda of the *#Fees Must Fall* and *#Rhodes Must Fall* student protests less of a priority. They claim that such HDIs are characterised by economic survivalist modes rather than engaged with the epistemological, political reconceptualisations around (financial) access and (cultural) acclimatisation. A moot point for further consideration.

merely to illustrate that institutional analyses are examples of a relational and dialogical humanising research agenda. The study revealed that the institutional space, like the nature of one's familiar and dynamic human identities, was characterised by much busy-ness to provide semblances of change, and seek to be considered relevant and responsive. Institutions chose what was expedient and capable of restoring stability to counter the era's turbulence. The institutions revealed themselves as capable of posturing and sanitising the radical agenda by creating official documentation in policy and regulatory texts. Some institutions set up committees to create a form of bureaucratising by counting and demonstrating the patterns of change. Others co-opted radical elements into decision-making structures to preserve the local hegemonies; many slowed things down by advocating and adhering to regulatory internal and external structural and departmental hoops. These institutions ensured radical ideas were kept at bay by creating exoticised demonstrations of alternative curriculum, which further ghettoised the radical ideas. Few students enrolled for these new courses, returning the institution to a homeostasis (Soudien 2019).

Whilst these strategies might appear deliberately conservative, they reflected that institutional identity is pliable, patient, and polyglot. The study revealed that the individuals in the organisation and their research agenda mutated, morphed and looked radical in their choices. The management encouraged a way of riding out the storm as they waited for things to return to normal. Perhaps, South Africans have become habituated to recurring protests, and this decolonisation movement, though taking on universal fervour and national political policy responses, recalibrated to another form of calm after the storm. Each institution chose its own varied strategy, and its individual personage, institutional contexts and human agents activated unique perspectives. The authors of this study conclude, however, that decolonisation is interpreted, but not implemented.

Towards humanising situation analysis research

It appears that the status of the institution, its reputation and its ranking fetishes were a hidden motivating force behind the institution's decision-making. Indirectly, the radical ideas become co-opted by the macro-

systemic performance culture of the higher education system. Whether at an historically underserved institution or in more affluent universities, all institutions were driven by economic priorities to stay afloat. This kind of analysis of the relationships within the institution (between its student body and management, within the structures of the academic departments and curriculum making and across the broader sociological terrain) constitutes a more comprehensive understanding of a humanistic research approach. The students, whilst depicted in this study as a somewhat receptive force in the institutional bureaucratising post-protest era, nevertheless demonstrate a silent, powerful force. The original protests had a lingering effect on the decision-making processes at the institutional level. This could become a recommended focus for further humanising situational analysis research. However, students too become seduced by the agendas of ensuring that they graduate from the institution and hence, collude (or become indirectly co-opted) into less radical ways of being and becoming.

The institutional dance, embodied and demonstrative, is one of continued relearning about *self, about others, about structures and systems* (Loots 2021). An entanglement of complementary and paradoxical forces could be accommodated relationally. Both *radical and conservative interpretations coexist* in dialogue, not as schizophrenic and postmodernist, but as an acknowledgement of being human. A humanising pedagogy and research agenda should encompass these *situated elements* in the knowledge-making enterprise.

Section Three: Three lenses of researching human experience: From the personal to the political

An underlying feature across Sections One and Two is the interest in foregrounding *the life experiences of individuals* within an elaborated contextual understanding of a humanistic research agenda. A paradoxical and multi-perspectival complex lens is required to explore the nature of life experience was emphasised. Section Three will explore three possible options, amongst many, of qualitative approaches to researching individual experiences. Each approach is located within the preferred paradigmatic axioms of *lifehistory research, phenomenography* and *critical phenomenology*.

By exploring the possibilities of researching life experience, this section reinforces the view that a humanising research agenda is not singular in its paradigmatic preference. Each tradition of researching life experiences yields vantage strengths ranging from interpretivist and constructivist to critical paradigmatic perspectives. The argument shows why South African approaches to studying life experiences should cross-pollinate a purist interpretive approach and embrace the possibilities afforded by a more radical examination of the politics of being and becoming.

This section draws from a published article in a special issue of the journal, *African perspectives on research in teaching and learning* (APORTAL), examining the evolution of phenomenology: the study of life experience (Samuel et al. 2022). This article presented a meta-reflective analysis arguing that it is possible to weave together interpretivist and critical paradigms to better address power, marginality and socio-political contexts in studying lived experience.

Lifehistory research: An epistemological pursuit, not a vanity project

The first author (A) clarifies the view that Lifehistory Research (LHR) is not the assemblage of vanity narratives documenting the trajectory of life events of individuals or institutions; instead, it uses the recalled life-stories of the individuals (or collectives) to abstract epistemological insights about a phenomenon. The LHR study reported on in the current study aims to complexify an interpretation of an intersected life in relation to the biographical, institutional and curricular programmatic dimensions of influence within the group of lives being explored. In the first author's study, looking at the student teachers in the 1990s at the onset of a new democratic macro-contextual environment, (A) traced how teacher identity construction was significantly influenced by the apartheid historical and personal biographical experiences of individuals, which became reshaped by the dynamics of alternative curricular interventions of a post-apartheid South African teacher education policy and curriculum. The study reinforced that as a life history researcher, one was not preoccupied with *forensic truth* (attending to positivist verifications); instead, the research

attended to how individuals choose to tell their stories (a *dialogical truth* making). Moreover, the LHR foregrounded the selected experiences individuals engage with in constructing the relationship between the researcher and the researched (an *experienced truth* collaboration). Both the spoken and the silenced are of interest to the researcher (Dhunpath and Samuel 2009).

The latter approach acknowledges the dynamics of power in all research interactions. Unlike positivist paradigms that attempt to neutralise the discourse production space, the LHR researcher is aware that all interlocutors have perspectives about the phenomenon being explored (student identity in this study). These conceptions pre-exist (consciously or not) the fieldwork engagement or are activated within the research moment. LHR is a theoretical analysis of pre-existing and emergent abstract insights about the phenomenon; hence, this study (A) concludes with the presentation of a *force field model* depicting the dynamics of personal and systemic influences. Over time, LHR has expanded beyond individual lives to explore groups of individuals working within organisations or institutional settings. The latter form could be considered as institutional biographical work. Further, it has activated the lifehistory of conceptual phenomena (for example, academic staff development) within the research terrain.⁴

Phenomenography: From neutral interpretivism to layered criticality

The second author (B) outlined the early canonical traditions of phenomenology, which foreground the qualitatively different ways people experience a phenomenon (Giorgi 1999). This ontological focus exposes how individuals make sense of their world and experience a new phenomenon. Neither the person themselves, nor the phenomenon itself, is the object under scrutiny within a “phenomenographical” tradition. The emphasis of a purist approach to phenomenography hones *the relationship*

4 This present chapter might be considered as an elaboration of this LHR tradition, examining the phenomenon of how humanising research agendas have shifted chronologically and conceptually.

between the person and the phenomenon (Marton 1986; 1994). (B)'s work tracked medical students' experiences of a new problem-based learning (PBL) curriculum across their on-site university-based lecture halls and in clinical internship and community-service contexts. Traditional models of medical education curricula tend to operate within an applied science model, in which students are exposed to theoretical learning about, for example, anatomy and physiology and thereafter, are assessed in relation to how they applied it practically in clinical settings. By contrast, a PBL curriculum approach exposes students to develop responses to scenarios presenting (problematic and complicated) medical cases for which the student, as an individual or in an interdisciplinary team, seeks to find solutions to the presenting real-life problem. How adequately a PBL approach prepared medical student doctors operating in clinical and community service contexts, became the focus. However, this practice was located within already habituated sets of expectations by qualified doctors and academic lecturers who were trained in the traditional applied science medical education curriculum approaches. Moreover, the introduction of PBL was competing with co-existing unwritten assumptions that medical doctors are expected to display certainty and confidence as a mark of their professionalism, even when their rationale for clinical decision-making might be ritualistic, rather than based on empirical logic (Naidoo 2018).

The aim in (B)'s study was to understand whose interests are being served by the revised curriculum modality and how individuals saw their relationship to PBL. While the study yielded categories of description as per the agenda of phenomenography, (B) considered it a limited explanatory insight about why a range of variations of the experiences occurred. Thus, (B) introduced an emancipatory paradigmatic lens into the analytical frame for making sense of the descriptive data. This layered a critical discourse analysis onto the "phenomenographic" findings, shifting from a neutral interpretivist stance to a worldview that interrogates how power, discrimination and institutional ideologies within the institution and its academic staff shape students' learning experiences.

This study's shifting paradigmatic lens suggests that a responsive attention to humanist research agenda should acknowledge that the lens one chooses to research life experience may be unsatisfactory for explaining the

phenomenon of the fieldwork. Rather than straightjacketing the analysis to fit into a predefined paradigmatic home, the study opened possibilities for new insights into how and why the perspectives about PBL occurred the way they did. The study shifted its focus from the individual students to the framing contextual curriculum space and the dynamics between those who valued the applied science model as the hallmarks of applications of theoretical certainties, and those who suggest that the medical field and its patients cultural and social contexts offers more authentic complexities that need to be addressed, than what textbooks offered.

Critical phenomenology: From first-person respect to analysis of socio-historical injustice

In conducting doctoral studies within the second decade of the post-apartheid context, the third author (C) initially chose to bracket out external contextual realities to describe the essentialist structures of experience. This classical phenomenological approach drew on the seminal work of Husserl (1983), who aimed to provide a descriptive, first-person, subjective analysis of consciousness. This was to counter the objectivist positivist definitive categorical ways of knowing. The phenomenological approach foregrounds what resources individuals draw on when they make sense of their world (Koopman and Koopman 2020). Further theorists, like Merleau-Ponty suggested that these phenomenological experiences draw from the lived and embodied experiences of individuals and should be connected into the lived accounts of individuals as they negotiate space, context and time drawing from, amongst other features, age, race, gender, disability, weight, height, medical status and sexual orientation (see Merleau-Ponty et al. 2013). An individual can read the world through their body, in much the same way as the world interprets individuals in relation to the bodies they expose. This poses a tension between the bracketing expected by classical canonical phenomenology, which disconnects the external realities and the evolving approaches which embed the self in dialogue with its context.

(C)'s study focused on student teachers' negotiating unfamiliar practicum placements in a policy-practice world which professed the expectations that students embrace their personal diversities and venture

out of their comfort zone into contested school spaces. The fieldwork repeatedly exposed the hesitance of individuals operating outside their comfort zones of familiarity in cocooned apartheid-like mentalities. (C) was concerned about how ingrained racialised and classed conceptions of self and others still dominated almost thirty years after the formal dismantling of legislated apartheid. The author's original lens captured rich descriptive insights, yet sidelined socio-political analysis of what explained why students resisted alterity. Drawing on Dyring and Grøn (2022) and Guenther (2019), (C) argued for a "critical phenomenology" that retains first-person respect while explicitly embedding experiences within power dynamics, marginality and historical injustice. Such a hybrid approach better explains, for example, why student teachers resist crossing racial or class boundaries in post-apartheid schools.

Towards a critical phenomenology

Across their reflections, all three authors—initially anchored in interpretivist canons—encountered the *disquiet* that descriptive accounts alone cannot unpack persistent inequities in South African higher education. The authors, thus, propose a *phenomenological turn*: shifting the discourse from the bounded individualistic interpretivist perspectives towards embracing the *self in dialogue with itself*, as well as in *fluid and dynamic conversation* with the ambient socio-political and historical landscapes of the institutional biographies, organisational legacies and contested evolving social lived spaces within which they operate. Drawing on researchers and studies outside of the dominant northern or western contexts (from where many of the traditional life history, phenomenography or phenomenology originate), the authors also shift the research enterprise by writing back from the margins in conversation with the dominant hegemonies. This could be considered an activation of Southern scholarship.

Critical phenomenology, the authors conclude, offers an emancipatory, dialogical framework capable of illuminating how knowledge, power and context co-construct lived and learning experiences in an unequal society. Such an epistemological and paradigmatic turn is recommended for the agenda of humanising pedagogy and research approaches. This does not

mean that only a critical pragmatic perspective should be embraced within a humanistic research approach. The range and fluidity of paradigmatic border crossings, as illustrated in the three studies above, signal the value of testing the limits of initial theoretical perspectives and promote that researchers should be comfortable in their self-reflective agentic critique about how they choose, refashion or abandon dominant lenses for their studies.

Section Four: Research supervision relationships: The dark side and the bright

About toxicity in research

This section explores how a humanistic pedagogy could be embedded within the private research relationships between students and their supervisors. This section is inspired by the compelling criticism offered by a post-doctoral fellow who recounts the abusive lauding over the process of doctoral supervision, post-doctoral supervision, academic mentoring or staff development by whom the author calls ‘rockstar professors’ (Singh 2024: 106). Singh (2024) presents an image of the supervisors/ professors driven by the economic rationalities of institutional pressure and neoliberal profit-driven discourses. These rockstar professors’ motives are considered derived not from an ethics of care about their students or colleagues, but driven by a self-centred need to glow in the limelight of those who measure and afford them popularity and fame, namely research foundations, funders and their institutional managers who measure their success by matrices of outputs of research and productivity units. Such affirmation of these professors derives from producing research outputs that satisfy the corporate university culture, which is obsessed with efficiency and productivity rationales, and the income generated by the funding subsidy that accrues to the university systems.

In the view of Singh (2024), the students attached to such professors are regarded as fodder to be used to ensure that the professors maintain their continued publications and conference presentations required. The doctoral students or post-doctoral fellows are expected to do the “hard donkey

work” of literature review construction, fieldwork data collection and even to produce reports in which their authorship is often not acknowledged. The fame is ascribed to the rockstar professors who parade on the institution’s performance stage. The students are hereby inducted into a world of competition and attention-seeking that sometimes translates into abusive personal relationships bordering on illegality. Students are expected to conform, since they are basking in the glory of being aligned with the famous. From the professors’ point of view, the logic is that such vicarious association with the research processes are a form of induction into the (ruthless) world of research. Singh (2024) argues that this is the dark side of neoliberalism, which produces toxic egos and engenders historical legacies of negativity by students in their association with the research enterprise. It normalises darkness.

Hlatshwayo (2025: 1) corroborates the argument that post-doctoral fellows (postdocs) are a precarious and casualised temporary labour force who serve as the ‘ice-boys and girls’⁵ of the departmental university systems and cower to their line managers. The postdocs are delegated pedestrian, menial administrative and non-academic services, fetching and carrying at the behest of the supervisors. Their positionality is liminal, since they are not altogether students or permanent academic staff (Hlatshwayo 2024). Nevertheless, the toxic relationality, as argued by Singh (2024) above, produces a de-professionalised worker with limited agentic powers. Like Dorenkamp and Weiß’s (2018) view, Hlatshwayo is concerned that many postdocs may ride out the storm or lose faith in academia. Hlatshwayo’s call for papers for a forthcoming special journal issue of *Education as change* suggests that one could develop scholarship by hearing the complex narratives and lived experiences of postdocs and how they negotiate being an early career researcher theoretically, philosophically, empirically and practically. This edition promises to offset this group of academic workers being largely unseen, invisible and misrecognised in South African higher education.

5 Hlatshwayo (2025:1) explains the concept of ‘ice boys and girls’ as follows: ‘The concept of the “ice boy” and “ice girl” is a derogatory and insulting term meant to label and classify people who do not have money and are usually sent on random errands to buy ice, alcohol, cigarettes, cold drinks and other miscellaneous stuff.’

The bright side of collective disruption

The current study's contribution to the above spectacle is to question the roots of how human relationality is constructed much earlier during master's and doctoral studies. It is suggested that archaic models of hierarchical supervisory relationships still dominate the postgraduate space. The master-apprenticeship model elevates the supervisor's role and status to a demi-god who is envisaged as being deferred to by the underlings. The goal of a behaviourist model approach is to clone the theoretical and methodological agenda of the supervisors through repeated imitation and ritualisation of research designs and practices, which the current study refers to as normalising "discipleship".⁶ This is reinforced by the view that the purpose of postgraduate research is an extension of the construction of undergraduate students as receivers of the wisdom of already-established bodies of knowledge.

The master supervisor is directed towards extending their empire of established epistemologies and promotes a consistent explanatory logic to test existing worldviews in varying contextual spaces. The research agenda is pre-ordained, and the student is considered a subordinate project partner. The effect of such a model is that it produces repeated versions of the same theoretical and methodological parameters of the supervisors, and the students offer only minor variations of contextual specificities. This model might be appropriate within signature paradigmatic and knowledge-production approaches within the natural sciences, which favour positivist hypothesis testing and refutation as their mode of operation. However, this research design contradicts the social sciences' exploratory endeavours, where alternative theoretical elaborations and contestations are pivotal to innovative insights about sociological phenomena. Unfortunately, many social scientists imitate the natural science supervision model unproblematically (often unconsciously) as a hallmark of good research.

Other models of postgraduate supervision advocate personal reflective growth of the student researcher. Relational growth building between supervisors and students underpins this learning/teaching agenda of

6 It is unsurprising that departmental university structures are obsessed with disciplining the disciplines, that is, consolidating and protecting their boundaries.

supervision. Within this model, the role of the supervisor is directed towards the independent and autonomous (personal and academic) growth of individuals who may seek to explore topics and methodologies outside the purview of the supervisor's expertise. This is sometimes considered dangerous work. Firstly, the supervisor is constructed as a co-learner; secondly, the supervisor cannot guarantee the directions the study would take, and moreover, the length of time to explore unexplored terrains is not pre-defined (Samuel 2016b).

Further elaborated models challenging the reflective practice mode described above aim to respectfully draw on multiple sources of influence in the university supervisory relationships. This might include individuals within or outside the institution, and even outside defined singular disciplinary homes. This extends the use of study teams, which include groups of supervisors and teams of students working collaboratively on projects that may not all follow a defined singular methodological approach or even a pre-defined paradigmatic approach. Students from multiple disciplines might be assembled to explore joint projects. Within this later model, interdisciplinarity is promoted to activate innovative ways of seeing, doing and being a researcher. The goal is not to protect the disciplinary boundaries, but to open a permeable exchange across varied insights about the phenomenon. This model has activated models of cohort supervision where teams of students and their supervisors work to create an environment wherein all possibilities are contested and put under erasure. This includes working across institutional, national and geographic contexts (Samuel 2016a).

The focus of this is not about compliance and adherence to a ritual and routinised research. The agenda of the communal approach to research setting, mentoring and evaluation is underpinned by a valuing of positive disruption (Samuel et al. 2017). This disruption is not imbued with a destructive intention, creating overload, anxiety or abuse, instead, it aims to affirm students with the opportunities to develop ownership of their own ideas, to become aware of a range of theoretical and methodological positionings and thereby, develop an authentic and autonomous voice when their personal decisions about research are made. Students' personal

choices are understood as intersected with the political and paradigmatic environments within which they operate.

This brighter form of intersectional learning in the supervisory communal systems prepares postgraduate students to critique and defend their own positionalities, to self-manage their own growth and development as a researcher relationally and dialogically. Furthermore, this latter model suggests that research is not about aligning with comfortable capitulation to predictable routines and rituals. It acknowledges that research is implicated in multiple contestations and flights of power, and that (strategic) defensible research and supervisory relational choices could be made.

The student-supervisory relationships within this approach recognise that supervision is more than bland sentimentalist, egotistical affirmation of students and their present interpretations and readings of the wor(l)d. The supervisory space is a robust forum of critique and contestation where ideas and interpretations are tested to their limits. Whilst the robust critique of supervisors may produce anxiety, especially from the students' points of view, the interaction behind authentic acts of deliberative supervision must be driven by a shared understanding of a meta-level of care to generate critical and creative thinking. Supervisors should be sensitive to facilitative anxiety to drive the humanising project. The supervision is not about a naïve self-protection of the egos of novice student researchers, nor is it about senior and more experienced supervisors denigrating subordinates. A humanising supervisory pedagogy, as an act of teaching and learning, is not simply protecting comfort zones.

A humanising supervisory pedagogy is about nurturing a *pedagogy of disruption* motivated by the facilitative growth that understands democratic collaboration. It understands transformation deeply (see Section One above), and suggests that researchers should grow comfortable with uncertainty, thus, producing non-toxic conceptions of self and others. If these rationalities underpin postgraduate supervision, then the scenario painted by Singh (2024) and Hlatshwayo (2025) above, would be unlikely to manifest. This normalises disruption as a positive force, and is my (the author) interpretation of an authentic humanising research space.

Concluding thoughts: Dialogues across pluralities

The critique of a human-centred approach could be led from varied vantage points, such as a post-humanist analysis arguing against the ascendancy of human interests as arrogant and caustic. Such an approach might argue that human-centredness is responsible for the catastrophic destruction of the environment as profit priorities overtake concerns about people or the planet; post-humanists might foreground the need to understand both human and non-human agentic forces and their intersected connectivity. An ethical analysis could show how the foregrounding of human interests has become selfishly distorted and competitive. A comprehensive analysis of such critique has been adequately presented elsewhere (see Le Grange et al. 2024).

Instead, this chapter highlights the nature of a humanising schema as a subset of a human-centredness approach. More specifically, it foregrounds the nature of the relationships between individuals during the conception and practice of humanising research. The chapter has argued that such relationships are connected to complex interactional ecologies of competing, complementary and paradoxical tensions between many forces. For example, it has been argued that the human-focused agenda, on the one hand, could be seen as an antidote to the histories of suppression and marginalisation of collective groups of individuals, as was the case during apartheid in South Africa. Humanising programmes could be associated with democratic affirmation. On the other hand, a humanising preference could naively endorse selfish interests, which foreground the personal and individual enrichment and ascendancy over others. The private individual interests over the collective public good are indirectly fostered. Such a simplistic interpretation of humanistic agendas could paradoxically endorse corruption and greed, in the name of affirmation.

This chapter has suggested that research agendas (like those who promote robust learning and teaching higher education considerations) should develop a diffractive analysis exploring how individual researchers (supervisors and students) could turn the focus to themselves, asking what kind of transformative goals are supported in the journey of research they select. This allows individuals to critically examine whose interests are being

served via the types of research undertaken. This entails asking questions about what we research, who we research, how we research and why we do research in the first place. The chapter has suggested that innovation and reimagination will be constituted as we explore not myopically the consolidation of disciplinary discipleships, fossilising ritualistic practices, paradigms, theories and methodologies. Alternatively, a humanising research agenda advances the goals of “in-between-ness”: looking to create fluid and dialogical exchanges across habituated departmental borders in higher education. This necessitates a conviction of more extensive transformational projects beyond dressing up rhetorical semblances of institutional reform.

The chapter made a case for substantive and saturated conceptions of transformation beyond capitulating to rhetorical policy discourses. It has shown the tendency of higher education institutions to return to homeostasis as radical ideas become co-opted into various forms of institutionalisation. However, “the institution” is not caricatured as a disembodied monolith. Instead, it is argued that the institution is constituted as a living personage through its relational collusions between actors and agents at different levels who serve to co-construct the higher education spaces. Multiple co-existing forces push and pull the institutional identity, characteristically creating a space of forever becoming. There are no uncontested and coherent perpetual stabilities. Expediencies, survivalism and laudable epistemological and sociological projects compete for supremacy and remain forever in dialogue, not only between adversarial individuals, but also within individuals themselves. Entangled dialogues permeate disciplines, departments and institutional structures. The role of the humanising research agenda is to expose, nurture and analyse the dialogues across these pluralities.

This chapter promoted the view that a humanising research agenda is not activated by choosing singular radical paradigms. The argument is made that research agendas are multi-versal and evolving. Consequently, while critiques are made of toxicity in some supervisory relationships which negate a respectful humanity, the chapter has supported supervisory relationships to be characterised by robust critical engagement that is not about bland, sentimentalist, egotistical pedagogical caring spaces. The chapter has argued that one should move beyond a pedagogy of comfort;

one must elaborate one's conceptions of care and critique and instead acknowledge the values of disruption as a productive force towards new imaginative possibilities. A humanising supervisory agenda promotes blurring boundaries, supports the challenging destabilisation of rituals and appreciates uncertainty.

In support of new lines of flight in complexity, future research must tackle what Appadoo-Ramsamy (2022) refers to as diffracted and entangled agencies. Appadoo-Ramsamy's (2022) study defragments the notion of individual agency as singular, stable or coherent. Looking at teachers as they negotiate the dictates of recurrent national regulatory curriculum reforms, the author suggests that teachers choose to present images of their agency that serve defined audiences, purposes and contexts. Individuals choose the human agency they aim to foreground in varied ways when asked their views by peers, line managers, close friends, bureaucrats or policymakers. Such individuals might appear like a cubist painting: multiple and incoherent, or dishonest. Appadoo-Ramsamy's (2022) shards of the kaleidoscope of agencies include teachers choosing to diffract themselves as compliant, restorative, delusional or deliberately provocative. Individuals may choose deliberative agent-centred repertoires of themselves, making it difficult for researchers looking for reductionist interpretations to make sense of the staging form of agency they are presented with.⁷ The agency is best understood in dialogue with the unique ambient contextual spaces. Humanising research agenda and methodologies should capture and represent these fluid multiplicities, recognising not only the overt representations of selfhood at face value, but also exploring the occasions and circumstances where individuals choose in varied ways to present strategic representations of themselves. What informs these varied selections should be the subject of further research.

Similarly, Harari (2024) suggests that like the biblical Noah, we are living through a flood that is threatening to destroy the world of knowledge-making as we know it today. Individuals inhabit an infinite present, calibrating the past and the future iteratively, yielding competing

7 This has motivated Appadoo-Ramsamy (2022) to depict data analysis in the representational form of a staged dramatic script, exploring the dialogical interactions of participants in different settings and amongst varied interlocutors.

and multiple conceptions of time, space and knowledge. As researchers and research students, scholars are confronted not just with linear paradigmatic shifts or paradigmatic options; they are immersed in simultaneous multiple revolutions that threaten foundational axioms about research. We are also part of a post-paradigmatic world questioning whether paradigms matter. Furthermore, the flood of information and the technological age have provoked the foundational forms of epistemological endeavours. Artificial Intelligence has opened new dimensions about the authorship and authenticity of the written, spoken and visually textured world. Harari (2024) suggests individuals seek how to survive and thrive as they examine the flood of possibilities about forms, methodologies and representational manifestations. One may be looking for a sign, like the pigeon with an olive branch in its beak, to signal that the flood may be over and that we can return to normalcy. However, will that normalcy ever return? Should this be the targeted goal? Rather than capitulate to despondency in sealed arks, Hariri (2024) argues that one's responses must be relational to these competing forces and floods. As a feature of the quest for the survival of humanity, individuals could redirect their thinking about what is valued or not, choices could be made. One should not abandon hope as we uphold what the future agenda of higher education and research will become. Human-centred education and a humanising research mandate are more than just matters of preferential options; it is about robust, critical and complex engagement with self, others, systems and structures and being and becoming as a collective. A research agenda must be hopeful of a future.

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Part Two

Human-Centred Education in Action

Centring Humanism in STEM Education

Chapter Three: Evolution Infused Science Education Empowers Students to Navigate their Way in the Current Global Storms of Change

Philip Mirkin

Faculty of Education, University of Pretoria, South Africa

Introduction

Several years ago, I was teaching the constellations of Orion and the Southern Cross to Grade 7 learners to be used for night navigation on a survival camp. I showed them a simulation of what the night sky would look like on the camp, and they drew the positions of the stars while chatting distractedly among themselves. A week later, on the first night of the camp, two girls came running excitedly up to me shouting, ‘It’s real! It’s real!’, while pointing up to the sky. Their joy at recognising Orion’s belt led to them wanting to find the Southern Cross. They jumped up and down and hugged each other with excitement when they found it. They then asked me how to use the stars to find north, as we had discussed in class.

The girls’ “discovery” that the star constellations we learned about in class is real, struck me as significant. It seemed to me that even when we teach science, our rigorously tested facts and understanding of our world, students do not approach it as though it is real. While the learners were drawing the positions of the stars, it later occurred to me that they were simply doing what the teacher told them to do, and they would have probably been able to reproduce something close to that in a test. Yet, it had no bearing on their relationship to reality or the world. My conclusion was that learners simply no longer believe what they learn in class.

A key aspect of the survival camp was for the learners to experience many of the basics of historically traditional life, like fetching drinking water, washing in a river, digging their own toilets, cooking and cleaning. Despite much initial moaning and resistance, by the end of the camp most

of the learners did not want to leave. Many of them were crying to stay even though a monster thunderstorm had collapsed and soaked most of the campsite on our last night. What were they crying about? In our feedback session as we prepared to go home, one boy gave his answer by saying this,¹ ‘My whole life I’ve feared nature. After these three days, nature now feels more like home than my actual home. I feel like I’ve been a prisoner in my house my whole life.’ His sentiments were echoed by many of his peers.

The boy’s reflection on the survival camp, where they had no modern conveniences in meeting their daily needs, reinforced that it is not only education that is removed from reality, but that many students live lives removed from nature. Because nature is our true home, the world that gave birth to us through evolution and which continues to nurture us, this alienation should be of great concern to everyone involved in education. In physical sciences education, this is of a direct concern as it is the laws of nature and the laws of matter and energy, that we study.

The wish for transdisciplinarity in education

The impulse towards transdisciplinarity in higher education is all about giving education a broader context, a context that when assembled into a meaningful whole gives one a picture that more closely resembles reality. When viewing the world through the lens of a single academic discipline or paradigm, we know that we are limiting our perspective, however, we do it to get to the detailed basis of what that perspective can bring. The gifts of this approach are evidenced all around us in the power and precision of our modern technological tools. The problem with this approach is that we may end up having limited concepts that ignore important elements from broader reality. We may then feel trapped in our own thoughts in the same way as the Grade 7 boy felt himself to be a prisoner in his own home. The Grade 7 boy was expressing, in his way, what academia is often seeking through transdisciplinarity, to feel a liberation of being and knowledge through experiencing ourselves in the world from multiple significant perspectives. Such an experience enables one to feel a greater intimacy

1 I cannot recall his actual words, but what he said made a deep impact on me, so I remember the essence to be exactly this.

with ourselves and our world, where one's sense of personal meaning unites with their scientific rational understanding. Students at the survival camp possibly felt the way that they were interacting with nature, the world that gives us everything, hence, it reflects our true nature.

If a simple trip into nature can achieve this to some degree for Grade 7 students, where have we gone wrong in our current approach to education, and how can we get back on track?

Let us start at the beginning, before formal education

Here in South Africa, until about 300 years-ago, everyone lived very close to nature. Everything in our world came from our surrounding world. We made our homes from stone, earth, wood or grass. We ate the food that lived in our environment and drank the water from our rivers. We lived according to the weather and the seasons. The people that we grew up with were the same people that we knew until we died. Our family and community remained relatively constant our whole lives.

The stories that helped us to make sense of our world were also related to the things of our world. Animals and demons as well as gods and helpful nature spirits were all beings to whom we related. Globally, all indigenous communities made sense of their world in similar ways, with stories that gave life meaning and understanding. These stories also ensured the health and sustainability of their identity, community and environment. The local river whose nature spirit needed certain gifts in order that the people would be given gifts in return (such as the Ganges in India [Kumar 2017]), or the mountain that should be looked upon as sacred ground (such as Mount Ruapehu in New Zealand [Davidson 2022]) were common types of indigenous relationships to the world of nature. It meant that people understood that their own attitudes and behaviour had a direct impact on the behaviour of nature in a more personally intimate manner than how this is understood through our current environmental understanding. Their systems of knowledge and the application of it in daily life remained intact. Perhaps it was a taste of this that made my Grade 7 class reluctant to leave the camp.

With modern scientific thinking, we now know many aspects of how our

actions impact on nature, however, we are still a long way from the intimacy with nature with which indigeneity gifted our ancestors. Even the God/s of our religions have become delocalised and abstracted. And yet the power of our religion's God/s to unite large numbers of people who have never and will never meet is unmatched.

In the modern day there are many people who claim to have human-like communication with animals (Breytenbach 2015; Del Monte 2020; Fitzpatrick 2013; Hafen 2013; Loy 2016; Mackay 1998), and a great many others who claim to have communication with or visions of, the nature spirits that stand, invisibly for most, behind the phenomena of nature (Baan, 2013; Bloom, 2012; Borges, 2012; Crombie, 2018; Dispenza, 2019; Mayer, 2021; Mirkin, 2021; Mutwa, 1964; Pogacnik, 2012; Power, 2019; Sadhguru, 2009; Weirauch, 2004; Wilhelm, 2022). Despite this, not many people are tempted to return to an indigenous way of life. These indigenous understandings of the world helped individuals to maintain their intimacy with their immediate environment, but our new religious, scientific and nationalistic ideas offer us other gifts.

Over the years indigenous groups became larger and more powerful because the stories that they shared had a more universal basis. These ideas were beyond the local river and mountain whose spirits helped the group survive and thrive. These larger ideas seem to have eventually become those that support our current national, political and religious identities (Harari and Perkins 2014). Religion and nationality enabled individuals to unite behind ideas that gave life meaning beyond indigeneity.

Science carries a tested and proven universality of ideas into the wisdom of humanity, however, these ideas usually lack the narrative story element behind which people can unite with a sense of belonging and meaning. Instead, they require the individual to temporarily step away from their ideas surrounding identity, and to place the evidence and facts as objects for their examination. The mental effort required to grasp the ideas of science demand a rational, evidence-based objectivity that has the potential to grow one beyond even religious and nationalistic ideas as evidenced in the international contributions to the development of science.

This chapter is about science education, and how an evolutionary educational approach can give students the needed universal scientific facts

while not robbing them of their religious and indigenous sense of meaning and belonging. To be able to do this, this chapter must first present an understanding to why science has the depersonalising effect that it does, and then to explore the theory of evolution that underpins the research reported upon here.

Science as an objective, left-brain activity

When one tries to be objective, one must push the object of observation away from themselves so that their previous ideas do not interfere with their ability to examine evidence scientifically. Scientists from all backgrounds can then engage with this evidence rationally, without their differing cultures and beliefs interfering with their work. It is this approach that has made science universally testable, understandable, acceptable and useful. This approach has been recognised as taking place predominantly in the left side of the brain, which is why it is often referred to as left-brain thinking (McGilchrist 2019). Right-brain thinking is usually associated with being creative, intuitive and subjective. Even though we use both types of thinking in our scientific activity, in the science classroom we are predominantly focused on training our students to develop skilful left-brain thinking. It is likely that this is in fact our primary task in science education.

The objective facts of science then become the perfect material for our work. This is because we can use these objective facts to test if our thinking is correct or not. One's thoughts and understanding either align with the observable evidence, or they must be wrong. This challenges one to engage with the facts from different perspectives until we have identified the underlying principles that explain what we see. Further, anybody can then check their new understanding with new evidence, testing and refining scientific thinking and understanding. The value of being able to distance oneself from their personal perspective and to develop the universal language of science has led us to being able to communicate across almost all cultural and language barriers. It is such a powerful type of thinking that Comte (1976) regarded all other ways of knowing as inferior, and Kant (2019) regarded it as the gift that gave birth to what the author called a new age of enlightenment.

This left-brain faculty has given us the capacity to free ourselves from personal prejudice and see the world through the eyes of others. It has also enabled us to develop the well-tested understanding of our world that is used to create the ever-changing and powerful technologies in our time. Left-brain faculty also gives one the tools to work towards political, economic and environmental understandings that are practical and rational. Despite these extraordinary gifts, even a rational mind can recognise its own limitations in knowing that it only uses one side of the brain, one side of our biologically given mental functioning. It can, therefore, only give us a one-sided relationship to our world.

The intuitive, creative and personal faculty of right-brain experience is what is missing. This is because it is subjective, and was banished from our scientific endeavours for us to become truly objective. If we only live in our objectivity, we lose our relationship to ourselves and our world. It is precisely the personal and subjective realm in which we get our sense of identity and belonging through experiencing relationships emotionally and intuitively. The creative playfulness inherent in right-brain activity gives one the enthusiasm and warmth needed for a meaningful life. It is in fact right-brain activity that is the driving force in how we make most of our decisions (Eagleman 2015), making it a 'sacred gift', while our rational faculties act as a 'faithful servant' in testing them for integrity (Samples 1976: 26). By giving all our attention to our left-brain activity, Samples (1976) posits, we honour the servant and forget the gift. Richard Feynman, a Physics Nobel Laureate and top scientist of the twentieth century, once apologised to his audience for delivering a lecture on science as opposed to giving them an artistic recital that contained the essence of his work (Feynman 1955). Feynman (1955) boldly declared that until we can lift our scientific knowledge into our artistic and creative intuitions, we will not yet be living in a scientific age.

Feynman (1973) also delighted in talking with leaders of different disciplines. The author argued that science has already used and perfected specific methods for its work and could advance in different directions with new approaches. These approaches can easily be found in disciplines where the nature of the work demands different strategies, assumptions, skills and techniques. A current dilemma in physics is the lack of progress in detecting

dark matter and dark energy, the substances that make up over 90 per cent of the universe. Scientists know where the regions of these substances are. They can even detect the shapes of where they reside, but cannot detect them. Billions of dollars have been spent on this project without much success, leading to a sense of despondency in physics (De Sutter 2025). If scientists took a leaf out of Feynman's approach they may make some progress. This approach has great potential for all transdisciplinary research and education. It is the potential of this transdisciplinary approach that the current research sought to test in the science classroom.

Evholutionary justification for balancing the use of one's mental faculties

Reality is multidimensional. An individual needs all their mental faculties and associated understandings from within the many academic disciplines to study and understand reality. For many decades academics have dug ever deeper within their fields to understand its essence. In nature, however, we always find overlapping data blended within single phenomena. For example, a sunset reveals as much about the atmosphere as about the behaviour of light and of lovers. When we use our diverse human faculties in the science classroom, we help students experience a whole and monist understanding of reality that mirrors the evolved intimacy of natural phenomena. A monist understanding is achieved when we recognise that all aspects of the phenomena are intimately related, and where we welcome and value the varied elements of the phenomena equally.

Evolution [or God if you prefer] has gifted us with the capacity to experience reality in these multiple and varied ways. Evholution recognises that the religious and scientific approaches to reality must be brought into conversation to bring the fruits of these two important ways of knowing into harmony. Evholution, thus, trusts that there are important reasons for our multidimensional perceptions from both an evolutionary and spiritual perspective, in that they must somehow help us to survive and thrive.

Without researched data it is challenging to justify the use of one's broad range of mental faculties and understandings in scientific work, considering how successful the left-brain approach has been. By embarking on the

research journey where students are given the possibility of reconciling their various ways of perceiving and knowing while studying science, we begin gathering the researched data needed to indicate if there is value in the process.

Research process

In evolutionary science education, scientific phenomena and knowledge is used as a starting point and encourages students to relate personally with it using everyday language, narrative, the arts, characterisation and personal experience. Students are also encouraged to find meaningful relationships between their scientific and indigenous, religious or cultural understandings of reality.

The research that is being discussed included science experiments, conventional classroom content presentation, classroom conversation, with the use of characterisation, metaphor and poetry to stimulate student's experiences. Probing questions were asked to stimulate students creative thinking. For example, after doing experiments with chlorine the students may have been asked something like, 'If Chlorine walked into the room, what would it look like? How would it behave? What would it be wearing? Would it even be human?' And so on. This approach took the students out of a formal relationship to learning science which is often focussed on students needing to know universally accepted ideas on the work and allowed them to probe their own imagination and intuitions about chlorine, based on the experimental evidence and their previous knowledge of the element. With no right or wrong answers, all responses were respected as valid, and probed for how the associations were made and which aspects of the phenomena they portrayed well, as well as those that were overlooked. The use of metaphor and characterisation was to transform the otherwise often abstract concepts of science into characters of a story with whom they could identify. This calls upon one's full range of sympathies and antipathies, where the scientific dynamics portrayed in reactions and formulae become the basis for the relationships between the characters. This approach changed the students from needing to only learn specific facts and logic, to creating their own personally meaningful content in conjunction with their classmates.

This research is ongoing, however, the research findings that have been reported on involved Grade 11 school students as well as pre-service and in-service teachers, who were taught using the evolutionary educational approach mentioned here (Mirkin 2024). The interventions used with the various groups were not uniform. They took a different form each time to fit in with the given timetable of the school or university classes. Data was gathered from classroom observation and student feedback after the intervention. No specific outcomes were expected. The researcher and students simply commented on the aspects that stood out for them. The feedback was then processed using qualitative thematic coding (Mirkin 2024).

Research findings

The most consistent comment and feedback was on student involvement and engagement. As with much enquiry-based learning research, the findings showed the students became noticeably more engaged during the lesson (Attard et al. 2021), with many students who usually don't contribute in class becoming involved. It was not just an increase in teacher-student engagement, but student-student interactions also increased. Together with this increased engagement, students also felt less tired and needing a rest both during and after the interventions. On one occasion, where the intervention was implemented in three-hour slots, the students were usually so engaged in the work that the researcher needed to remind them that the time was up and that they should finish up and leave. In the intervention sessions, students were observed becoming fresher and more enlivened once they began engaging with the content using their imagination and creativity.

Other observations by the researcher and in the student feedback, include students relating the work to their religious or indigenous understanding. These often resulted in new insights and a deeper meaning for the students. In the process, students have both questioned with doubt as well as deepened the ideas of their background. Some students long-held questions also naturally emerged, where they felt that the usual taboo subjects of religious and indigenous beliefs could be engaged in a spirit

of openness and enquiry, free from judgement. In every such case, the strengthening of personal meaning and engagement was reported, with no single case of a loss of meaning, despite the occasional shift in belief.

These findings suggest that students experience a greater sense of personal meaning and investment in the work, and that they do not suffer as easily from academic exhaustion and burnout, but engage more openly and can feel enlivened during the sessions.

Reflections

In scientific studies one is always focused on treating evidence with objectivity and well-reasoned logic. In evolutionary enquiry, this same approach is taken with the difference being in what is regarded as evidence. In the current research, the subjective intuitions of students were taken as valid subjective evidence, where they were probed to explore the fit between them and the scientific observations. In this process the seriousness of the subjective creative process united with a spirit of objective scientific enquiry. The harmonious working of left-brain and right-brain activity made the experience of learning both exciting and personally meaningful.

Evolution, being a holistic understanding of the holistic and monist intimacy between all aspects of reality, therefore, showed itself as a useful theoretical framework for learning science both at high school and university level, including with in-service teachers. This research showed that evolution offers one a “how” for enriching science education with enabling students to experience a seamless bridge between their objective and subjective learning. It also offers one a “why” in that it gives the framework to see one’s position within a greater evolutionary context while offering students an opportunity to engage with their indigenous and religious ground of meaning in a new way. This ground is after-all our inherited domain for finding our “why” in life. By bringing these into a meaningful relationship with scientific facts and the power of the scientific method, students are offered real ground to developing their independent “why” in life.

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Chapter Four: Grade 11 Learners’ Adaptive Reasoning Proficiencies in Solving Euclidean Geometry Problems

Roger M. Mayani, Ugorji I. Ogbonnaya and Fru V. Akuma

Faculty of Education, University of Pretoria, South Africa

Introduction

Until recently, successful mathematics learning meant mastery of arithmetic computational skills (Findell et al. 2001; Moodley 2008). However, there has been a discussion about what it means to be successful in mathematics education (Moodley 2008). It has been argued that learner success in learning mathematics strongly depends on their proficiency in terms of conceptual and procedural competencies, expertise in reasoning and problem solving and facility in the subject, for example (Ally 2011; Findell et al. 2001; Ho 2020). Mathematical proficiency, a central aspect in mathematical understanding, reasoning and problem solving, is a requirement for learner competitiveness in today’s and tomorrow’s world (Moodley 2008; Syukriani et al. 2017).

Mathematical proficiency, which is synonymous with problem-solving proficiency, has been thought of as consisting of five mutually interdependent strands (Findell et al. 2001). The strands are conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition. During mathematical problem solving, adaptive reasoning interacts with other mathematical proficiencies, especially when a solution strategy requires the use of procedures for calculation, measurement or display. In such a situation, adaptive reasoning is essential to identify an appropriate procedure (Syukriani et al. 2017). In favour of depth, the focus in the presented work is on adaptive reasoning.

Adaptive reasoning includes knowledge of how to justify the steps taken in solving a problem logically, justify conclusions and assess the solution steps (Ansari et al. 2020; Mulyayunita and Nurjanah 2019). Learners

with adaptive reasoning can also explore different solution strategies, comprehend the logical structure of a proposed proof and identify logical inconsistencies (Siegfried 2012). Adaptive reasoning plays a critical role in increasing learners' deductive reasoning and their capacity to think, particularly in geometry, but also in other branches of mathematics (Mudaly and De Villiers 2004; Mulyayunita and Nurjanah 2019).

The question can be asked as to how proficient the school output is in South Africa, for example, particularly in adaptive reasoning, and in mathematics in general. In this regard, it is helpful to first consider the Curriculum and Assessment Policy Statement (CAPS) for Mathematics Grades 10–12 in South Africa. Amongst the specific aims of CAPS for mathematics, teaching is the provision of opportunities for learners to develop the ability to be methodical, generalise, and generate, prove or justify conjectures (Department of Basic Education [DBE] 2011). Also included is assisting learners to recognise and resolve issues and make judgements using both analytical and imaginative thinking. There is, however, evidence of an undesirable state of learner performance in Euclidean geometry (EG), in examination results and research studies.

Learners find it difficult to solve mathematical problems, particularly those involving EG (DBE 2020, 2021, 2022; Dongwi 2014; Malatjie and Machaba 2019; Mthethwa 2015; Naidoo and Kapofu 2020). Grade 12 examination (matric) results show that most learners are not mathematically proficient by the end of the compulsory phase of schooling (DBE 2020; Dhlamini and Luneta 2016; Moodley 2008). In this regard, Table 4.1 contains information about the performance of Grade 12 learners in EG in matric examinations compared to other aspects of geometry and mathematics.

Table 4.1: Grade 12 learners' performance in EG and three other areas of mathematics

Topic	2020	2021	2022
Analytical geometry	52 %	50%	57 %
Euclidean geometry	41.3 %	38%	34.7 %
Statistics	75.5 %	75 %	60.4 %
Trigonometry	46.7%	38.5%	36.7 %
Source: DBE diagnostic reports 2020–2022			

Table 4.1 specifically presents the results of Grade 12 learners in matric exams for Mathematics Paper 2 for three consecutive years and in four curriculum topics, including EG. The proportion of learners passing in EG is relatively low.

Many learners perceive EG as the most challenging part of the mathematics curriculum (Patkin and Lavenberg 2012). In a study by Ali et al. (2014), 92 of the 120 learners failed an EG test. It has also been noted that many high school learners struggle to construct and characterise features of plane geometry effectively and construct adequate proofs in geometry (Dongwi 2014). In the Vhembe East District, South Africa, the first author of the current chapter (Roger Mayani) noted in his experience as a mathematics teacher that Grade 11 learners frequently skip or score poorly in the EG sections during the year and in the final exam.

There have been some studies on EG and the difficulties in learning EG in South Africa. The studies have focused on learner deduction levels (Masilo 2018), EG terminology (Alex and Mammen 2018) and understanding of basic EG concepts (Ngirishi and Bansilal 2019). Researchers have paid more attention to conceptual understanding in EG, at the expense of adaptive reasoning proficiencies. The presented study contributes to bridging this gap in research. The question that guided the current study was, 'How proficient are Grade 11 learners in the Vhembe East District of South Africa in adaptive reasoning and EG problem solving?' The purpose of the study was to yield a description of the mathematical proficiency of the learners.

Conceptual framework

The purpose of the presented study relates to adaptive reasoning proficiency with a focus on Grade 11 EG learning in South Africa. Thus, it is helpful to outline Grade 11 EG in the context of the Grades R–12 EG mathematics curriculum of South Africa. Also helpful is a more detailed discussion of adaptive reasoning in mathematics.

EG in the South African school curriculum

In Grade R, learners learn to describe the relative position of objects and follow directions to move around the classroom (DBE 2012). In Grades 1–3, learners consider different views of the same object and follow directions on an informal map. In Grades 4–6, learners, amongst other aspects, sort and compare 2-D shapes and draw the shapes on grid paper. In addition, they use a pair of compasses to draw circles, patterns in or with circles. In Grades 8–9, learners distinguish different types of triangles and describe the properties of congruent and similar shapes. They also solve problems involving triangles and quadrilaterals, classify 3D objects, build 3D models and perform transformations on a co-ordinate plane. In Grade 10, learners investigate line segments, define special quadrilaterals, investigate and make conjectures about the properties of the quadrilaterals and prove the conjectures. Additionally, the learners solve problems and prove riders. Also involved are theorems and proofs.

In Grade 11, the focus of the presented study is that learners investigate and prove theorems of the geometry of circles and their converses and use them to solve problems. The theorems are:

- The line drawn from the centre of a circle perpendicular to a chord bisects the chord.
- The line drawn from the centre of a circle to the midpoint of a chord is perpendicular to the chord.
- The perpendicular bisector of a chord passes through the centre of the circle.
- The angle subtended by an arc at the centre of a circle is double

the size of the angle subtended by the same arc at the circle (on the same side of the chord as the centre).

- Angles subtended by a chord of the circle, on the same side of the chord, are equal.
- The opposite angles of a cyclic quadrilateral are supplementary.
- An exterior angle of a cyclic quadrilateral is equal to an angle in the alternate segment.
- Two tangents drawn to a circle from the same point outside the circle are equal in length.
- The angle between the tangent to a circle and the chord drawn from the point of contact is equal to the angle in the alternate segment, (DBE 2011: 34)

In Grade 12, learners prove that a line parallel to one side of a triangle divides the other two sides proportionally, equiangular triangles are similar, triangles with sides in proportion are similar, and the Pythagorean Theorem (in a right-angled triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the other two sides) using similar triangles. Furthermore, the learners use these theorems and their converses to solve and prove riders (DBE 2011). Outlined above is the EG content framework for the development of adaptive reasoning proficiency, in the Vhembe East District, like elsewhere in South Africa.

Adaptive reasoning in mathematics

It has been noted that adaptive reasoning involves logical thinking about the relationship between concepts and situations (Findell et al. 2001). Also included is the careful consideration of alternative solution pathways. Adaptive reasoning also includes the ability to justify problem-solving steps, knowing when the steps are incorrect and how to justify conclusions (Ansari et al. 2020; Mulyayunita and Nurjanah 2019). Hence, it encompasses not only deductive reasoning, but also inductive and intuitive reasoning using patterns, analogies and metaphors (Susilawati et al. 2021). To demonstrate adaptive reasoning, learners must think logically about problems, estimate and reflect on them and provide justifications for their problem-solving.

Learners show adaptive reasoning proficiency in EG by investigating, proving and utilising a range of geometry of the circle theorems and their converses, to solve problems. In this context, learners must justify their statements, prove the theorems, understand concepts, apply them to novel problem situations and utilise inductive and deductive reasoning. While adaptive reasoning consists of inductive and deductive reasoning (Ansari et al. 2020; Findell et al. 2001), inductive reasoning involves identifying and applying patterns in mathematical problem solving (Fischbein, as cited in Ansari et al. 2020). On the other hand, deductive reasoning is the learner's ability to make predictions, present reasoning and examine an argument.

Five categories of adaptive reasoning proficiency have been identified, and consist of proposing predictions or conjectures, providing reasons for given solutions, finding patterns in a problem, examining the validity of an argument and drawing conclusions from a statement (Ansari et al. 2020; Findell et al. 2001). Table 4.2 outlines categories and levels of adaptive reasoning proficiency.

Table 4.2: Adaptive reasoning categories and proficiency levels

Category	Level of Proficiency		
	Excellent (E)	Moderate (M)	Poor (P)
1. Ability to propose a conjecture	Correct and complete	Less complete	Presenting wrong conjecture
2. Ability to find the pattern of a problem	Correct with calculation	Less complete with some miscalculations	Wrong pattern and calculation
3. Ability to present reasoning for the solution	Correct and complete	Managed to present the reasoning	Incorrect or providing incorrect reasoning
4. Ability to draw correct conclusions	Correct and complete	Managed to write the conclusion	Without conclusion
5. Ability to examine the validity of an argument	Correct with calculation	Less correct (some miscalculations)	Miscalculation

Source: Adapted from Ansari et al. (2020)

The Rubric of Mathematical Adaptive Reasoning (RMAR) (Table 4.2) has been used to investigate the adaptive reasoning proficiency of Grade 8 learners in a junior high school in Indonesia when answering a test of adaptive reasoning proficiency in algebra, plane and 3-D geometry questions (Ansari et al. 2020).

Research methodology

Within the framework of a qualitative approach, the current study used a descriptive case study design. A descriptive case study is research that is an in-depth examination of a few units of study over a period or across multiple periods of time (Creswell 2014; Creswell and Creswell 2018; Leavy 2017).

Prior to the data collection, approval was obtained from the ethics committee of the University of Pretoria and the Limpopo Department of Basic Education. The data collection took place in ten public schools in the Vhembe East District, Limpopo province, South Africa. The schools that participated in the research study were named School A to School J. Twenty learners were sampled from each school to participate in the research study, making a total of 200 learners.

Under the supervision of the first author (Roger Mayani), a Euclidean Geometry Proficiency Test (EGPT) was used to acquire qualitative data about mathematical problem solving. The EGPT was aligned with the RMAR (Table 4.2) to cover all the categories of proficiencies. The tasks on the EGPT classified as predominantly adaptive reasoning tasks were numbered: 1.2; 2.1; 2.2; 3.2; 4.1.1; 4.1.2; 5.1 – 5.4; 6.1 and 6.2.

This study used the RMAR framework to analyse the learners' solutions to the problems. This ensured that the data was interpreted in accordance with the research question. The analysis was done using descriptive statistics. Specifically, the current study employed tables to find the frequencies of learners' problem-solving proficiency levels, to illustrate the analysis of learners' levels of mathematical proficiencies and to calculate the mean scores obtained by learners in adaptive reasoning. In the content analysis, excerpts of the learners' responses to the questions were selected for use as concrete examples in the presentation of the findings.

Findings

The findings, based on three of the problems addressed by the learners, are exemplified below. The questions are 1.2, 2.1 and 5.1. Question 1.2 is shown in Figure 4.1.

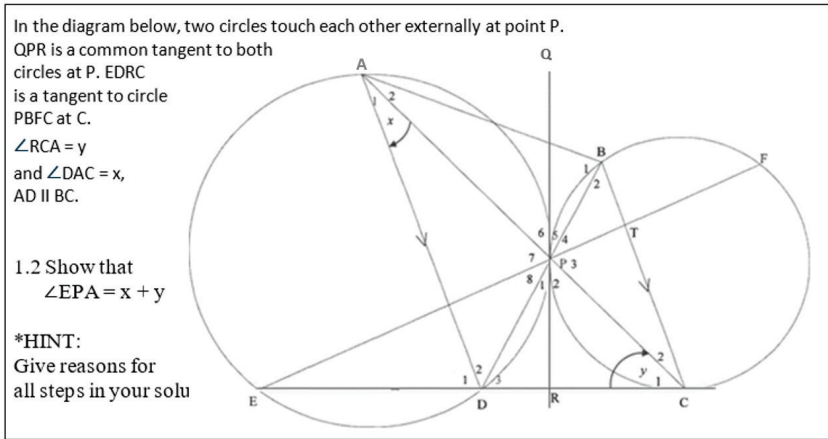


Figure 4.1: Question 1.2

In Question 1.2, learners were asked to show that $\angle EPA = x + y$. The solution to this question should follow the following reasoning pattern:

- (1) Make connection with the previous question by $\angle C2 = x$ (from 1.1).
- (2) Establish the correct pattern $\angle D1 = \angle DCB = x + y$ with the reason that they are corresponding angles, $AD \parallel BC$.
- (3) State that $\angle D1 = P7$ with the reason that they are angles in the same segment.
- (4) Use deductive reasoning to conclude that $\angle P7 = \angle EPA = x + y$.

In Question 1.2, 166 learners, making up to 83 per cent of the participants, were found to be poor (Table 4.2). The learners' solutions showed that the learners lacked adaptive reasoning proficiencies. The solutions did not show any conjecture in them; there were no patterns of the problem; the learners failed to examine the validity of their argument; the conclusions were written without any justifications and did not show a logical relationship between concepts and situations. Ten learners, accounting for 5 per cent of the participants, were ranked moderate, as their ability to propose a conjecture were not complete; the patterns of the problem were not correct; the learners managed to write the conclusions, however, the solutions were

found to be less valid because the patterns followed had mistakes. Twenty-four learners, making up to 12 per cent of the participants were classified excellent: the learners wrote correct patterns. Moreover, the learners proposed correct statements and their conclusions were made from correct, logical and complete reasoning. This proves that the learners could examine the validity of their arguments.

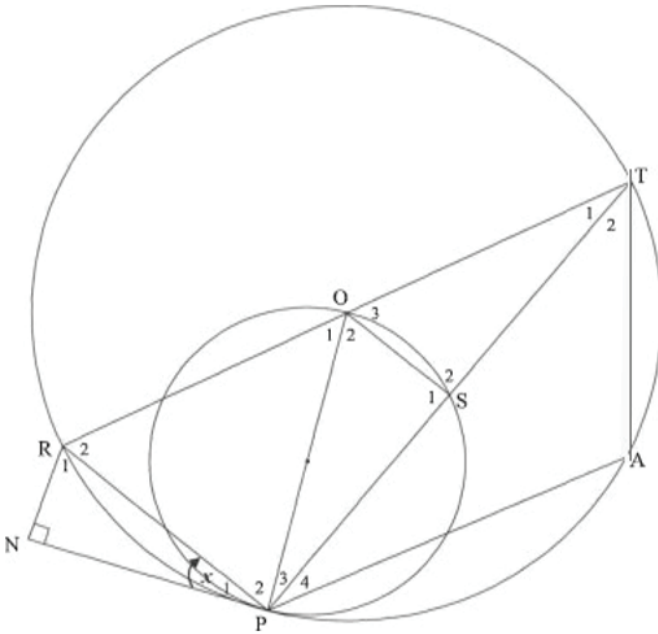
Table 4.3 shows examples of learners' work at different levels of adaptive reasoning in Question 1.2

Table 4.3: Learner proficiency level and excerpts of solutions to Question 1.2		
Learner	Level of Proficiency	Excerpt
A	Poor	$\begin{aligned} \hat{EPA} &= x + y \\ &= 90^\circ + 90^\circ \quad \times \\ &= 180^\circ \quad \text{Sum of opp \angles of cyclic quad} \quad \times \end{aligned}$
B	Moderate	$\begin{aligned} 2) \quad \hat{E} &= x \quad \text{--- proven above} \\ \hat{C} &= y \quad \text{--- given} \\ \hat{E} + \hat{C} &= \hat{EPA} \quad \text{--- Ext } \angle \text{ of a } \checkmark \\ \therefore x + y &= \hat{EPA} \quad \checkmark \end{aligned}$
C	Excellent	$\begin{aligned} 1.2 \text{ RTP: } \hat{EPA} &= x + y \\ \hat{C}_2 &= x \quad (\text{from 1}) \\ \hat{BCD} &= \hat{C}_1 + \hat{C}_2 = x + y \quad \checkmark \\ \hat{D}_1 &= \hat{BCD} = x + y \quad (\text{Corr } \angle \text{s}) \\ \hat{D}_1 &= \hat{P}_7 \quad \text{--- } (\angle \text{s in same seg}) \\ \hat{P}_7 &= x + y \quad \checkmark \\ \therefore \hat{EPA} &= x + y \quad \checkmark \end{aligned}$

The solution of Learner A showed that the learner lacked several adaptive reasoning proficiencies. The learner started with the conclusion that $\angle EPA = x + y = 90^\circ + 90^\circ = 180^\circ$ with the wrong reason of sum of angles of cyclic quadrilateral; the learner's solution does not show any conjecture in it; there is no pattern of the problem; the learner failed to examine the validity of their argument and the conclusion was written without proposing a conjecture and without finding the pattern of the problem. For these reasons, Learner A was ranked poor in adaptive reasoning. In the solution of Learner B, the pattern of the problem is partly correct: the learner proposed that $\angle E = x$ then in the second line of their answer, they wrote $\angle C = y$ instead of $\angle C_1 = y$; the statement $\angle EPA = \angle E + \angle C$ is partly correct because $\angle EPA = \angle E + \angle C_1$; in their attempted solution, the learner failed to establish that $\angle EPA = \angle P_7 = x + y$. The learner's conclusion is, therefore, less valid because the pattern followed contained mistakes. For these reasons, Learner B was found to be moderate in adaptive reasoning. The solution of Learner C showcases as excellent in adaptive reasoning proficiencies. The learner wrote a correct pattern: $\angle C_2 = x$; $\angle BDC = \angle C_1 + \angle C_2 = x + y$; $\angle D_1 = \angle BCD = x + y$; $\angle D_1 = \angle P_7 = x + y$; $\angle EPA = x + y$. Moreover, the learner proposed a correct statement: $\angle BCD = \angle C_1 + \angle C_2 = x + y$; their conclusion was made from a correct and complete reasoning. This proves that the learner examined the validity of their argument.

In Question 2.1, learners were asked to prove that PR bisected ORN. The solution to this problem should follow the following reasoning pattern: (1) find the correct pattern to the problem and solve for $\angle R_1$: $\angle R_1 + \angle N + \angle P_1 = 180^\circ$ (sum of $\angle s$ in a Δ); $\angle R_1 + 90^\circ + x = 180^\circ$; $\angle R_1 = 180^\circ - 90^\circ - x$; $\angle R_1 = 90^\circ - x$; (2) present the correct statement and correct reason that $\angle NPO = 90^\circ$ (tan \perp radius); (3) present the second pattern and solve for $\angle P_2$: $\angle NPO = \angle P_1 + \angle P_2$; $\angle P_2 = 90^\circ - x$; (4) establish that $\angle R_2 = \angle P_2$ ($\angle s$ opp. = sides); (5) deduct that $\angle R_2 = 90^\circ - x$; (6) using deductive reasoning to conclude that $\angle R_1 = \angle R_2 = 90^\circ - x$; PR bisects ORN ($\angle R_1 = \angle R_2$).

O is the centre of the circle RTAP. OP is the diameter of the smaller circle PSO.
 NP is a tangent to both circles at P. $RN \perp NP$. Let $P_1 = x$.



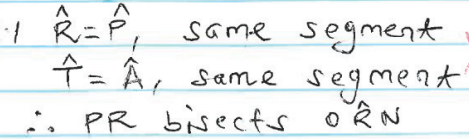
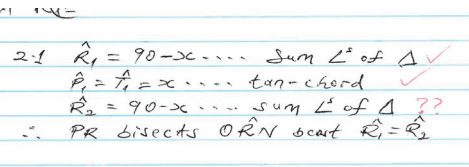
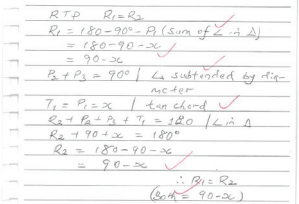
2.1. Prove that PR bisects $\angle ORN$.

Figure 4.2: Question 2.1

In Question 2.1, 158 learners (79 per cent) were ranked poor in adaptive reasoning. The learners presented wrong conjectures with incorrect reasons, and their patterns of the problems were incorrect. Moreover, the conclusions were written following incorrect reasoning. Furthermore, the learners failed to examine the validity of their arguments. Twelve learners (6 per cent) were moderate in adaptive reasoning: the learners proposed less complete conjectures, and the reasoning pattern to support conclusions was unclear. Moreover, the learners managed to examine the validity of their arguments, but not completely. Thirty learners (15 per cent) were excellent in adaptive reasoning. These learners were able to propose correct statements, and they were able to write the correct patterns with correct calculations. Their conclusions were drawn from a correct and complete reasoning pattern. Moreover, they were able to examine the validity of their arguments.

Table 4.4 shows examples of learners' work at different levels of adaptive reasoning on Question 2.1

Table 4.4: Learner proficiency level and excerpts of solutions to Question 2.1

Learner	Level of Proficiency	Excerpt
D	Poor	
E	Moderate	
F	Excellent	

Learner D proposed a wrong conjecture $\angle R = \angle P$, with incorrect reasoning (same segment); the learner's pattern of the problem is incorrect: $\angle R = \angle P$, $\angle T = \angle A$. Moreover, the conclusion was written from incorrect reasoning. For these reasons, learner D was declared poor in adaptive reasoning proficiency. Learner E proposed a correct statement $\angle R_1 = 90^\circ - x$ and $\angle R_2 = 90^\circ - x$, however, the reasoning pattern to reach the statement is not clear in their attempted solution. Moreover, the learner managed to present the reasoning for their solution, but not completely. For these reasons, Learner E was ranked moderate in adaptive reasoning. Learner F was able to propose the correct correct statement that $\angle T_1 = P_1 = x$; the learner wrote the

correct pattern $\angle R2 + \angle T1 + \angle RPT = 180^\circ$ (sum of \angle s of triangle) with correct calculations $\angle R2 + x + 90^\circ = 180^\circ$; $\angle R2 = 90^\circ - x$; $\angle R1 + \angle RNP + \angle P1 = 180^\circ$, $\angle R1 + 90^\circ + x = 180^\circ$, $\angle R1 = 90^\circ - x$. The conclusion that $\angle R1 = \angle R2 = 90^\circ - x$, PR bisects $\angle OR$, was written from a correct and complete reasoning pattern. For these reasons, Learner F was ranked excellent in adaptive reasoning.

In Question 5.1, learners were asked to prove that $\angle B1 = \angle T3$. The solution to this question should follow the following reasoning pattern:

- (1) Find the pattern of the problem with correct reason $\angle C3 = \angle CAB$ (tan-chord);
- (2) Present the statement that $\angle B1 = \angle CAB$ (tan-chord);
- (3) Deductive reasoning $\angle B1 = \angle C3$ (both = $\angle CAB$);
- (4) Establish that $\angle T3 = \angle A = \angle CAB$ (corresponding \angle s; TE II AC) and
- (5) Correct conclusion and correct reason $\angle T3 = \angle B1$ (both = $\angle CAB$).

Another way to solve this problem was: (1) find the pattern for the problem with correct reason $\angle B1 = \angle A$ (tan-chord); (2) correct statement and correct reason $\angle T3 = \angle A$ (corresponding \angle s, TE II AC); (3) deductive reasoning and conclusion: $\angle B1 = \angle T3$ (both = $\angle A$).

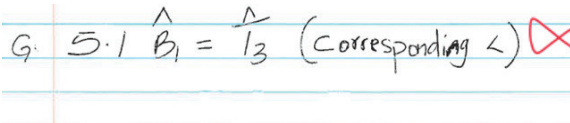
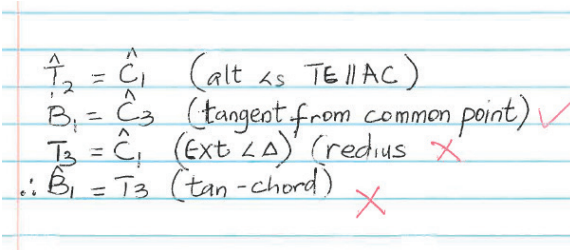
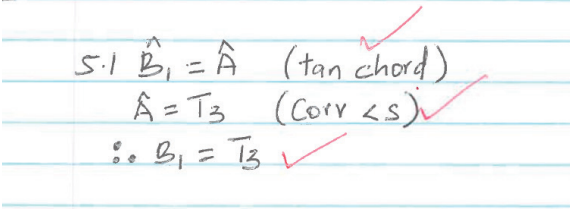
Figure 4.3: Question 5.1

In the diagram, the vertices A, B and C of $\triangle ABC$ are concyclic. EB and EC are tangents to the circle at B and C respectively. T is a point on AB such that $TE \parallel AC$. BC cuts TE in F.

5.1. Prove that $\angle B_1 = \angle T_3$.

Table 4.5 shows examples of learners' work at different levels of adaptive reasoning in Question 5.1

Table 4.5: Learner proficiency level and excerpts of solutions to Question 5.1

Learner	Level of Proficiency	Excerpt
G	Poor	 <p>G. 5.1 $\hat{B}_1 = \hat{T}_3$ (Corresponding \angle) \times</p>
H	Moderate	 <p> $\hat{T}_2 = \hat{C}_1$ (alt \angles TE AC) $\hat{B}_1 = \hat{C}_3$ (tangent from common point) ✓ $\hat{T}_3 = \hat{C}_1$ (Ext \angleΔ) (radius) ✗ $\therefore \hat{B}_1 = \hat{T}_3$ (tan-chord) ✗ </p>
I	Excellent	 <p> 5.1 $\hat{B}_1 = \hat{A}$ (tan chord) ✓ $\hat{A} = \hat{T}_3$ (Corr \angles) ✓ $\therefore \hat{B}_1 = \hat{T}_3$ ✓ </p>

The solution of Learner G showed that the learner provided a wrong conjecture, no pattern of the problem and incorrect reasoning by stating $\angle B_3 = \angle T_3$ with reason that corresponding angles are equal. For these reasons, Learner G was ranked as poor in adaptive reasoning proficiency on Question 5.1. The solution of Learner H showed that the learner's conjecture $\angle B_1 = \angle C_3$ is less correct, because the reason alternate angles are equal is incorrect. The correct reason is that the 2 angles are subtended by the same

chord CE. The proposition that $\angle T3 = \angle C1$ is also incorrect because $\angle T3 = \angle C3$ with reason: subtended by the same chord BE; the learner managed to write a conclusion $\angle B1 = \angle T3$, but with the wrong reason of tangent chord theorem; the learner managed to present reasoning even if the pattern of the problem had mistakes. For these reasons, Learner H was ranked moderate in adaptive reasoning in Question 5.1. The solution of Learner I showed that the learner could make the connection between the diagram and the tangent chord theorem to propose that $\angle B1 = \angle A$, and to establish that $\angle T3 = \angle A$ with reason corresponding angles were equal. Using deductive reasoning to deduce that $\angle B1 = \angle T3$. For these reasons, Learner I was classified as excellent in adaptive reasoning in Question 5.1.

The findings on the learners' levels of adaptive reasoning from all the questions are presented in Table 4.6. Taking Question 5.1 (row 8) as an example, it was found that 176 learners, accounting for 88 per cent of the participants, were poor in adaptive reasoning: they presented wrong conjectures, no patterns of the problem, incorrect reasoning and without conclusion. Moreover, the learners failed to examine the validity of their arguments. Fourteen learners (7 per cent) were classified as moderate in adaptive reasoning. The learners' conjectures were less complete. The learners managed to write conclusions, however, with wrong reasons; the learners managed to present reasoning, even if the patterns of the problem had mistakes. Ten learners, accounting for 5 per cent of the participants, were excellent in adaptive reasoning: the learners could present correct and complete conjectures; they could find the correct pattern for the solution; they presented a correct and complete reasoning for the solution and were able to examine the validity of their arguments.

Table 4.6: Learners' adaptive reasoning proficiency from the EG test

Question in EGPT	Frequency					
	Poor		Moderate		Excellent	
	Number ^a	%	Number	%	Number	%
1.2	166	83	10	5	24	12
2.1	158	79	12	6	30	15
2.2	176	88	10	5	14	7
4.1.1	186	93	10	5	4	2
5.1	176	88	14	7	10	5
5.3	194	97	2	1	4	2
5.4	184	92	4	2	12	6
5.5	192	96	2	1	6	3
6.1	160	80	12	6	28	14
6.2	180	90	8	4	12	6
Average percentage		88.6		4.2		7.2

^aout of 200

The overall performance depicted in Table 4.6 shows that on average, approximately 89 per cent of all learners were poor in adaptive reasoning, while only 4 per cent were found to be moderate, and 7 per cent were qualified as excellent.

Discussion and conclusion

The research question was: What is the level of Grade 11 learners in Vhembe East District's adaptive reasoning in EG problems? This question was addressed by analysing learners' performance in the EGPT from the adaptive reasoning point of view. The findings are that most learners (89 per cent) are poor in adaptive reasoning of EG (Table 4.6). This is specifically in terms of proposing a conjecture, drawing a correct conclusion, finding the

patterns of the task, presenting reasoning and examining the validity of an argument. These findings explain the poor performance of learners in EG, a major contribution of the current study.

The findings of the current study resonate with the findings of some existing studies. Susilawati and Dewi (2019) found that more than 50 per cent of high school students in their study exhibited low levels of mathematical reasoning ability. Ali et al. (2014) found that 77 per cent of learners in their study performed poorly in a geometry test. Ngrish and Bansilal (2019) found that 99 per cent of the participants in their study showed no signs of engagement within the formal deduction level, while Ansari et al. (2020) found that most learners in their study lacked adaptive reasoning proficiency.

The current study has practice-related and research-based implications. One practice-related implication is that teachers must assist learners better to increase their adaptive reasoning. This is across all the aspects of adaptive reasoning (Table 4.6). Ansari et al. (2020) concluded that adaptive reasoning proficiency puts learners in a position to think logically and reflectively when addressing mathematical problems. It also helps learners to provide reasons for their solution and helps them link the various patterns before providing a solution. Mabilangan et al. (2011) conclude that problem-solving activities should be embedded in all aspects of learning situations, as exposing the learners to problem-solving tasks can develop learners' mathematical reasoning power and foster their understanding that mathematics is a creative endeavour.

In this regard, however, there may be a need to strengthen teachers' knowledge of teaching problem-solving in South Africa. Several studies have blamed the poor performance of learners in EG on difficulties associated with teaching and learning geometry in South Africa (Alex and Mammen 2018; Chimuka 2017; Dongwi 2014; Patkin and Lavenberg 2012). Some authors have noted that the teaching of problem-solving is weak and unstructured (Ally 2011; Dhlamini and Luneta 2016). Additionally, Bankov (2013) opined that teachers tend to present geometric facts and solutions to learners without providing them opportunities to interact geometrically and develop their reasoning skills. Teachers should attend seminars and workshops on the different dimensions of adaptive reasoning,

so that they can better teach these to their learners. The need for preparing lessons that promote all the dimensions of adaptive reasoning has been noted (Ally 2011). Increasing learners' levels of adaptive reasoning will increase their proficiency in solving EG problems. Teachers also need to be able to design formative assessments, targeting the different facets of adaptive reasoning. Teachers should be advised not to present geometric facts and solutions without allowing the learners to interact geometrically and develop their reasoning skills.

The presented study focused on the levels of adaptive reasoning of the participating learners, for the purpose of depth. However, this excluded four other strands of mathematical proficiency—conceptual understanding, procedural fluency, strategic competence and productive disposition. Given the interaction between the different dimensions of mathematical proficiency (Findell et al. 2001), the participating learners' proficiency levels in these other four dimensions may have been impacted by the low level of proficiency in adaptive reasoning. However, their proficiency levels in conceptual understanding, procedural fluency, strategic competence and productive disposition must be studied independently. Additionally, given the focus of the presented study in a single school district, the Vhembe East District in Limpopo province, South Africa, there may be a need to research other school districts in adaptive reasoning and even mathematical proficiency in general, to establish a picture of learner proficiency on a broader scale.

In conclusion, it is worth recalling that the purpose of the presented study was to explore the problem-solving proficiencies of the 200 Grade 11 learners in solving EG problems in terms of adaptive reasoning. The focus was on the Vhembe East District in Limpopo province, South Africa. After evaluating the learners' problem-solving in the EGPT using the RMAR, the findings are that 89 per cent of learners were poor in adaptive reasoning, while only 4 per cent were found to be moderate, and 7 per cent were qualified as excellent in this category. These findings raise questions about the levels of proficiency of the participating learners in other dimensions of mathematical proficiency. The study also raises questions about the mathematical proficiency of learners in other school districts in South Africa. Addressing these questions will allow the teaching and learning

of EG to be better supported. Success in mathematics strongly depends on problem-solving proficiency (Ally 2011; Ho 2020), a requirement for learner competitiveness in today's and tomorrow's world (Moodley 2008; Syukriani et al. 2017).

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Chapter Five: Using Participatory Action Research to Change the Landscape of Mathematics Word-Problem-Solving Instruction

Nadia Swanepoel

Faculty of Education, University of Pretoria, South Africa

Introduction and background

Mathematics word-problem-solving is one of the most complex processes in mathematics education (Swanepoel 2022). Not only does it include the basic mathematics addition and subtraction operations (Morales et al. 1985; Swanepoel 2022), it also relies on instructional practices that allow for creativity and critical thinking. The current landscape is not conducive to creativity and critical thinking, as Verschaffel et al. (2020: 908) attest, explaining that the current landscape of mathematics word-problem-solving is restrictive. Teachers are resistant to teaching mathematics word-problem-solving; they are also intimidated by, and uncomfortable with teaching the subject (Kakoma 2016). The current landscape of mathematics word-problem-solving is problematic and concerning. Botha et al. (2005) and Nel (2012) attest that learners' performance in mathematics word problem-solving can be traced back to teachers' performance in this area. Guo (2024) elaborates that learners' performance in solving mathematics word problems is an indication of teaching effectiveness.

One of the reasons that mathematics word-problem-solving is deemed unsuccessful, is due to the implementation of ineffective instructional practices used for mathematics word-problem-solving (Agwagah 2013; Gersten et al. 2009). The instruction of mathematics word-problem-solving is a multi-faceted practice that entails the 'interplay between language and mathematics' (Hagena et al. 2017: 4057), where both mathematical and linguistic elements must be mastered for successful problem-solving to take

place (Jitendra et al. 2015; Kong and Swanson 2019; Morales et al. 1985). Instructing mathematics word-problem-solving is often associated with negative connotations owing to traditional methods of instruction being employed, which are not universally appealing to teachers. Both teachers and learners are resistant towards these so-called demon problems (Weber 1966); therefore, not all instructional practices of mathematics word problems lead to feelings of success. In fact, such instructional practices lead to feelings of frustration and inadequacy.

A significant concern in the current practices of instructing mathematics word-problem-solving is that learners do not understand the mathematics register, which is the language dedicated to mathematics (Swanepoel 2022). Nel (2012) highlights that although mathematics is a visual language of symbols and numbers, it is also expressed and explained through written and spoken words. The challenge of successful instruction of mathematics word-problem-solving can only be addressed if teachers are purposeful in constructing learning experiences that direct learners' attention to specific words and their meanings (Nel 2012). However, for this to be done, there is a need for a new landscape that accommodates different instructional practices that accommodate both the teacher and the learners.

Swanepoel (2022) refers to teachers' concerns about their ability to teach mathematics word-problem-solving and the challenges associated with the task itself. These concerns were anchored in Fuller's (1969) concerns-based model of teacher development (CBMoTD). The participating teachers highlighted concerns about their own understanding of mathematics word-problem-solving, their limited knowledge of different instructional practices to teach mathematics word-problem-solving and their negative attitudes towards mathematics word-problem-solving instruction. These concerns emphasise the need for a changed landscape of mathematics word-problem-solving, where it is made accessible and understandable for teachers and learners. This change is possible by relating mathematics word-problem-solving to learners' "lifeworlds" and making the content relatable to what learners are familiar with through interactive, engaging and creative learning instructional approaches that are embedded in critical thinking.

This chapter forms part of a larger study by Swanepoel (2022), who investigated how Grade 3 teachers' mathematics word-problem-solving

skills could be supported through participatory action research (PAR). The research question this chapter is built upon, is ‘How can Grade 3 teachers’ mathematics word-problem-solving instruction be enhanced through a professional development initiative?’ The focus of the current study is to place the spotlight on critical instructional practices of mathematics word-problem-solving that elicit joy and fun from both the teacher and the learner. Aspects such as setting the context of the word problem, unlocking the background of the word problem and vocabulary instruction are important for both the teacher and the learner to understand the word problem.

Literature review

The integration of creativity and critical thinking

Creativity and critical thinking are two aspects needed to make mathematics word-problem-solving more enjoyable for all. Creativity extends to understanding that mathematics does not belong only in the classroom, it is also found in the world around us (Orton and Frobisher 2004). Creativity interwoven with mathematics is a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements and disharmonies (Guilford 1967; Torrance 1966). Essentially, ‘creativity is the heart of solving a problem’ (Vuong and Martin 2014: 312). Creativity is an essential ingredient needed in critical thinking and reasoning (Swanepoel 2022) and should be made part of the daily routine and integrated into everyday living (Ismunandar et al. 2020; Runco and Acar 2012; Runco and Jaeger 2012). Alongside critical thinking, creativity can be integrated into the instruction of mathematics word-problem-solving, because creativity and critical thinking are about finding new solutions and thinking away from the usual idea (Runco and Acar 2012). Hasan and Khan (2020) emphasise the notion that change in the way mathematics word-problem-solving instruction is executed, needs to take place. More specifically, a culture of creative thinking and reasoning, and creative teaching and learning should be cultivated (Hasan and Khan 2020).

Teaching and learning must be adapted to enable learners to experiment freely and discover open creativity within themselves. This can only

be done if learners' creativity is taken into account and different ways of learning are considered (Swanepoel 2022). For this to happen, however, teachers must be guided on how to unlock learners' mathematical creativity. Mathematical creativity is defined as the capacity to employ the skills and contents of the arts to focus attention and create interest in mathematics to pursue defined mathematical goals (Ariba and Luneta 2018). Creativity and critical thinking work together for people to understand the world and find new solutions and thinking that deviate from the usual idea (Boccia et al. 2015). Teachers who employ creative teaching techniques are seen as creative teachers. Such teachers critically appraise teaching and learning methods and discern the best teaching practices (Swanepoel 2022). Creative teachers are effective teachers, because they are willing to try new practices and ideas that vary from traditional educational beliefs to improve practice (Henriksen 2016).

Critical thinking is the deliberate use of skills and practice that increase the probability of a desirable outcome (Henriksen 2016). Moreover, critical thinking is a core component of problem-solving, transcending normal thinking and reasoning and diminishing discipline boundaries to involve a combination of different types of knowledge (Henriksen 2016). With reference to critical thinking, Dayal and Chandra (2016) emphasise the critical importance for teachers to understand the process of mathematics word-problem-solving, so that they can adapt their thinking and think beyond the known confines of the instruction of mathematics word-problem-solving. Critical thinking extends to teachers having to be trained to become critical and creative thinkers in teaching mathematics word-problem-solving (Henriksen 2016). Teachers are exposed to critical thinking when they teach mathematics word problems, as mathematics word-problem-solving is part of everyday life (Sepeng and Webb 2012). Being involved in the teaching and learning of mathematics word-problem-solving means that the problem poser and problem solver are developing mental processes that assist in the formation of logical and critical thinking and accuracy, which contribute to decision-making and getting to a feasible solution (Department of Education 2011). According to Ariba and Luneta (2018), insufficient attention has been accorded to creativity in mathematics education. This can be rectified through the introduction of

creative mathematics practices that are built on critical thinking.

Traditional versus alternative practices to teaching mathematics word-problem-solving

Most teachers use the traditional teaching practice by providing an outline of the activity, demonstrating a few techniques to solve the problem, and providing the learners with a one-size-fits-all method to solve the problem (Barker 2012). The result of teaching using the traditional practice is that both the teacher and the learners are left discouraged, disheartened and unmotivated. This elicits negative affective emotions towards solving mathematics word problems on the part of both the teacher and the learner (Di Martino and Zan 2001). The traditional teaching practice influences learners' attitudes towards the subject, which may be useful to them in their future lives (Bates et al. 2013). This traditional practice restricts learners' creativity and imagination, as the content taught through this practice is seen as a universal set of facts (Cohrssen et al. 2015; Stipek et al. 2001). Mathematics taught to learners through the traditional practice is seen as a discipline, not content. In this practice, there is a belief that content should be conveyed through regulated teacher-directed instruction (Finlayson 2014; Whyte et al. 2018). The most favoured way to teach within the traditional practice is to provide learners with worksheets and textbooks to practise the skills taught continuously. The end goal is for learners to generate an answer (Stipek et al. 2001). The unfortunate reality of the traditional practice of teaching is that learners often do not understand what numbers and symbols represent, even though they perform the procedures as a continuous practice (Beisly et al. 2025; Peker and Ulu 2018).

The opposite of the traditional practice of mathematics instruction is the alternative practice of mathematics education, also known as the 'problem-solving practice' (Ernest 1989: 16). In contrast to the traditional practice of mathematics instruction, the alternative practice views mathematics as unfinished and open-ended, with a view to it being a dynamic process (Stipek et al. 2001). In alternative practices of teaching mathematics, the focus should be on self-regulation, engagement and attaining a sense of responsibility for work, teamwork and participation in classroom activities

among learners (Jdaitawi 2020; Yilmaz 2017). In accordance with this view, Di Martino and Zan (2001) explain that when learners have positive experiences with mathematics early in their lives, a lifelong positive attitude towards mathematics is created. The most significant difference between the two practices of mathematics instruction is that, in the alternative practice, learners are encouraged to make use of inquiry to construct their understanding (Cohrsen et al. 2015) and the focus shifts from teacher-centred practices to learner-centred practices. Teachers assume the role of facilitators, assisting learners to activate prior knowledge and think critically and creatively to develop their own methods to solve problems (Beisly et al. 2025; Finlayson 2014). The role of the teacher as a facilitator includes asking appropriate questions to deepen and extend learners' mathematical understanding (Beisly et al. 2025). In the alternative practice, attention shifts from arriving at an answer as the product to understanding the process of mathematics word-problem-solving (Beisly et al. 2025). One such alternative practice of the instruction of mathematics word-problem-solving is the play-based teaching practice. Ndlovu and Mncube (2021) explain that a play-based practice promotes a special mode of thinking, a sense of possibility, ownership, control and competence in mathematics learners. Similarly, Ndlovu and Mncube (2021: 185) advocate that 'play-based learning sustains learner attention throughout the lesson and promotes problem-solving skills'. One advantage of integrating play as a teaching practice is that both teachers and learners can engage in creativity and activate critical thinking, while being in an environment that allows for flexible thinking and reasoning (Ndlovu and Mncube 2021).

Play as an instruction practice of mathematics word-problem-solving

The word sum wheel (Swanepoel 2022), depicted in Figure 5.1, emphasises the value of learning through play and makes reference to a variety of different manners in which teaching and learning mathematics word-problem-solving can be done by means of *play* as an umbrella term. The word sum wheel was collaboratively developed by the co-researchers¹ in

1 The co-researchers in the study were participating Grade 3 teachers. The terms 'co-researchers' and 'teachers' are used interchangeably depending on the context.

Swanepoel’s (2022) research. The six steps in the word sum wheel are as follows: (1) read and look for clues; (2) constantly communicate (ask questions and reflect); (3) make time for play and creativity; (4) work out an open number sentence and operations; (5) work out the answers (calculations and sentence answer) and (6) double-check your answer (Swanepoel 2022). In the current paper, emphasis is placed on the aspect of play and the implementation of critical instructional practices that elicit joy and fun in mathematics word-problem-solving. In light of this study, emphasis is placed on *play*, which is the umbrella term used to encapsulate fun, creative and interactive practices of teaching mathematics word-problem-solving and changing the landscape of mathematics word-problem-solving instruction (Swanepoel 2022). Polya’s (1945) four-step problem-solving process informed the word sum wheel.

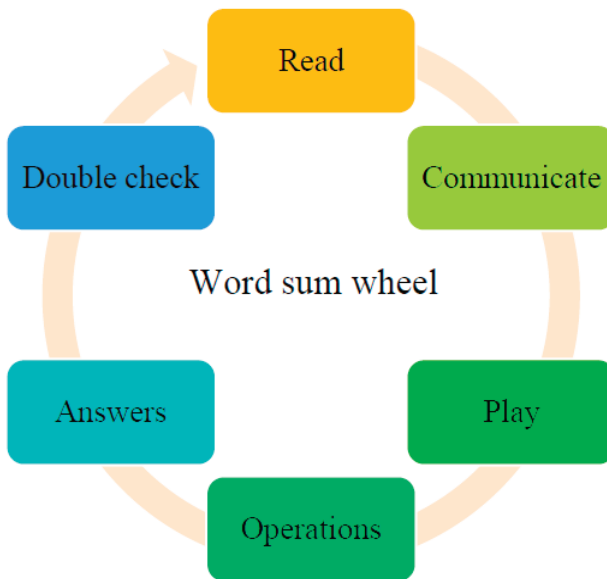


Figure 5.1: The word sum wheel

Source: Swanepoel (2022: 280)

The umbrella term *play* encapsulates dramatisation, peer and group engagement, the introduction of manipulatives and the inclusion of the multiple intelligences (MI) theory. The first component of play allows learners to dramatise a word problem to their peers. Dramatisation aids in linking learners' personal background to the nature of the word problem (Swanepoel 2022). An example of dramatisation taken from Swanepoel (2022) is a teacher who gives the learners in their class a broomstick and a mop and allows the learners to run around. When time is taught, the learners decide among themselves who is the short hand and who is the long hand of the clock. This way, the learners depict the clock as best they can and learn about reading time in a playful manner. Another example is to allow learners to sing their timetables and assign actions to the words (Swanepoel 2022). In the study by Nair et al. (2017), once the learners became physically involved in the dramatisation of the word problem and took part in the integration of movement, they started to understand concepts on a concrete level.

Second, the inclusion of peer and group engagement, where teachers allow learners to turn to one another and teach the mathematics word problem to one another, can be used successfully (Double et al. 2020; Harmer 2007; Henriksen 2016; Matherson and Windle 2017; Nurlaili et al. 2015; Panadero and Alqassab 2019; Swanepoel 2022). Group engagement is also effective when learners are granted the opportunity to teach and learn in an unconventional manner (Stach and Veldsman 2021; Swanepoel 2022). By using peer and group engagement, learners are given the freedom to discover the meaning of the mathematics word problem and experiment with solutions to the problems while working in their groups (Swanepoel 2022). Part of the success of integrating the MI theory and creativity in a lesson is to expose learners to real-life experiences (Ariba and Luneta 2018) and let them experiment with three-dimensional objects rather than abstract prototypes (Swanepoel 2022).

Third, by integrating concrete manipulatives, learners are given the opportunity to concretely explore, acquire or investigate mathematical concepts or processes and perform problem-solving activities. Bartolini and Martignone (2020) explain that concrete manipulatives are physical artefacts that learners can handle concretely and offer a large and deep

set of sensory experiences. Some learners need the reassurance that concrete manipulatives are provided to understand the essence of the mathematics word problem. Most learners enjoy being taught mathematics through interactive and participatory methodologies that include the use of manipulatives (Day and Hurrell 2017; Reimer and Moyer 2005; Stiegelmeier and Moore 2019). In addition, Maboya et al. (2020) align the use of manipulatives with play as an instruction practice for mathematics word-problem-solving by explaining that the beauty of manipulatives is the learner's ability to engage in hands-on learning in mathematics. Manipulatives do not have to be costly, but can include items such as maize, wheat, rice grains, bottle caps or stone pebbles (Maboya et al. 2020). Time should be allocated for learners to play actively with these concrete materials and manipulatives to experiment and discover how the mathematics register, numbers operation and relationships complement one another (Larsen-Freeman 2000; Millington 2011; Tirtayani et al. 2017).

Part of the success of integrating the MI theory and creativity in a lesson is to expose learners to real-life experiences (Swanepoel 2022). The inclusion and application of the MI theory make solving mathematics word problems fun for teachers and allow all learners to engage in teaching and learning in a *language* that learners understand (Larsen-Freeman 2000; Millington 2011; Tirtayani et al. 2017).

Methodology

This qualitative research was viewed through the constructivist paradigm, and PAR was employed as the research design. Data were generated through virtual collaborative workshops, which were transcribed for data analysis purposes. Teachers' reflection diaries and field notes and the researcher's research diary were also included as data generation instruments. Deductive data analysis was used to create four predetermined categories, after which inductive analysis was used to analyse the data. After reading through the data generated, inductive analysis was used to code key aspects of the data, which were grouped into predetermined categories. For the purposes of the current paper, attention is focused on one of the categories, namely critical instructional practices for mathematics word-problem-solving.

Grade 3 teachers from six different primary schools in Gauteng were included in the population sample. Sampling was done through purposive sampling. The sampling criteria included teachers who had been teaching a Grade 3 class and had been teaching Grade 3 learners consecutively for two or more years. The theoretical framework used to underpin the research was the continuous process of professional development (Swanepoel 2022), as seen in Figure 5.2, which incorporates Shulman’s (1987) model of pedagogical reasoning and action (part 1), the CBMoTD (part 2) and the interrelated relationship between subject matter knowledge, pedagogical content knowledge, professional development and the understanding and instruction of mathematics word-problem-solving (part 3) (Swanepoel 2022).

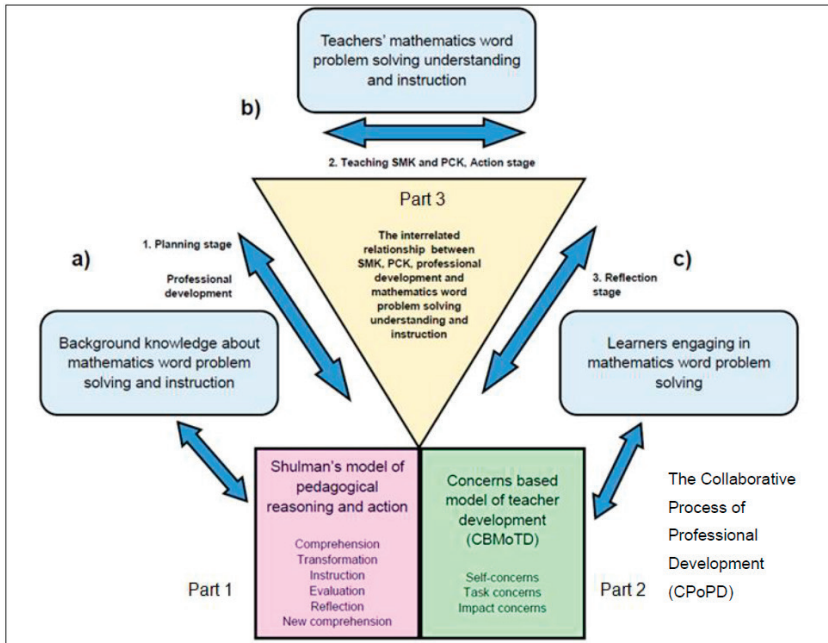


Figure 5.2: The Collaborative Process of Professional Development

Source: Swanepoel (2022: 29)

Ethical clearance was obtained from the University of Johannesburg (Sem

2-2019-030) and the Gauteng Department of Education. After providing consent, participants voluntarily participated in the research. The principles of anonymity, confidentiality, participants' rights and non-discriminatory and inclusive participation were upheld throughout the study. Member checking was done following the completion of the study.

Findings

Integration of mathematics word problems

Several teaching methods have been highlighted as important in effectively teaching mathematics word-problem-solving. The context or milieu of the mathematics word problem is essential. Throughout the teaching of mathematics word-problem-solving, the teacher should consistently integrate the instruction of word-problem-solving with other areas of the curriculum. The act of integration is what makes creativity possible. This is what Co-researcher EB3 did, and explained how they integrated daily activities with the instruction of mathematics word-problem-solving: 'I always try to relate it to real-life experience, whether it is banking or baking at such capacity and stuff like that. So, trying to relate it to real-life experience.'

However, in making the word problem relevant to the learners' context and background, the teacher should align the word problem with the background of the learners (Burt and Ridgard 2014; Ipatenco 2021; Joubert et al. 2019; Makoe 2014; Swanepoel 2016). Another suggestion for making mathematics word-problem-solving relevant to learners' context is to introduce texts, stories and themes that relate to the learners' interests (Swanepoel 2016, 2022).

Co-researcher EB1 explained that the best way to make mathematics word-problem-solving practical and relevant for a learner is to include 'things that he sees every day and you can really just bring those types of things into the class'. Similarly, learners can be accommodated in the class, and content can be made relevant to their lifeworld by 'taking the child's background into consideration and talk[ing] about current events' (Co-researcher ED2). Lastly, to involve learners and help them understand the

background of the word problem, word problems should be linked to the learners' own circumstances (Co-researcher ED1).

Verbal answering technique used as an alternative approach to solving word problems

Verbal answering is a different stance on teaching mathematics word-problem-solving, as suggested by Co-researcher ED1. In the classroom, Co-researcher ED1 allows learners to provide verbal answers to mathematics word problems from time to time. Co-researcher EC1 explained that 'learners battle to read and write in Grade 3'. Although most learners can find the answer to the problem, they are challenged by having to write down the answer. However, when they are allowed to answer the word problem verbally, it takes away some of the anxiety of mathematics word-problem-solving.

Breaking mathematics word problems into smaller sections

One mathematics word-problem-solving teaching method that was used by most of the participating teachers was the use of breaking mathematics content into smaller sections to aid with the instruction of word problems. Co-researcher AB1 commented that the teacher had 'to take it piece by piece, that the children really need to see it'. Co-researcher AD3 explained the rationale behind this teaching method as follows: 'With [the breaking up of the mathematics word problem] we realised that when we do that, they understand better what is required. So, they understand the concept behind the sum, it is not just limited to the numbers that are provided.'

Co-researcher EB2 explained that solving mathematics word problems could be made more playful by breaking the word problem into smaller sections so that everyone can understand it: 'I think if we take everything step by step and break the word problem in bite-sized chunks, we break the process of solving the word problem down and you actually make it fun and playful; then everybody can do maths.'

Using humour and dramatisation in the instruction of mathematics word-problem-solving

Another somewhat different teaching method used by Co-researcher AD1 is to introduce humour in the classroom. According to Co-researcher AD1, if learners are exposed to elements of humour, 'then they grasp something somewhat faster'. Co-researcher AD5 added that if the teacher makes mathematics word-problem-solving humorous, they can make the learners relax while they are solving the word problem. That way, without realising it, learners look for the clues and they do a word sum (Co-researcher AD5). The use of acting out or dramatising a word problem was an aspect that was highlighted by most of the co-researchers (AB2, AD4, AD5, AD6, EB1, EB2 and EB3). When learners dramatise a word problem, it allows them to reinforce and explain the vocabulary to one another in a playful manner, as Co-researcher AD6 explained. The act of visualising a word problem was also mentioned, with Co-researcher EB1 explaining it as follows: 'I would let them close their eyes and visualise what it is [...] Just so that the child gets a visual of what is asked of him or her.'

Co-researcher AB2 challenged themselves in mathematics word problem solving and incorporated role play in teaching a word problem. They gave the following explanation:

I put myself outside my comfort zone and we did role play in class [...]. I asked learners to count sweets with me in this see-through bag and see how many there are, and then they had to hand it out to their friend, but it was really role playing in the sense of them having to actually use emotions with it. The amazing thing is that role playing works. Learners enjoyed the lesson and could answer the questions which followed [...] although I had a couple who thought I was crazy.

The visualisation of a mathematics word problem is very important. Co-researcher AB2 explained it as follows: 'I also believe that the children need to understand this and it is a very big part for me that they should also imagine that they are in the story or they can see the story happen in front of them.'

Differentiation in mathematics word-problem-solving instruction

Emphasis was placed on differentiating teaching and learning methods in mathematics word-problem-solving instruction. In a classroom, the content must be differentiated in such a way that all the learners can grasp the information. Co-researcher EB3 explained that differentiated teaching and learning refers to 'learners [who] have different learning styles, so some may be visually inclined, auditory inclined, linguistically and kinaesthetically [inclined]'; therefore, it is important for the teacher to know how to adapt the learning content in such a way that all learners can learn and achieve success. The reality is that the teacher 'need[s] to know that children learn in different ways' (Co-researcher AB1).

The role of constant communication in mathematics word-problem-solving instruction

Continuous communication in mathematics word-problem-solving instruction is of crucial importance and entails constantly reflecting and asking questions to determine learners' progress. The main role of asking learners questions is to see whether they understand the work. If they do not understand it, the teacher must return to their previous knowledge and take and explain one aspect at a time (Co-researcher EB1). It is critically important to activate learners' prior knowledge, as their presence or lack of prior knowledge serves as a guiding light for what the teacher should teach the learners (Ahmadi et al. 2013; Jenkins and O'Connor 2002; Palincsar and Brown 1988). Co-researcher EB1 gave the following explanation:

Learners' prior knowledge determines every lesson that you do. Because the minute you see that the children do not understand, there is no use going on and continuing to get to do this wonderful lesson if half your class is not going to understand what you are saying.

Asking questions during mathematics word-problem-solving is essential (Swanepoel 2016). Co-researcher AB1 explained that being able to ask

questions is as good as being able to communicate, and that is the glue that keeps teaching and learning together. Similarly, Co-researcher EB2 explained that teachers are required to ‘ask inter-leading questions, introduction questions [...] we ask questions to sort of figure out where [learners] are at, at that moment’. Furthermore, it remains the teachers’ ‘responsibility to probe [learners] and make them excited in that lesson’ (Co-researcher EB2).

Co-researchers AD1, AD3 AD5, EB2 and EB3 agreed that the purpose of asking questions was to determine learners’ level of comprehension of mathematics word-problem-solving so that the teacher can make adaptations to their style of teaching and ascertain how to support the learners best. Co-researcher AB2 expanded on this train of thought by adding: ‘It also helps, it actually assists the teacher, because sometimes a child will give an answer, which actually leads to the next thing, and that encourages the other children to also think a little bit further.’

The learner’s role in the process of asking questions is very important in guiding teachers. Co-researcher EB4 explained their view of the role of posing questions to learners and said that asking and answering questions should be a natural part of communication in mathematics word-problem-solving instruction. The stigma associated with learners asking questions should be removed. It should not only be the learners who do not understand who need to ask questions, but all learners should test their understanding by asking questions. The following explanation was given:

I feel like the learners do have a role in mathematics word-problem-solving instruction. I tend to ask my children quite often throughout the day or throughout specific lessons if they are still with me. If they understand. If they do not understand, they need to put up their hand. And everyone always thinks I am a bit ridiculous when I say to them that I tell the children, you know, well not to stand up, but if they get everything wrong, they need to raise their hand and say: ‘I need help.’ (Co-researcher EB4).

The act of speaking *on* learners’ level, as opposed to speaking *over* learners is another teaching method Co-researcher AD5 emphasised. Along the same

line, Co-researcher AD6 clarified that ‘one will absolutely have to convey those concepts at their level to them’. Co-researcher AD4 explained that teachers ‘have to get back to [the learners’] level. As teachers, we want to think big, and that is when we begin to speak over learners’. Co-researcher AD5 gave a very practical example of what is done in their classroom. She explained that she talks to learners about a ‘James Bond sum’ or a sum where they must find clues like Scooby Doo. Co-researcher AD5 said:

I do not like the word ‘word sum’; it scares the children. I feel it is a problem they are giving you that you need to solve, almost like a detective case. I always tell them [...] I use a lot of stories and stuff. Almost like Scooby Doo has to look for the clues.

Teaching mathematics word-problem-solving using resources and interactive strategies

The use of resources in the classroom should also be considered to make the instruction of mathematics word-problem-solving practical, fun and relevant. Co-researcher AD3 explained that she enjoyed using resources such as large dice to teach. The participant said: ‘I like using something like large dice that the words are written on, like altogether, divide, or what is the product, or what other word that we use; then I [toss] the dice [to] learners.’

Interactive teaching is a method that not all the participating teachers embraced with equal confidence. Co-researcher AB2, however, explained that interactive teaching served to ensure that learners understood the basics of the content. She added that teaching interactively also allowed learners to grasp concepts differently than just doing the calculations on paper. Co-researcher AD5 gave the following explanation of how she allowed her class to experience a word problem about time physically:

I physically build a clock using sheets of paper that I put on the carpet from one to six [...] then the children are the hands. So, then I choose the second hand. Then as the minute arm goes around when five minutes have passed, then he jumps on five minutes and then the [unintelligible] stands and then the seconds hand runs. We physically do; we portray

how the clock moves. And then, eventually, I make it go a little bit faster. Then the hour one can give a step. So, we do it physically [...] we run the clock on the carpet with the broomstick.

Discussion

The new landscape of the instruction of mathematics word-problem-solving

Practices for instructing mathematics word-problem-solving should be adapted (Fülöp 2021) by integrating the teaching methods highlighted above. It is crucial to create an environment where teaching mathematics word problems brings joy to teachers and learners (Ndlovu and Mncube 2021). A teacher cannot make the content relevant to the learners' background if they have little to no background knowledge of the learners' (Swanepoel 2022). It is equally important for the teacher to unlock the context of word problems for learners and develop learners' vocabulary, so they can truly grasp the milieu of the word problem. Another foundational aspect critical to changing the landscape of instructing mathematics word-problem-solving is to allow learners to feel safe and secure. This is possible when the teacher speaks on the learners' level instead of over the learners (Swanepoel 2022). This critical instructional practice is often overlooked. However, inviting the learners to be part of the teaching and learning climate is important. Furthermore, this critical instructional practice allows learners to feel that they belong in the classroom and that their contributions to teaching and learning are important.

The use of humour is another critical instructional practice in teaching mathematics word-problem-solving (Van Dooren et al. 2019). While the use of humour is vital to speak a language that learners understand, it is also important to make use of differentiated teaching and learning methods in teaching mathematics word-problem-solving. Differentiated teaching and learning methods allow learners to be accommodated according to their strengths. This is one of the first ways in which learners feel welcomed and are given permission for their voices to be heard. Differentiated teaching and learning extend to several ways in which learners are accommodated

in the classroom. One example is to allow learners to answer mathematics word problems verbally instead of having to write the answer down. This accommodation is an excellent asset to learners who are unsure about how to process their thoughts on paper (Swanepoel 2022). Another way of accommodating learners is through integrating the MI theory in the instruction of mathematics word-problem-solving. Gardner and Hatch (1989) define intelligence as the capacity to solve problems or fashion products that are valued in one or more cultural setting. The MI theory is important because it provides a platform for all to achieve. The MI theory is focused on the individual strengths of each individual (Swanepoel 2022).

The role of participatory action research in changing the landscape of mathematics word-problem-solving practices

PAR was selected as the research design for this qualitative study owing to its ability to introduce change and allow the participating teachers, as co-researchers, to stand together and find a collaborative solution to a challenge (see Somerville 2014). Considering the current study, PAR cannot be discussed without aligning it with teachers' professionalism.

In the intervention phase of the research, there was a continuous cycle of planning, action and reflection. The implementation of PAR led to the teachers' successful professional development. It provided a platform where they socially contributed to one another's learning and understanding of critical practices for the instruction of mathematics word-problem-solving. The teachers were able to establish a community of practice. The collaborative workshops informed the development of critical instructional practices for mathematics word-problem-solving. The collaborative workshops served as a platform for teachers to raise their concerns about instructional practices of mathematics word-problem-solving and share ideas, experiences and suggestions with one another to remedy these matters. Each collaborative workshop was based on the three phases of PAR, namely preparation, action and reflection. The first workshop dealt with the CBMoTD, and the second workshop critically viewed the MI theory and creative teaching methods. The third workshop paid attention to Shulman's (1987) model of pedagogical reasoning and action, while the fourth addressed subject

matter knowledge and pedagogical content knowledge. The fifth workshop covered reading comprehension strategies, techniques, the mathematics register and critical thinking, and the last workshop addressed mathematics modelling and mathematics proficiencies.

When assessing the role of the teacher through the lens of PAR, one of the roles the teacher takes on during the instruction of mathematics word-problem-solving is that of an agent of change (Bourn 2016; Van der Heijden et al. 2015; White et al. 2021). Good education is largely determined by the quality of the teacher (Depaepe et al. 2020) and the ability of the teacher to set an example (Skemp 1993). The emphasis of PAR and professional development remains the collaborative nature of participants who work together to solve a matter at hand.

Conclusion

Mathematics word-problem-solving no longer needs to be a feared area of mathematics instruction. This research indicated how accessible and understandable mathematics word-problem-solving can be made for both learners and teachers. The focus of this chapter was to highlight how participatory action research was used to change the landscape of mathematics word-problem-solving from a product-orientated approach to a process-orientated approach. The answer to the research question ‘How can Grade 3 teachers’ mathematics word-problem-solving instruction be enhanced through a professional development initiative?’ is that mathematics word-problem-solving should be meaningful to the teacher and the learner—it must be enjoyable for all.

Through the incorporation of alternative teaching methods, such as the integration of word problems into the curriculum and real-life experiences, verbal answering techniques, and breaking mathematics word problems into smaller sections, mathematics word problems can be explored in a different manner to ensure that the essence of the mathematics word problem is understood. Emphasis is placed on the constant integration of creativity and critical thinking as necessary components for successful teaching and learning. Through the introduction of humour and dramatisation in the instruction of mathematics word-problem-solving, the word problems

become less daunting to teach for teachers and easier to understand for the learners. While incorporating alternative approaches to teaching mathematics word-problem-solving, the word problems are presented on the learners' level of understanding. They can solve the word problems while focusing on the process of the enquiry, rather than the final product. Adhering to the alternative approach to the instruction of mathematics word-problem-solving allows for differentiation. Lastly, the role of constant communication is highlighted as a critical aspect required for the successful answering of a mathematics word problem. This approach also includes the teachers' ability to speak to learners on their level, and not over them.

The new landscape in teaching mathematics word-problem-solving was made possible through PAR. The word sum wheel is the collaborative product of the participants in the research, which highlights the essential role of play in mathematics word-problem-solving. The collaborative process of professional development reinforces the notion of how important it is for teachers to continually evolve in their practice and ensure that they do not stagnate in their approach to teaching. Instead, teachers should continually find ways to approach mathematics word-problem-solving through alternative teaching methods that challenge the traditional teaching approaches and require teachers to think out of the box while having fun.

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Chapter Six: Using Binomial Logistic Regression and Receiver Operating Curves to Identify at Risk Learners

Celeste Combrinck

Faculty of Education, University of Pretoria, South Africa

Introduction and background

The subjectivity of standard setting as well as the importance of the decisions to be taken based on these standards, which affect the future of the learners tested, are among the main reasons that make the setting of cut scores one of the most complex, contradictory and controversial problems in the area of achievement testing (Kaftandjieva 2010:10).

Standard and norm-setting, determining cut-off points and decision criteria can be done arbitrarily, with reasonable sounding points being selected or done scientifically and based on data for or from the instrument(s) (Blömeke and Gustafsson, 2017). Test users sometimes choose to set such criteria based on a perceived reasonable number, for example, 50 per cent or 60 per cent (Habibzadeh et al. 2016; Yousef et al. 2017). Such a number is chosen because the test users are unfamiliar with other methods for setting cut scores, and the number used has a tradition attached to it (Khatimin et al. 2013; Kubiszyn and Borich, 2024). Unfortunately, cut scores, even for high-stakes tests, are often set using a number that is not more precisely chosen. A failure to set evidence-based cut points has social justice implications and negatively affects scientific accuracy (Kellow and Wilson, 2008; Yudkowsky et al. 2015). Setting such points more scientifically requires technical knowledge and other resources, such as a panel of experts, to review and rate the test or items. This paper is a practical demonstration of how to set cut-off points scientifically using the Rasch partial credit model (Masters 2016). I demonstrate how to assess the validity assumptions related to instruments and convert the results to an interval scale using logistic regression modelling and receiver operating

curves (ROC). These methods use only data and are recommended when other resources, such as the judges or experts, are not available due to financial or practical constraints experienced by the test users (Diniz 2022).

Setting cut scores requires research studies involving several professionals with the appropriate backgrounds and consequently be expensive and time-consuming, as is typical of the most preferred Angoff method (Khalid et al. 2022). For these reasons, setting cut scores is often not practically possible in situations where it is required, such as in educational settings with limited resources (Cohen-Schotanus and Van der Vleuten 2010; Wang and Keller, 2024). In literature, criterion-referenced methods for setting cut scores are advocated as best practice (Park et al. 2021; Parsaeian et al. 2024;). However, this may not be possible for the test users to employ (Kellow and Wilson 2008; Pitoniak and Morgan 2017; Smith and Stone 2009). Therefore, the current manuscript explores non-parametric statistical techniques and reports on a purely data-driven approach, usefulness in setting cut scores.

Measurement plays a vital role in setting standards and cut-score determination while forming a part of an evaluative decision-making process (MacCann and Stanley 2006). Measurement theory and data inform the decision-making process, but should alone not dictate the outcome (Stone 2011). Cut scores should be linked to the construct and what the person is expected to have mastered, crucial aspects of the process which are lost when such points are set arbitrarily (Wyse 2017). Reducing the score could result in a loss of mastery of aspects of the content, as contained in specific items or scales in the instrument (Stone 2011). A reasonable cut score is directly related to the instrument's construct validity regarding the content coverage that should ideally be grasped. A test score is not necessarily equivalent to competency; mastery and competency differ (Gervais 2016). Instead, any test, no matter how well designed, should form a more comprehensive process, increasing the overall validity of decisions in which assessments play a role (Stone 2011). There is no universal method for setting standards and cut scores; instead, several different methods may apply to certain test types, and researchers and practitioners only sometimes have sufficient knowledge of these methods to use them (Wyse 2017). Testing and instrument development are also evolving, therefore,

methods for setting standards and cut scores are required to adapt and could be done using generative artificial intelligence (Latif and Zhai 2024). Furthermore, different methods can lead to various cut scores being set (Carlson et al. 2009; Kaftandjieva 2010).

Angoff's (1971) method has remained the most popular and well-known method for setting cut scores. It requires each item to be rated by a panel of experts in terms of whether a person of minimal proficiency would be able to answer the question correctly, and these items are then totalled to reach a cut score (Angoff 1971; Biddle 1993). This process requires the judges to understand what a minimally proficient person must know to succeed in a given scenario. A modification to this process could be to ask the raters what the probability is that a minimally proficient person or persons would correctly answer the item, in which case the sum of the probabilities would be used to calculate an acceptable cut score (Wyse 2017). The process requires at least seven to ten raters of the items (Biddle 1993). Most standard-setting methods involve using raters to assess whether a "proficient" person would correctly answer an item, depending on what such a person would be expected to know (Cizek et al. 2004; Kaftandjieva 2010). When Rasch person measures are linked to scales and further validated through convergent validity, using person measures to set standards becomes possible instead of relying on raters or judges (MacCann and Stanley 2006). Criticism of Angoff's methods is that judges need help to estimate item response probabilities for minimally competent candidates (Ricker 2006). Decision and overconfidence biases are also drawbacks of Angoff's method (Longford 1996). Such methods require not only a panel of experts, but also that such experts receive training to reduce their propensity to give biased ratings (Arce and Wang 2012).

Various authors have explored and advocated the combination of using judges and Rasch item measures as a more efficient way to set cut scores (Arce and Wang 2012; Baghaei 2007; Boone et al. 2014; Bowers and Shindoll, 1989; Wright, 2000). This method, however, also has challenges as judges may only sometimes agree with the Rasch measures regarding where the items are located, and a compromise must be reached (Baghaei 2007, 2009). A further challenge of using panel methods is that considerable time should be spent training panellists to minimise bias (Schultz 2006; Wyse

2018). Arce and Wang (2012) found that panellists can add significant increases to the standard error when setting cut scores and that such cut scores could vary according to the training and instructions given to panellists. The authors compared traditional and alternative approaches to using the modified Angoff's method and were unable to conclude whether this produced more accurate cut scores for academic achievement levels (Arce and Wang 2012). They also report that developing a standard setting and research framework is time-consuming. Different approaches when using panellists may result in very different outcomes, primarily due to the subjective nature of setting cut scores when using human opinions and ratings (Tannenbaum and Kannan 2015; Wang 2003). Khatimin et al. (2013) used the Rasch objective standard-setting method for setting standards and cut scores (Grosse and Wright 1987; Wright and Grosse 1993). Wright and Grosse (1993) also found that judges' ratings vary widely depending on factors such as expectations of the process, the scope presented and their specific expertise. According to Khatimin et al. (2013), using the Rasch Objective Standard Setting mitigates some problems with panellists to set cut scores and standards.

Data-based methods for setting cut scores and standards and identifying at-risk learners include predictive validity and statistical methods (Diniz 2022). Criterion and predictive validity of reading assessments have been used in the United States to predict how well learners achieve on high-stakes tests (Klingbeil et al. 2015). Curriculum-based assessment can broadly indicate knowledge and skills gained in a learning area (Mitchell 2019). Silbergitt and Hintze (2005) compared discriminant analysis, logistic regression and ROC curves to see which worked best for setting curriculum-based measurements. The authors found that each method could set adequate cut scores, which led to high specificity and negative predictive power, which they attribute to the fact that each method attempts to maximise the number of true negatives. Silbergitt and Hintze (2005) conclude that logistic regression is the most parsimonious method, though each method gives good results. A study which examined ROC, T-scores and the Rasch rating scale method (RSM) for setting cut scores found that the ROCs and RSM identified similar cut scores, whereas the T-scores led to lower, more conservative scores being set (DiStefano and

Morgan 2011). Stone et al. (2011) point out the importance of investigating the construct validity of an instrument before applying standard-setting methods. In their comparison of the Angoff method and objective standard setting (OSS), Stone et al. (2011) found that Angoff's method did not define a stable and valid construct. The importance of construct validity points to the fact that theories such as Rasch measurement theory should be applied to the instrument before cut scores are set, as was done in the current study.

Methods

The current study was part of a more significant endeavour to design tests to gauge curriculum knowledge gained over a year at a group of South African schools (Combrinck 2018). The schools were independent and part of a coalition with its curriculum, partly based on the South African Curriculum Assessment Policy Statements (CAPS) (Department of Basic Education 2024). The independent schools in the current study have longer school days than nationally recommended, smaller classes and give learners more individual attention. The learners came from impoverished environments and attended low-functioning primary schools. These independent schools aim to prepare learners for their end-of-year exams in the final school year so that they attain access to tertiary studies (Combrinck et al. 2016). The learners are second-language English speakers but have been in English Language medium schools since Grade 1. The funders wanted the developed instruments to be used as benchmarking tools (comparing schools) and accountability measures and to feed back into the school system to enhance teaching and learning (Combrinck et al. 2017). The instruments were also designed to monitor learning progression and identify learners requiring additional assistance (Combrinck et al. 2018). This chapter looks at a sub-component of the study, in which scores were examined and cut scores set, which could assist teachers in identifying learners who had a higher risk of not finishing school with access to tertiary studies. Such cut scores could then be used to identify at-risk learners going forward and resources put in place to assist academically at-risk learners.

Sample

At the end of Grade 11 all learners at the cluster of schools wrote the English Language, Mathematics and Natural Science tests. Not all learners have all three subjects; 384 wrote the English language test, 360 the mathematics test, and 309 wrote the natural science test. Two hundred ninety-six learners wrote all three of the tests (Valid N). The current study combined data from two cohorts of two years' worth. All the schools in the cluster were assessed, and the seven schools are seen as the total population, a sub-population in the school system. Most of the sample was female (78 per cent), as a girl-only school forms part of the cluster, and the other schools also have more female learners than male learners. The sample chosen for this study had written their final school year exam, and the schools provided the results. A retrospective analysis was done to set cut scores and then compare the success of these scores to the Grade 12 outcomes.

Instruments

Before cut scores can be set, an assumption about the quality of the instrument is taken for granted. Assessments designed for the current study followed strict guidelines for best test design (Boateng et al. 2018; Kline 2015; Wright and Stone 1979). The instruments were designed to be curriculum-based measurements (CBM), assessing the curriculum's broad goals and giving a more general indication of knowledge and skills gained throughout the year (Hintze and Silbergliitt 2005). Curriculum-based measurements help enhance teaching and learning, improve curriculum implementation, monitor learning progression, evaluate learning programmes and identify academically at-risk learners (Costello et al. 2022; Deno, 2003; Hintze and Silbergliitt 2005).

Subject specialists identified learning goals based on the national curriculum to assist with the test design (Kellow and Wilson 2008). After identifying the learning goals, the experts designed individual items to address the learning goals. The current study focussed on creating a range of items on a spectrum of difficulty and different levels of Bloom's taxonomy (Bloom et al. 1956). Next, the instruments were piloted and refined based

on Rasch statistics and subject specialist analysis of pilot results. Table 6.1 shows the Rasch criteria for quality instruments and to what degree each instrument.

Table 6.1: Instrument quality criteria

Criterion	English Test	Maths Test	Science Test	Interpretation
Targeting	0.08	0.13	0.07	Good targeting. Less than 1.0 error is good
Item Model Fit Mean Square Range	0.84–1.30	0.66–1.64	0.57–1.81	Productive for measurement
Person Reliability	0.86	0.86	0.81	Excellent
Item Reliability	0.98	0.97	0.95	Excellent
Ceiling Effect	None	None	None	Excellent
Floor Effect	None	None	None	Excellent
Variance in Data Explained by Measures (unidimensionality)	30.50%	34.80%	29.20%	Acceptable, no secondary dimensions (eigenvalues lower than 3.0)
Local Dependence	0.36–0.36	0.72–40	0.59–0.30	Values higher than 0.7 indicate dependence. Only one item in the Maths test exhibited potential dependence.

Criterion	English Test	Maths Test	Science Test	Interpretation
Sample Size	384 persons for 77 items	360 persons for 57 items	309 persons for 79 items	Acceptable sample size for dichotomous and polytomous items (99% confidence)
Person Separation Index	2.45	2.46	2.04	Values above 2 are desirable; all the tests had acceptable separation indexes
Item Separation Index	6.66	5.83	4.37	Values above 3 are desirable; all the tests had excellent separation indexes.

The English language, mathematics, and science assessments achieved most of the requirements, having excellent targets, model fit and person and item reliability, and they did not show any ceiling or floor effects. The criteria were based on recommendations from Linacre (2023b), Boone (2016), Bond et al. (2020) and Boone et al. (2014).

Processes

Data collection was done by the external monitoring agent each year in November, and all the Grade 11 learners (who were taking the respective subjects) wrote the three assessments. Experienced teachers scored the assessments, and scripts were moderated. Thereafter, all scripts were captured on the item level and the results were analysed. All procedures

were standardised. After these identical learners completed their twelfth year, their results were obtained from the schools for comparison with their Grade 11 results for predictive validity.

Data analysis

Two commonly used methods for setting cut scores in assessment measures were considered: binomial logistic regression and ROC curves. Each method has advantages and disadvantages; for example, ROC analysis allows setting different cut scores by comparing them to one another. Logistic regression uses maximum likelihood estimation to maximise the classification of true positives, but at the cost of less accurate identification of true negatives. Both methods were applied and compared to find the most accurate methods for setting the cut scores and identifying the academically at-risk learners.

The Rasch model

The Rasch model was applied to the instruments to assess their quality and to convert the ordinal scale to an interval scale. Rasch measurement theory is a family of statistical models, all of which are logistic regression models, in which the probability of correctly answering an item is calculated as the person's ability minus the item's difficulty (Combrinck 2020). The raw scores were transformed into an interval scale via the Rasch measurement model in Winsteps (Linacre 2023a). This had the advantage of giving each student a score based on the log odds of their correctly answering an item versus how many persons could correctly answer the item. The final person score was based on all items and person interactions, and the logit score was converted to a scale of 0 to 100, with the same mean as the raw scores and a standard deviation of 10.

Binomial logistic regression

To graduate from high school in South Africa, learners must pass the final 12th-year exams, that is, the National Senior Certificate (NSC). To pass the

exams, learners should have achieved 40 per cent or more in three subjects, and one of those subjects should be a language at the home language level (Umalusi 2014). The other two subjects require a minimum of 30 per cent or more. To gain access to diploma-level study, the learner must achieve 40 per cent or higher in their home language and 40 per cent or higher in at least three other subjects. To gain entry to bachelor studies, the learner must have 40 per cent or higher in five subjects, one of which must be the home language. As this coalition of schools aims to prepare learners to gain tertiary access, a dichotomous variable was created: no tertiary access failed or only passed, or access, diploma or bachelor access. Binomial logistic regression was used to assess whether the three tests could be used as predictors for the dichotomous outcomes. All assumptions were met for binomial logistic regression; variables were linearly related; there was a lack of multicollinearity and errors were independent (Field 2009; Field 2024). Linearity of the logit was assessed in SPSS (IBM 2025) using interaction terms, and all three of the interactions were not statistically significant ($p > 0.05$), indicating that the assumption of linearity of the logit holds (Field 2009). The potential multicollinearity problem was tested using collinearity statistics in the linear regression analysis option. The tolerance values were above 0.1, ranging from 0.419 to 0.679. The VIF values did not exceed 10; these ranged from 1.473 to 2.385; all these indicators point to multicollinearity not being a problem in this analysis (Myers 1990). Mathematics and Science scores correlate highly at 0.731 ($p = 0.000$), however, running the model without either weakens the model's predictive value. Forced entry was used as the subjects were expected to predict the outcome to some degree (Tabachnick and Fidell 2007). Two cases with high values for Cook's distance exceeded 1 and were removed from the analysis, reducing the sample size to 294. The standardised residual values were below 2 except for one case (less than 5 per cent of the sample), and the mean leverage value was close to the expected value of 0.010 at 0.013. The DFBetas had values of less than 1, and all residuals indicate that the model fits the data and that errors are independent.

ROCs

ROCs were used to gauge the discriminant value of tests for dichotomous outcomes and to determine the cut points for identifying at-risk learners (Metz 1978; Zweig and Campbell 1993). ROC results for mathematics and science test results were analysed separately, and cut scores were set discretely for these two subjects to maximise sensitivity and specificity. Sensitivity is the probability of the predictor correctly identifying true positives, in this case, not having tertiary access at the end of the schooling career (Grade 12). Specificity is the probability of the predictor correctly identifying true-negatives, in this case, those who would have tertiary access correctly being classified as such and not classified as being at risk (Linacre 1994; Metz 1978). The cut scores' usefulness was examined using a prediction table to see how many learners were correctly identified as at risk (true positive) and how many were not identified who should have been classified as such (false negative).

Results

Table 6.2 shows the descriptive statistics for the pass type regarding learners who had completed all three subjects. The end-of-school results showed that 172 (58 per cent) of the learners achieved tertiary access, passing either with a diploma or bachelor's degree. While 124 (42 per cent) had no tertiary access, they failed their exams or only passed.

Table 6.2: Descriptive of final year exam results for learners with mathematics and science

Outcome	Frequency	Per cent	Valid Percent	Cumulative Percent
Tertiary access	172	58.1	58.1	58.1
No tertiary access	124	41.9	41.9	100.0
Total	296	100.0	100.0	

In Table 6.3, the results of the binomial logistic regression are shown. The Grade 11 English language test did not significantly predict the dichotomous outcome ($p = 0.792$). For this reason, the Grade 11 mathematics and science tests were used to identify at-risk learners and the language test results were not included in the ROC analysis. The model fit statistics were insignificant; Hosmer and Lemeshow test = 3.629 ($p = 0.898$), indicating a good fit between the data and the model (Hosmer et al. 1997). The exponential statistic shows that for every percentage gained in the Grade 11 mathematics test, the learner becomes 1.590 times more likely to pass with tertiary access, and for the Grade 11 science test, for every extra percentage, the learner becomes 2.521 times more likely to pass with tertiary access. The pseudo-R² is high, with 91.9 per cent of the variance in the outcome being explained by the model (Nagelkerke).

Table 6.3: Binomial logistic regression output for three test results predicting the type of pass

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
English Language Test results*	-0.038	0.039	0.973	1	0.324	0.963	0.892	1.038
Mathematics Test results*	0.464	0.094	24.347	1	0.000	1.590	1.322	1.911
Science Test results*	0.925	0.180	26.336	1	0.000	2.521	1.771	3.589
Constant	-47.119	8.834	28.453	1	0.000	0.000		

Note Pseudo R² = 0.919 (Nagelkerke), Hosmer and Lemeshow = 3.629 ($p = 0.898$), overall prediction = 96.3

* Note rescaled using Rasch model, 0–100 scale with STD of 10

Table 6.4 is the classification table and shows that, overall, the model had a prediction rate of 94.9%. The model correctly identified 95.6% of learners as having tertiary access and correctly identified 93.5% as not having tertiary access. The null model had an overall prediction rate of 58.1% and could

not identify any at-risk learners (0% correctly identified for this group). The result indicates that the Grade 11 Mathematics and Science tests significantly increase the possibility of identifying learners who will gain tertiary access at the end of Grade 12.

Table 6.4: Classification table

Observed	Predicted		Percentage Correct
	Tertiary Access	No Tertiary Access	
Tertiary access	167	5	97.1
No tertiary access	6	116	95.1
Overall Percentage			96.3

a. The cut value is 0.500

Table 6.5 presents the results using the predicted categories from the binomial logistic regression analysis to set cut scores. These cut scores were based on the mean of the Grade 11 tests for the predicted categories. The cut point was set for mathematics at 39.85 and science at 24.39 based on the predicted groups from the binomial logistic regression analysis. The results show that there were no false negatives, that is, those who would have tertiary access were identified correctly. However, there were false positives, such as learners who were at risk, but were not identified. Eighty-four learners were not identified as being at risk when the mathematics cut point was applied, and 68 learners were not identified when the science cut point was applied.

Table 6.5: Prediction table with binomial logistic regression categorisation

		No Tertiary Access	Tertiary Access	TOTAL
Maths cut point from logit rescaled applied	At risk	79	0	79
	Not at risk	84	197	281
	TOTAL	163	197	360
Science cut point from logit rescaled applied	At risk	61	0	61
	Not at risk	68	180	248
	TOTAL	129	180	309

Table 6.6 shows the results of the ROC analysis for the mathematics test. The area under the curve was 0.814, indicating a balance of sensitivity and specificity, a reasonably helpful test (Camasso and Jagannathan 1995). The statistically significant result (asymptotic = 0.000) provides further evidence of the instrument’s accuracy for predicting a dichotomous outcome.

Table 6.6: Area under the curve for mathematics rescaled test

Area	Std. Error	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.814	0.026	0.000	0.763	0.865

a. Under the non-parametric assumption

b. Null hypothesis: true area = 0.5

The ROC plot for the mathematics test is presented below in Figure 6.1.

An intercept of 0.726 and 0.715 was used to maximise sensitivity and specificity. The modelling helped to identify these intercepts, resulting in a cut score of 43.920 for the mathematics results.

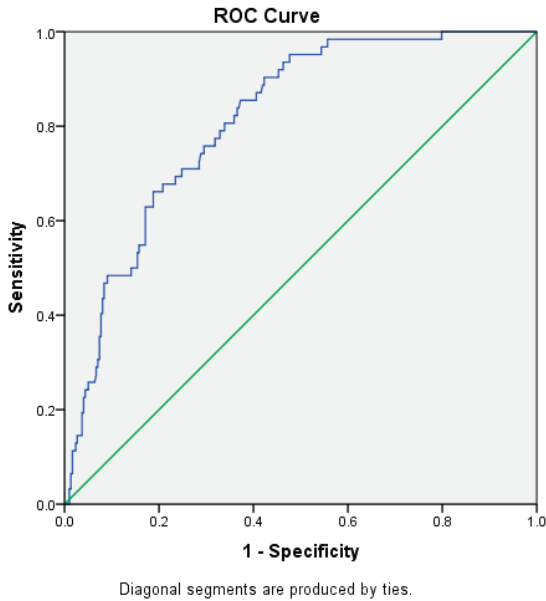


Figure 6.1: ROC curve for mathematics test data and dichotomous end-of-year outcome

Table 6.7 shows the results for the science test, with an area under the curve of 0.815, like that of the mathematics test and statistically significant ($p = 0.000$).

Table 6.7: Area under the curve for science rescaled test

Area	Std. Error	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.815	0.030	0.000	0.757	0.873

a. Under the non-parametric assumption

b. Under the non-parametric assumption

Table 6.7 reveals the ROC curve for the science test data. The aim was to identify a good trade-off between sensitivity and specificity, and an intercept of 0.754 and 0.728 was identified, which resulted in a cut score of 28.505 for the science results.

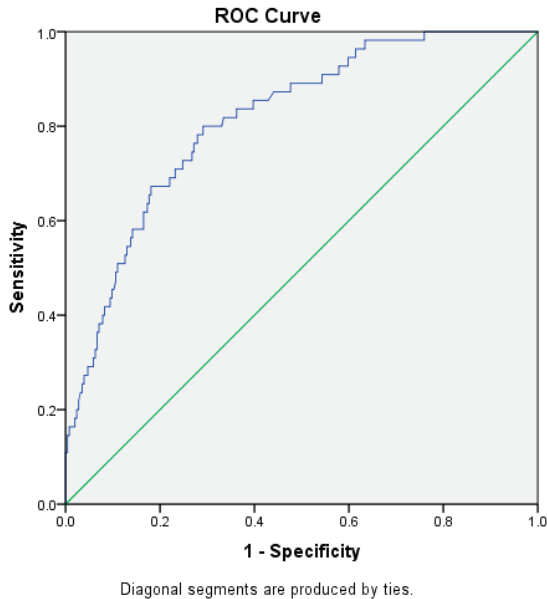


Figure 6.2: ROC curve for science test data and dichotomous end-of-year outcome

Based on these cut points, learners were classified as “at risk” or “not at risk” in Table 6.8 below and cross-tabulated with their results regarding whether they gained tertiary access or did not gain access. Based on the mathematics dichotomy, the categorisation correctly identified 45 learners as at risk while failing to identify seventeen who were at risk. For the science categorisation, 41 were correctly identified, and fourteen, also at risk, were not identified.

Table 6.8: Prediction table with ROC categorisation

		No tertiary access	Tertiary access	Total
Maths cut point from logit rescaled applied	At risk	45	85	130
	Not at risk	17	213	230
	Total	62	298	360
Science cut point from logit rescaled applied	At risk	41	69	110
	Not at risk	14	185	199
	Total	55	254	309

Combining the results from the mathematics classification and the science classification, the results are presented in Table 6.9. The combination of the two subjects leads to more learners being correctly identified.

Table 6.9: Classification table with ROC categorisation combined for two subjects

	No Tertiary Access	Tertiary Access	Total
At risk	45	79	124
Not at risk	7	165	172
Total	52	244	296

After combining the mathematics test and the science test cut-off scores, 45 learners were correctly identified as at-risk, and seven were not identified. In total, 79 were also identified as being at risk, but ultimately were not at risk as they obtained tertiary access. In practice, this would mean that out of 296, 124 learners would receive additional assistance to increase their chances of gaining tertiary access.

Discussion

Table 6.10 presents the results of the percentage correctly predicted by the binomial logistic regression analysis when cut scores were set for

mathematics and science separately, as well as the correctly predicted percentage when the model classified learners based on results.

Table 6.10: Classification table of percentages correctly predicted

Type	Observed			Predicted		
	Binomial Logistic Regression			Receiver Operating Curves		
	Maths	Science	Combined*	Maths	Science	Combined*
Tertiary access	100.0	100.0	97.1	92.6	93.0	95.9
No tertiary access	70.1	72.6	95.1	34.6	37.3	63.7
Overall Percentage	85.1	86.3	96.3	63.6	65.2	79.8

*Mathematics and science results combined for prediction

The following columns show the same results when ROCs are used to set the cut scores. Both logistic regression and ROC analysis are highly accurate at identifying those not at risk, yet, the logistic regression model is recommended as it is more accurate compared to the ROC. The most precise way to identify learners who require intervention is to use the predicted categories from the logistic regression model, which correctly identifies learners as being at risk 95 per cent of the time. Using logistic regression to set cut scores for mathematics and science separately results in 70 per cent and 73 per cent of learners being correctly identified. Having more measurement points increases the accuracy of correctly identifying the learners in danger of not achieving university allowance. It should also be noted that the time between the end of school results and the assessment can reduce the accuracy of the prediction; in this case, a full year had elapsed between the two measurement points, but the Grade 11 test results yielded accurate indications for Grade 12.

Implications for practice and policy

Like many resource-constrained countries, South Africa has limited access to cultural capital through measurement experts, psychometrists and assessment designers (Combrinck, 2018; Laher and Cockcroft 2017). There is a need to find alternative, more accessible techniques for setting cut scores and maintaining accountability indicators involving stakeholders (Kohrt and Kaiser 2021; Spaul 2015).

Accurate, valuable cuts-scores have important implications for human-centred decision-making which can be summarised as:

- Identifying students who require academic help.
- Informing policy in terms of how to set reliable cut scores.
- Setting and maintaining standards in educational decision-making.
- Enhancing the quality of national and school-based assessments so that accurate and valid inferences can be made for immediate and long-term use.

Areas where the current study can be applied include national assessments, early warning systems, benchmarking and performance indicators and resource allocation. For more sustainable futures in developing countries, one must consider the complexity of resource restraints and the desire to support students who need academic assistance the most. Using statistical techniques to find human-centred solutions can be done as demonstrated in the current study and applied in African contexts and other developing environments.

Implications for educational practice include the following poignant points:

Interventions for at-risk students: Predictive models can pinpoint the individuals who need the most academic support, thereby diverting failure or at the very least, reducing the chance of this occurring. Intervention could include mentoring, tutoring and specially designed pedagogical programmes.

Improved assessment design: Teachers, researchers and lecturers should leverage the power of data-driven techniques in setting standards and assessment refinement. Instruments with more predictive power will also be better indicators of student competencies and needs.

Individualised learning pathways: When instruments are well developed, possess good predictive power and are aligned with curriculum goals, it is possible to tailor instruction or interventions to specific and individual needs.

Scientific, evidence-based decision-making: Whenever high-stakes decisions are made, researchers and educators should strive to use rigorous, scientifically backed empirical data as the basis for the decision-making process. The current article supports this aim of empowered and sound decision-making by offering analysis techniques, which has been shown works with well-designed instruments.

Summary and the way forward

In the current study, the Rasch model was used to gauge the functioning of the assessments and confirm instrument reliability and validity. The Rasch model was also used to transform the ordinal total score into an interval scale. The current paper shows that school monitoring assessments can identify academically at-risk learners and alert schools and teachers to help those who need it most. As always, such results should be used with the school assessments and teacher experience and knowledge of the learners. Binomial logistic regression was used to identify the instruments with predictive power to set cut scores and predict group membership. Receiver operating curves were also used to gauge the instruments' usefulness and set cut scores. Both methods predicted group membership, that is, having tertiary access or not having access, beyond chance. The results demonstrate that binomial logistic regression and receiver operating curves can be used to set cut scores and predict which learners are academically at risk. The results could be enhanced by using multiple sources of information, such

as school marks, teacher evaluations and peer ratings. When such methods are combined with multiple data sources, more accurate cut scores can be set and mastery levels within the tests can be identified. Using panels is time-consuming and may require other resources not available to the test designer, such as funds, access to field specialists and knowledge of the methods (Engelhard 2013). This chapter examines how to set cut scores when resources are unavailable and shows reasonable alternative methods using statistical and predictive validity.

The current study demonstrates that scientifically setting cut scores through logistic regression and ROC analysis is a viable alternative when traditional, expert-driven methods are impractical. These approaches enhance the objectivity and reliability of educational assessments and have substantial implications for policy, practice and research. Educators and policymakers can make informed decisions that improve student outcomes and promote equitable access to educational opportunities by adopting data-driven methodologies.

Based on the data and findings presented, researchers are encouraged to use the following guidelines when applying the models to their datasets:

- **Try the models in varied educational contexts:** Applying binomial logistic regression and ROC in diverse educational milieu, including low-income schools, will help assess the generalisability of the current manuscript.
- **Integrate binomial logistic regression and ROC with additional information about learners and students,** which could include teacher evaluations and school-related data. That way, a more holistic and accurate measurement can be obtained.
- **There is a need to gauge the longitudinal usefulness of the models;** researchers could conduct studies that track learner progression throughout high school to university to determine how well the predictions hold up.
- **Explore across subject-specific variability:** The current study used data from mathematics and science, and there is a need to assess whether binomial logistic regression and ROC would work just as well in the soft sciences.

- **The ethical implications** should be explored when a data-driven cut-score setting is used, especially when any high-stakes decisions are made or interventions are made available only for specific groups. Other issues that require further investigation include data privacy, bias mitigation and student autonomy in educational decision-making.

Limitations

The demonstrated effectiveness of ROC relies on having more than one accurate predictor. Statistical knowledge would also be necessary to run the analysis, and this may not always be accessible to educators. Well-designed, refined and piloted instruments may also not be available to educators, or they may not have sufficient knowledge and time to design such assessments. While the current paper opts to offer an alternative to labour-intensive cut-score setting, there is also an assumption of cultural and intellectual capital, which may not be available in developing settings.

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Chapter Seven: Revolutionising Coding and Robotics Curriculum Design for Grade 4 through Whole Brain® Thinking and Action Research

Soené Botha, Maryke Anneke Mihai and Pieter Hertzog Du Toit

Faculty of Education, University of Pretoria, South Africa

Introduction and background

The Fourth Industrial Revolution (4IR), represents a significant shift in the global economy and society, fuelled by the integration of advanced digital technologies. As traditional jobs evolve, there is an increasing demand for twenty-first century competencies. The twenty-first century competencies, referred to as the 4Cs, encompass communication, cooperation, critical thinking and creativity, as advocated by Reaves (2019) and Thornhill-Miller et al. (2023). Scholars argue that coding and robotics education can help learners develop these critical twenty-first century competencies, making it an essential component of modern education (Kálózi-Szabó et al. 2022).

The school's journey toward incorporating coding and robotics as a subject began as a co-curricular offering in 2022. Initially, coding and robotics were presented as an extracurricular activity, allowing learners to voluntarily engage with the subject outside regular class time once a week for an hour. As interest in the co-curricular programme grew, the school recognised the need to integrate coding and robotics into the mainstream curriculum. This shift ensured that all learners could take part in the curriculum. The formal adoption of coding and robotics as a subject represented a significant progress in the school's educational approach, reinforcing not only technical competencies, but also essential twenty-first century competencies. This aligns with the broader global context, where

4IR technologies are reshaping economies and societies (Butler-Adam 2018; Schwab 2017; Sutherland 2020).

To bridge the gap in the national coding and robotics curriculum for a private school, we began developing a tailored coding and robotics curriculum that was aligned with both the learners' current abilities and the competencies they needed to learn. Recognising these gaps prompted the need for a Whole Brain® curriculum.

A Whole Brain® curriculum is an educational approach based on Whole Brain® thinking. Whole Brain® thinking posits that individuals have four distinct modes of thinking, culminating in practical, relational, organisational and experimental thinking preferences, respectively (Herrmann Global LLC 2022). By focusing on all four modes of thinking, this curriculum aims to improve learners' mastering of learning outcomes. Additionally, it focusses on holistic development by encouraging the 4Cs, allowing learners to maximise their full potential. Ultimately, this approach not only prepares learners for future challenges in a rapidly evolving technological landscape, it also supports their overall development as innovative and adaptive learners.

Research focus

Considering the evolving educational technology landscape and the need to design learning opportunities in which learners can be challenged by engaging in relevant learning experiences, the current study addresses the following primary research question: How can I use principles of action research to self-monitor the design and continual development of a Whole Brain® coding and robotics curriculum for Grade 4 learners?

This study explored the following secondary research questions:

- What pre-existing conditions are necessary to implement an action research-driven Whole Brain® coding and robotics curriculum?
- What will an action research-driven Whole Brain® coding and robotics curriculum entail?
- How does the Whole Brain® approach enhance the quality of the coding and robotics curriculum for Grade 4 learners?

- To what extent does the backward design approach contribute to the development of an effective and engaging coding and robotics curriculum for Grade 4 learners?

Literature review

The impact of the 4IR on education

The integration of coding and robotics into education has become increasingly significant in recent years, driven by the rapid technological advancements associated with the 4IR. Although its full impact remains uncertain due to its early developmental stage, researchers like Reaves (2019), Kayembe and Nel (2019) and Carrim (2022) emphasise its significant impact on education.

The rapid advancement of technology presents a continuous challenge for schools, particularly those with constrained financial resources (Kayembe and Nel 2019). Schools require modernised infrastructure and training to effectively incorporate new technologies. However, disparities exist between schools with access to advanced technology and those without, creating challenges in implementing coding and robotics curricula effectively.

Educational policies, curricula and pedagogical approaches must adapt to equip learners with competencies relevant to the 4IR. Technical skills, such as coding, robotics and data analysis are crucial for preparing learners for a workforce that values interdisciplinary collaboration and flexible, project-based work (Kayembe and Nel 2019). Furthermore, interdisciplinary learning in coding and robotics can prompt learners to integrate knowledge across various subjects, which is essential for addressing complex, interconnected challenges in their professional careers (Sun et al. 2024).

To ensure education remains pertinent and effective in a technology-driven landscape, educators and institutions must balance leveraging the advantages of technology with mitigating potential drawbacks. By fostering twenty-first-century competencies, such as critical thinking, problem-solving and digital literacy, educational institutions can better prepare

learners for success in the dynamic and evolving landscape of the 4IR.

Coding and robotics

The integration of technology in education is increasingly evident through the growing presence of coding and robotics in the curriculum (LEGO® Education 2022). Educational robots, or programmable toys, support tactile learning and help learners develop problem-solving and critical thinking skills through active engagement (Gunes and Kucuk 2022).

Various tools are used in classrooms, such as Bee-Bots for early sequencing skills, LEGO® kits for construction-based problem-solving and Arduino boards for hands-on electronics and programming experience.

Coding is a core competency in the digital age, empowering learners to create software, apps and websites. Block-based coding—using drag-and-drop visual elements—introduces programming concepts without requiring complex syntax, allowing learners to focus on logical reasoning and computational thinking (Sun et al. 2024).

Twenty-first century competencies

The twenty-first century demands a blend of traditional and technological competencies to ensure learners are prepared for dynamic professional and personal environments (Thornhill-Miller et al. 2023). Central to this shift are the 4Cs—critical thinking, communication, collaboration and creativity—which align closely with curriculum goals and Whole Brain® learning principles.

Critical thinking and problem-solving support informed decision-making in complex situations. Communication fosters clarity, active listening and understanding diverse perspectives. Collaboration develops teamwork, negotiation and shared accountability. Creativity enables innovation and adaptability in an ever-changing world.

Embedding the 4Cs into teaching and learning equips learners with essential, future-oriented competencies and supports holistic cognitive development through Whole Brain® strategies.

Application of the Whole Brain® Thinking Model in education

The Whole Brain® thinking model posits that individuals exhibit preferences for cognitive processes across four quadrants: A, B, C and D. The quadrants represent analytical, practical, relational and experimental thinking, respectively. This curriculum development model recognises the necessity of addressing all cognitive domains, fostering holistic learning opportunities.

In the field of curriculum development, it is essential to acknowledge and accommodate these diverse cognitive preferences. Individuals identified as analytical thinkers (quadrant A) exhibit proficiency in tasks requiring logical reasoning and problem-solving (Herrmann Global LLC 2022). Practical thinkers (quadrant B) excel in hands-on and applied activities (Herrmann Global LLC 2022). Individuals who conceptualise through relationships (quadrant C) may gain advantages from participating in collaborative and interpersonal learning experiences, whereas those who adopt an experimental mindset (quadrant D) may seek out creative and innovative approaches to understanding concepts (Herrmann Global LLC 2022).

In summary, the incorporation of Whole Brain® thinking into curriculum design provides a versatile and efficient method to engage learners by aligning with their preferred cognitive styles.

Developing twenty-first century competencies through Whole Brain® thinking

The twenty-first century has ushered in profound shifts in how we live, learn, and work—requiring an expanded set of competencies that blend traditional skills such as critical thinking and communication with emerging technological proficiencies (Thornhill-Miller et al. 2023). These competencies are not only essential for career readiness, they are equally critical for personal growth and meaningful participation in a complex, digital society.

To remain relevant, education must deliberately cultivate these competencies through curriculum design. Learners must be able to think

critically, solve problems, communicate effectively, collaborate in diverse teams and adapt to change. In digitally rich environments, proficiency with technology is no longer optional—it underpins most forms of communication, collaboration and innovation (Kayembe and Nel 2019).

Whole Brain® thinking offers a holistic framework to support the development of these competencies. It acknowledges that individuals engage with the world through different cognitive preferences—analytical, sequential, interpersonal and imaginative. By designing learning experiences that tap into all four quadrants of the brain, educators can promote deeper understanding, creativity and flexible thinking. This approach aligns well with the aims of twenty-first century education: to prepare learners not just to absorb information, but to apply knowledge across disciplines, solve real-world problems and continue learning throughout life.

Integrating Whole Brain® thinking into curriculum development ensures that learners are not only equipped with the necessary skills for the digital age, they are also cognitively and emotionally prepared to thrive in dynamic and uncertain environments. It encourages personalised, inclusive learning that fosters both competence and confidence—hallmarks of the future-ready learner.

Relevance of Whole Brain® curriculum development in coding and robotics

The integration of twenty-first-century competencies in coding and robotics education is essential for preparing learners for a fast-evolving, technology-driven world. The Whole Brain® curriculum development construct offers a holistic, structured framework that supports competency-based learning across all phases of curriculum design and delivery.

In the assessment phase, analytical tools are used to gauge learners' current skills and identify gaps, ensuring alignment with targeted competencies. The design phase focuses on setting clear learning outcomes and objectives, using approaches like backward design to align teaching strategies with desired skills in problem-solving, critical thinking and technological fluency.

During development, materials and tasks are created to foster collaboration, engagement and interdisciplinary learning—supporting

both cognitive and interpersonal growth. Feedback mechanisms at this stage ensure that curriculum content remains relevant and inclusive. The implementation phase encourages active exploration and innovation, promoting creativity and adaptability in digital learning environments such as coding and robotics.

Finally, evaluation and iteration draw on all quadrants of Whole Brain® thinking, ensuring that reflection and feedback lead to continuous curriculum refinement. This dynamic cycle not only strengthens content delivery, it also enhances learners' resilience, self-directed learning and readiness for complex challenges.

By aligning curriculum development stages with Whole Brain® thinking and twenty-first-century competencies, educators can cultivate well-rounded learners equipped for the demands of the digital age.

National curriculum context: Coding and robotics in South Africa

South Africa's integration of coding and robotics into the national curriculum reflects a strategic effort to align with global technological trends and reduce digital inequality. Grounded in the goals of the National Digital and Future Competencies Strategy (South African Government 2020), this initiative supports Sustainable Development Goal 4 by promoting equitable access to quality education and digital skills. The Department of Basic Education (DBE 2021a, 2021b) developed the curriculum as part of a broader national effort to equip learners with the competencies required for active participation in a digital economy, addressing persistent disparities in information and communications technology (ICT) access (Greyling 2022).

Curriculum development began in 2019, with a structured progression across schooling phases. Foundation Phase learners (Grades R–3) are introduced to basic coding concepts and logical sequencing. Intermediate Phase learners (Grades 4–6) engage with block-based programming (for example, Scratch), while Senior Phase learners (Grades 7–9) advance to text-based programming and robotics systems (DBE 2021b). Following initial planning in 2017 and presidential endorsement in 2019, pilot programmes launched in over 1 200 schools. The pilot phase ran from

2021 to 2023, with phased national implementation ongoing through 2025 (Liebenberg 2023). External organisations like RESA and RoboCup Junior SA have supported this rollout by fostering learner engagement through robotics competitions reinforcing the development of problem-solving and collaborative skills aligned with twenty-first-century learning goals.

Challenges of implementation in South Africa

Despite progressive curriculum reforms, the effective implementation of coding and robotics in South African schools faces persistent systemic barriers. Chief among these are limited teacher preparedness and insufficient training, with many educators lacking both the confidence and support to adopt unfamiliar pedagogies (Greyling 2022). A reluctance to shift from traditional methods further compounds the issue (Greyling 2022; Liebenberg 2023). Infrastructure shortfalls—particularly the scarcity of ICT equipment and internet access in under-resourced schools—underscore the digital divide (Liebenberg 2023). Financial constraints remain a major hurdle, as limited school budgets and inadequate state funding hinder the acquisition of essential technologies and personnel (Freese 2021). Addressing these challenges requires a coordinated national strategy focused on teacher capacity-building, equitable resourcing and sustained investment in digital infrastructure.

Construct frame

To address the evolving demands of twenty-first-century education, this study proposes a Whole Brain[®] Coding and Robotics Curriculum Development Model (Figure 7.1). The framework is informed by Stenhouse's (1975) curriculum-as-process paradigm, backward design, action research and Whole Brain[®] thinking. It synthesises cognitive diversity with iterative, evidence-based curriculum planning to ensure relevance, coherence and adaptability. The six-stage model—Assessment, Design, Development, Implementation, Evaluation and Reflection—guides a structured, yet flexible process that aligns pedagogy with learners' needs and systemic educational goals.

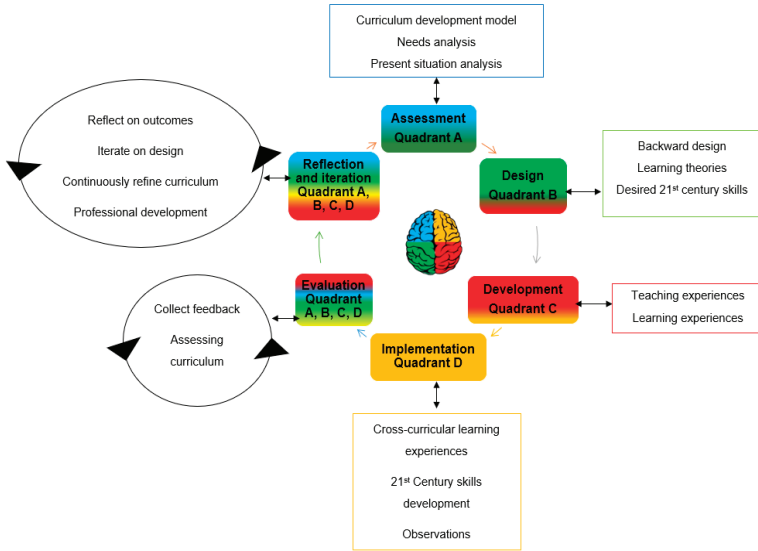


Figure 7.1: Curriculum development construct frame

Assessment (Quadrant A: Analytical thinking)

The assessment step emphasises the formulation of clear learning objectives and outcomes, which are crucial for efficient curriculum development. Essential elements encompass the selection of a suitable curriculum development model, exemplified by Stenhouse (1975), the identification of essential learning theories and the execution of a needs and situational analysis to assess the existing condition of coding and robotics education. This phase entails recognising deficiencies and opportunities for enhancement to guarantee the curriculum’s relevance and efficacy. Assessments of learners are essential for customising the curriculum to address certain needs and competencies.

Design (Quadrant B: Practical thinking)

The design step emphasises the creation of a systematic curriculum that cohesively incorporates coding and robotics principles. A backward design methodology is employed, starting with the determination of required

learner competencies via an analysis of needs (Knowledge Base 2021). This strategy subsequently guides the creation of educational programmes designed to cultivate these competencies (Emory 2014). Ultimately, assessment procedures are designed to measure the degree to which learners have attained the specified competencies (Emory 2014).

Development (Quadrant C: Relational thinking)

The development step includes the production of accessible and engaging educational materials and tools for educators and learners alike. Employing the backward design methodology guarantees coherence with defined learning objectives and outcomes. Creating interdisciplinary links between coding, robotics and other disciplines promotes cross-curricular education and strengthens essential competencies. This step also fosters an environment conducive to developing twenty-first-century competencies, such as critical thinking, communication, teamwork and creativity (Thornhill-Miller et al. 2023). Moreover, tactics that promote cooperation and teamwork improve the learning environment, equipping learners for real-world problem-solving in a dynamic technology context.

Implementation (Quadrant D: Experimental thinking)

The implementation step entails executing the curriculum in educational environments, maintaining coherence with learning objectives while promoting the development of twenty-first-century competencies. This step also involves observations, which are essential for evaluating curriculum efficacy and making necessary modifications to enhance educational experiences and skill acquisition.

Evaluation (Consolidation of all quadrants)

Assessing the curriculum's effect on learners' coding and robotics competencies is essential. Evaluating its efficacy in fostering Whole Brain® thinking ensuring that the programme meets the comprehensive needs of learners. Utilising feedback and empirical data to improve the curriculum increases its relevance and effectiveness.

Reflection and iteration (Synthesis of all quadrants)

Evaluating curriculum implementation results, incorporating feedback from learners and results from fieldnotes, enables the recognition of areas needing enhancement. Iterative revision informed by reflection improves curricular efficacy and alignment with learners' requirements. Modifying the curriculum to align with emerging educational trends and technology innovations guarantees its viability and enduring influence. This necessitates ongoing professional development for educators to stay informed about developing advances.

In summary, the Whole Brain[®] Curriculum Development Construct Frame offers a thorough and integrative methodology for a coding and robotics curriculum informed by action research. This paradigm strengthens learners' cognitive competencies by integrating analytical, practical, relational and experimental thinking, hence, preparing learners for future challenges in coding and robotics instruction. This frame highlights the relationships among curriculum creation, needs analysis, backward design, twenty-first-century competences, learning theories and professional development. It promotes a methodical and learner-centred methodology for curriculum development, catering to the evolving requirements of twenty-first century learners while encouraging innovation, adaptation and lifelong learning.

Methodological approach

This study developed an action research-driven curriculum design model to create the Whole Brain[®] coding and robotics curriculum for Grade 4. Illustrated in Figure 7.2, the model includes three interconnected phases: comprehensive needs analysis; backward design approach and action research, all contributing to a dynamic and transformative curriculum that meets learners' diverse needs. Each phase is described in detail below, explaining how it contributes to the Whole Brain[®] coding and robotics curriculum for Grade 4.

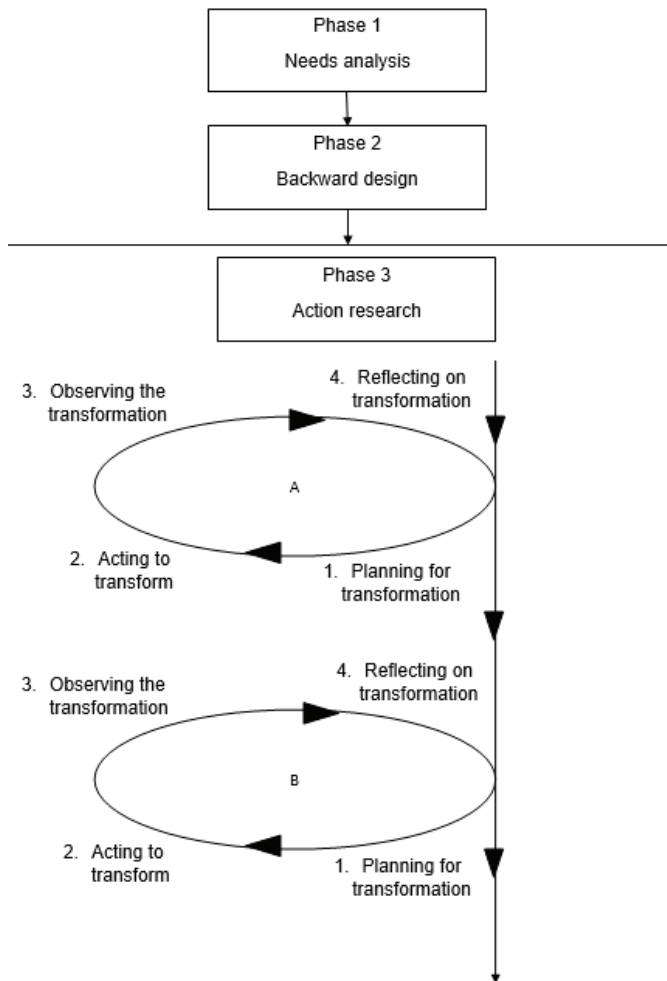


Figure 7.2: Curriculum development plan

Source: Author's own

Phase 1 of the curriculum development encompassed a thorough needs analysis, assessing learner thinking preference profiles, educator thinking preference profiles and the learning environment. Zohoorian (2015) asserts that it encompasses the examination of learners' backgrounds, competencies, deficiencies and cognitive abilities. This evaluation encompassed educator qualifications, experience, pedagogical methods, professional development requirements, adaptability to innovative approaches as well as the

educational context and socio-economic influences.

Phase 2 employed the backward design approach, aligning twenty-first-century competencies and Whole Brain® thinking with suitable assessments and learning opportunities (Emory 2014; Knowledge Base 2021). This model transitions from conventional instructional design to a more comprehensive “means of facilitating learning”, which includes the development of instructional materials, learning objectives, assessments and environments to enhance teaching and learning experiences.

Phase 3 executed action research, a cyclical methodology for ongoing curriculum enhancement involving planning, implementation, observation and reflection (McNiff 2016).

Results and reflections of a Whole Brain® Grade 4 coding and robotics curriculum

The implementation of the Whole Brain® Grade 4 coding and robotics curriculum followed fourteen action research cycles over six months. These cycles explored a range of cognitive, technical and collaborative competencies. Through continuous reflection and adjustment, the curriculum evolved to better align with learners’ needs and the Whole Brain® model. Key themes that emerged are discussed below.

Theme 1: Building technological fluency

Learners progressively developed confidence in block-based programming using LEGO® Spike Prime™. Early cycles focused on foundational tasks such as turning on the hub and connecting motors and sensors. As learners grew more proficient, tasks became increasingly complex—integrating loops, sequences and sensor-based responses to navigate mazes and perform interactive tasks. These activities strengthened learners’ analytical and experimental thinking.

Theme 2: Design thinking and prototyping

Learners engaged in iterative design and prototyping processes, applying

practical and relational thinking. They built and tested grabbers, mini cars and interactive objects, refining their prototypes through peer feedback and teacher guidance. Reflection activities helped learners evaluate their designs' effectiveness, troubleshoot mechanical flaws and iterate accordingly.

Theme 3: Collaboration and communication

Group-based tasks required learners to plan collaboratively, assign roles and share tools and ideas. Learners often worked in pairs or small groups to solve problems and build interactive projects. Organising LEGO® components, maintaining shared workspaces, and jointly presenting projects all fostered interpersonal competencies aligned with the Whole Brain® relational and practical quadrants.

Theme 4: Creativity and integration

Final projects required learners to integrate coding, design and sustainability principles by building interactive pets or mini golf courses using both LEGO® and recyclable materials. These culminating tasks drew on all four thinking quadrants, encouraging learners to apply what they had learned in a cohesive, creative and authentic manner.

Key findings and curriculum impact

The implementation of the Whole Brain® coding and robotics curriculum revealed key insights into learner engagement, curriculum responsiveness and the practical application of educational theory in a primary school setting. These findings respond directly to the research questions and point to broader implications for future curriculum design.

Theme 1: Preconditions for implementation

Successful implementation relied on three core enablers: (1) access to appropriate technology (for example, tablets and LEGO® Spike Prime™

kits); (2) a flexible timetable structure that allowed for iterative design work and (3) a school culture that embraced innovation. Importantly, the use of thinking preference profiles helped tailor support for both learners and educators, reinforcing inclusivity and differentiation.

Theme 2: Impact of Whole Brain® and action research

The curriculum fostered learner growth across all four Whole Brain® quadrants. Analytical and practical thinking were developed through coding challenges and prototyping; relational and experimental thinking emerged in team-based projects and design iterations. The use of action research enabled real-time responsiveness to challenges, allowing for meaningful adaptation and growth through reflection.

Theme 3: Curriculum responsiveness and skill development

Learners demonstrated significant improvement in coding literacy, problem-solving, communication and creativity. Observation and peer feedback sessions confirmed higher levels of engagement and self-confidence. By grounding the curriculum in backward design, each learning experience was structured around specific outcomes—which improved assessment clarity and learner accountability.

Theme 4: Reflection and iteration strengthened learning

Reflection periods allowed learners to refine their work and actively participate in the learning process. Teachers also used these cycles to identify common misconceptions and adjust instruction accordingly. This continuous loop of observation, reflection and revision made the curriculum dynamic and responsive.

Conclusion

The Whole Brain® Grade 4 coding and robotics curriculum exhibits

an innovative and transformative educational methodology, rooted in Whole Brain® thinking, action research and backward design principles. This curriculum integrates twenty-first-century competencies—critical thinking, creativity, collaboration and communication—within a structured, yet adaptable framework, equipping learners to thrive in a dynamic, technology-driven environment. The curriculum adapts to the needs of learners and educators through ongoing evaluation and iterative processes, promoting flexibility and resilience.

The curriculum’s effectiveness is rooted in its ability to engage learners with varying preferences for modes of thinking, connect educational activities to real-world challenges and develop critical competencies for future learning and problem-solving. The backward design framework guarantees coherence among educational goals, assessments and practical implementation, whereas action research offers a responsive feedback mechanism for ongoing enhancement. The Whole Brain® curriculum adopts a holistic development model that enhances technical competencies in coding and robotics, while also cultivating essential lifelong competencies for a changing educational and professional environment.

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Redefining Human Centric Skills through ‘Quality Talk’

Chapter Eight: ‘Quality Talk’: Human-Centred Education in a Complex Rural School Space

Marisa Leask

Faculty of Education, University of Pretoria, South Africa

Introduction

Globally, education systems are under growing pressure to evolve beyond mechanistic models of teaching and learning toward more holistic, inclusive and contextually responsive paradigms (UNESCO 2021). In South Africa, where historical injustices, socio-economic inequality and systemic under-resourcing remain deeply embedded in the education landscape, this imperative is especially urgent. Deep-seated socio-economic inequality, the legacy of apartheid-era educational planning, and chronic under-resourcing continue to shape rural schooling landscapes. In these contexts, teachers and students face multiple intersecting barriers, overcrowded classrooms, infrastructure deficits and linguistic diversity, which make equitable and effective teaching exceptionally complex (Maile 2008; Spaul 2013).

Within this reality, Human-Centred Education (HCE) offers not just a philosophical vision, but a practical reorientation of pedagogy. HCE places students at the centre of the educational experience, valuing their voices, identities and lived experiences as essential resources for learning. It prioritises agency, relational trust, inclusion and the co-construction of knowledge, principles important in rural classrooms where many students experience social marginalisation, language barriers and constrained educational opportunity (Biesta, 2010; Le Grange, 2019). In contrast

to traditional models that emphasise compliance and content coverage, HCE encourages dialogic, participatory and emotionally safe learning environments. Yet, operationalising HCE in rural schools demands pedagogical models that are both theoretically grounded and adaptable to local realities. This chapter argues that Quality Talk (QT) is one such model. Developed as a structured framework for classroom dialogue, QT helps students develop critical thinking, deep comprehension and collaborative reasoning through purposeful discussion (Kim and Wilkinson 2019; Murphy et al. 2009). Rooted in sociocultural learning theory and dialogic pedagogy, QT views students as active contributors to knowledge construction. It encourages open-ended questioning, respectful disagreement and student-led meaning-making—core practices that align closely with HCE’s emphasis on student agency and inclusion (Alexander 2020; Wilkinson et al. 2019).

In the South African context, QT has been locally adapted as *Inkhulumo*, a school-based intervention tailored to the linguistic, socio-economic, and cultural complexities of rural classrooms (Leask 2019). *Inkhulumo* integrates QT’s core principles with culturally relevant content, mother tongue discussion, and flexible facilitation practices. This has allowed it to function not only as a cognitive tool for comprehension, but also as a developmental framework that fosters belonging, confidence and peer connection among marginalised students (Ngwaru 2011; Zhou and Hassan 2024).

The chapter builds a case for QT as both an instructional model and a vehicle for advancing HCE in complex educational settings. It highlights how QT supports three interconnected shifts essential to human-centred teaching: the development of critical-analytic thinking; the emergence of collaborative, inclusive discourse and the creation of equitable, relational learning environments. These dimensions are especially powerful in rural schools, where dominant pedagogies often fail to support student engagement or respect the diverse realities students bring into the classroom. To develop this argument, the chapter is structured into five interlinked sections: (1) Theoretical Foundations of QT introduces the conceptual basis of QT, including its roots in sociocultural theory and dialogic pedagogy, and links these to the principles of HCE. (2) Classroom Discourse and Holistic

Development examine how QT supports cognitive, social and emotional development, with a focus on voice, confidence and agency. (3) Quality Talk in Rural Schools: Complexity and Adaptation explore how QT was locally adapted as *Inkhulumo* to suit multilingual, resource-constrained classrooms, while preserving human-centred principles. (4) Cultural Responsiveness and Human-Centred Instructional Design discuss how QT accommodates linguistic and cultural diversity through inclusive dialogue and contextual design. (5) Conclusion and Implications for Practice synthesise key insights and offer practical recommendations for educators, school leaders and policy actors committed to advancing HCE. Through this structure, the chapter contributes both conceptually and practically to the growing field of human-centred education, with a particular focus on its application in the Global South. It positions QT not as a rigid method, but as a flexible, relational pedagogy capable of transforming classrooms shaped by complexity, scarcity and historical injustice.

Theoretical foundations of QT

This section outlines the theoretical foundation for applying HCE in rural schools, where teaching and learning are shaped by a range of social, cultural and economic complexities. To address these realities, this chapter draws on the QT framework, an adaptable model that turns classrooms into spaces of *structured* dialogue, critical thinking and student voice.

HCE in complexity

HCE is a pedagogical orientation that places students at the centre of the educational experience, recognising them as capable agents whose identities, voices and experiences matter. It prioritises relational trust, student autonomy, emotional well-being and the co-construction of knowledge through meaningful participation (Biesta 2010; Le Grange 2019). Three foundational principles of HCE, student autonomy, inclusivity and co-construction are particularly relevant in rural education, where rigid, top-down instruction often dominates. Student autonomy means giving students some control over how they explore content, for example,

by allowing them to choose discussion topics or link lessons to personal experiences. Inclusivity ensures that all students, regardless of background or ability, can meaningfully participate. Co-construction encourages knowledge to emerge through interaction, negotiation and reflection.

HCE must also be understood through the lens of complexity theory, which emphasises the dynamic, interconnected and often unpredictable nature of educational environments. In this view, schools are not static institutions but complex adaptive systems, where learning and change emerge through the interaction of diverse elements, students, teachers, resources, policies and community conditions, rather than from top-down control ((Davis and Sumara 2010; Fidan and Balcı 2017). In rural schools, where socio-economic instability, language diversity and structural under-resourcing intersect, such complexity is heightened. Effective pedagogy in these settings must, therefore, be adaptive, relational and contextually grounded, responding to shifting conditions with flexibility and care (Mason 2008).

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QT framework

QT, a structured, teacher-facilitated and student-driven discussion model, grounded in a synthesis of sociocultural learning theory, complexity theory and dialogic pedagogy, making it a robust model for advancing HCE in under-resourced, high-need school environments. At its core, QT builds on

Vygotsky's idea that students learn best through guided support from others (Vygotsky 1978) social constructivist theory, particularly the concept of the Zone of Proximal Development (ZPD). This theory emphasises that students develop higher order thinking through guided interaction with more knowledgeable others. QT extends this through structured dialogue and scaffolded talk moves, creating conditions where students actively co-construct meaning with peers and teachers. QT sees students not just as listeners, but as thoughtful contributors who can ask questions, challenge ideas and help shape the lesson, aligning directly with HCE's emphasis on student agency, voice and autonomy (Biesta 2010; Le Grange 2019).

QT also draws on the dialogic teaching framework (Alexander 2018), which defines effective classroom dialogue as collective, reciprocal, supportive, cumulative and purposeful. Dialogic interaction in QT invites students to ask authentic questions, justify their thinking and engage critically with diverse perspectives. This dialogic emphasis aligns closely with inclusivity and co-construction, two core pillars of HCE. The framework provides a structured approach to promote authentic discussions in classrooms, aiming to replace monologic, teacher-dominated talk with dialogue that encourages students to reason, question, justify and elaborate (Murphy et al. 2009). It transforms classroom talk into a tool for critical thinking, agency and relational learning. Students are taught to construct and critique arguments, integrating textual evidence with logical reasoning. This is achieved through four core components:

- **Authentic Questioning vs. Test Questions:** Rather than focusing on recall or single-answer responses, QT promotes open-ended, interpretive questions that invite multiple perspectives and deeper reasoning.
- **Teacher Scaffolding and Responsive Dialogue:** Teachers model effective discourse strategies, use follow-up prompts and adjust support based on student responses. Teachers shift from knowledge transmitters to facilitators of inquiry, building student confidence in articulating and defending their ideas.
- **Interpretive Authority and Student-Led Discussions:** Students are encouraged to take ownership of meaning-making, pose their

own questions and challenge peer reasoning, shifting the authority from teacher to student.

- Collaborative Reasoning: Students are taught to engage with one another's ideas using reasoning moves such as justifying, elaborating, clarifying and respectfully disagreeing.

In these ways, QT explicitly reinforces human-centred principles. It creates space for student voice, encourages active participation and treats students as co-constructors of knowledge. In rural classrooms, where students are sometimes expected to be silent and obedient, QT helps break that pattern. It encourages students to speak, think aloud and engage actively with one another. While the theoretical foundation of QT is compelling, its true power lies in how these principles are enacted in real classrooms. The following section demonstrates how QT was implemented in rural South African schools, bringing the framework to life. Having established the theoretical foundations of QT and its alignment with HCE, the next section illustrates how these principles were brought to life through the implementation of QT in rural South African classrooms.

Classroom discourse and holistic development

Building on the theoretical foundations of HCE and dialogic pedagogy, this section illustrates how structured classroom conversations, particularly those modelled through the QT framework, foster students' cognitive, social and emotional development. The QT model not only deepens content understanding, it also transforms classroom culture by supporting inclusive, reflective and agentic participation.

Cognitive development through discourse

When students engage in structured, student-led discussions such as those promoted by the QT framework, they develop a deeper understanding of texts, enhance their critical reasoning skills and become more cognitively flexible. Unlike traditional approaches that emphasise passive knowledge absorption, QT fosters a dialogic environment where students articulate their ideas, justify their reasoning and collaboratively explore complex

concepts. Research has shown that students participating in QT demonstrate significant improvements in high-level reading comprehension and written argumentation, even compared to peers receiving other forms of enriched literacy instruction (Murphy et al. 2022; Li et al. 2016). Central to this development is the concept of “interthinking”, the idea that collaborative thinking occurs through talk (Littleton and Mercer 2013). Within QT discussions, students are taught to listen attentively, build on each other’s ideas and synthesise new understandings through interaction. This process is especially powerful when authentic questions are used. Unlike test-based questions that elicit factual recall, authentic questions provoke diverse viewpoints and encourage students to engage in higher-order thinking, a feature consistently linked with gains in comprehension and reasoning performance (Soter et al. 2008; Wilkinson et al. 2017).

Social growth and collaborative learning

The QT framework fosters collaborative learning by engaging students in small-group discussions where they actively listen, question and support each other. This structure enables students to co-construct knowledge, negotiate meaning and develop social competencies such as respectful dialogue and conflict resolution. Through such dialogic norms, students form peer-supported learning communities in which knowledge construction is both participatory and social in nature (Murphy and Team 2021). Negotiation of meaning, a process in which students refine their thinking through peer feedback, Reznitskaya and Gregory (2013) emphasise that such negotiation encourages students to reconsider their positions and deepen their understanding through social interaction. Moreover, QT practices encourage interpretive authority, allowing students to pose questions, initiate discussions and lead meaning-making processes. This student agency is particularly valuable in hierarchical or teacher-dominated settings, where QT has been shown to empower students to move from passive recipients to active participants in their education (Murphy and Quality Talk Team 2021).

Emotional engagement and confidence building

Beyond cognitive and social benefits, QT also supports the emotional dimension of learning by making classroom discussions feel more personal and meaningful. Students are encouraged to share ideas connected to their lives, which increases their emotional investment, confidence and sense of belonging. In this way, QT fosters a supportive classroom atmosphere where emotions, personal stories and diverse perspectives are welcomed and legitimised (Lee 2021). Emotional safety in the classroom has been linked to greater student motivation, effort and belief in their academic potential. Dialogic pedagogy, central to QT, cultivates inclusive environments that affirm student identity and encourage active participation, especially in classrooms where students have historically felt marginalised (Alexander 2018).

This emotional and relational foundation is particularly crucial in rural and socio-economically disadvantaged settings, where students often face barriers to engagement. Classrooms that cultivate emotional safety and student connection lead to increased academic engagement and resilience (Zins 2004). The quality of teacher-student and peer relationships has a measurable effect on identity, belonging and academic confidence (Osher et al. 2020). Well-structured dialogue supports this by fostering student voice and validating identity, creating the conditions necessary for academic and personal growth (Resnick et al. 2015).

Comparisons to traditional instruction

QT represents a significant departure from traditional teaching methods, where teachers dominate classroom talk and students are expected to passively listen and recall information. In conventional classrooms, discourse is often structured around closed-ended questions and brief answers, which restricts student agency and stifles the development of critical thinking skills (Applebee et al. 2003). In contrast, QT creates space for students to engage in thoughtful dialogue with peers, ask authentic questions and reflect deeply on complex topics. Empirical studies have shown that QT increases student engagement, encourages transfer of knowledge across

contexts and improves comprehension of challenging texts (Wilkinson et al. 2019). Case studies further illustrate that dialogic approaches such as QT are especially impactful in rural and under-resourced classrooms. In these contexts, QT has been shown to foster student autonomy, curiosity and intellectual agency, transforming passive learning environments into participatory spaces where students feel empowered to express ideas and take academic risks (Wei et al. 2020).

In summary, QT is more than a classroom discussion strategy; it is a pedagogical model that integrates critical thinking, collaboration and emotional support in ways that align powerfully with the principles of HCE. By fostering cognitive engagement through authentic reasoning, strengthening peer relationships through collaborative discourse, and building confidence through emotional safety and voice, QT nurtures the whole student. This holistic approach is important in rural and under-resourced schools, where students often contend with social, economic and psychological barriers. In these settings, QT serves as a developmental scaffold, supporting not only academic achievement, but also resilience, identity affirmation and a sustained sense of belonging. Through its emphasis on agency, inclusion and connection, QT offers a compelling, human-centred alternative to conventional instruction, transforming classrooms into spaces of growth, dignity and possibility.

QT in rural schools: Complexity and adaptation

Rural schools face multiple barriers, poverty, language differences, poor infrastructure and weak policy implementation. These make teaching unpredictable and demanding for both teachers and students. In South Africa, rural students often study in overcrowded classrooms with few qualified teachers and learning resources (Pretorius and Spaull, 2022; Spaull and Taylor 2022). Traditional, one-size-fits-all teaching methods often fail to meet these complex needs. In response, the QT framework was adapted to reflect the local realities of rural education. This locally adapted version, known as *Inkhulumo*, was specifically designed for large class sizes, minimal teaching resources and the necessity of cultural and linguistic relevance. For example, culturally distant references in training

materials—such as a school trip to the Smithsonian Museum, were replaced with relatable alternatives, like a taxi ride to the nearby city of Nelspruit. This grounded adaptation was co-developed by local teachers and student leaders, who were trained in the QT method to ensure the approach was accessible and contextually meaningful. A core innovation of *Inkhulumo* was the implementation of peer-led, small-group discussions. Within these groups, trained student leaders facilitated dialogue using QT prompts, managed turn-taking and encouraged participation from all peers. Importantly, students were allowed to use their home languages during discussions, which not only reduced anxiety, it also validated diverse linguistic identities. This adaptation created inclusive spaces for learning, especially for students who might otherwise feel marginalised in traditional classroom settings. The theoretical promise of QT, promoting interpretive authority and student-centred meaning-making, was clearly reflected in practice. Students who participated in QT discussions began to exhibit increased confidence and engagement beyond the QT sessions. Teachers reported that these students were more willing to ask questions and participate in whole-class discussions. This behavioural shift signals the development of what scholars call interpretive authority, a process whereby students assume responsibility for constructing and negotiating meaning, rather than relying solely on the teacher as the source of knowledge (Wei and Murphy 2017).

Student reflections from the *Inkhulumo* intervention provide compelling, firsthand evidence of this transformation. One student noted the shift in group dynamics: ‘They listen to me and they, they listen to the other people’s ideas and opinions and we argued about the questions, not the people.’ Another described increased confidence and peer collaboration: ‘I was afraid to raise a hand... but now with my group I can tell them that guys, help me, I don’t understand here.’ These statements illustrate how the QT structure promotes not only academic engagement, but also emotional safety and mutual respect. Teachers, too, benefited from QT training. Even in resource-scarce environments, they reported greater clarity in instructional objectives and increased confidence in facilitating student-led discussions. This structured, yet flexible approach allowed rural educators to align their teaching practices with student-centred pedagogical goals

without being overwhelmed by unfamiliar methods (Wei et al. 2018). Challenges like poverty, hunger and limited parental involvement can make learning even harder. QT does not solve these structural issues, however, it helps mitigate their effects. By promoting student voice, peer support and a sense of belonging, QT increases student motivation and engagement. Students report feeling more connected and confident when they are given regular chances to talk, listen and reason together (Omidire and Ayob 2022).

In summary, QT is not a static model, but a dynamic, adaptable pedagogy well-suited to the demands of rural education. By emphasising flexibility, cultural relevance and student voice, QT bridges the gap between abstract policy aims and the realities of rural classrooms. *Inkhulumo* demonstrates that even under challenging conditions, dialogic pedagogy can promote equitable participation, cognitive growth and emotional resilience.

Cultural responsiveness and human-centred instructional design

In complex educational spaces such as rural South African schools, culturally responsive pedagogy is not merely beneficial; it is essential. The linguistic, cultural and socio-economic diversity within these communities demands instructional approaches that are adaptable, inclusive and co-constructed with the very people they intend to serve. The local adaptation, *Inkhulumo*, exemplifies how dialogic pedagogy can respond meaningfully to these imperatives, embedding the principles of HCE in practical, transformative ways. Culturally responsive pedagogy rests on the premise that students' cultural and linguistic backgrounds are assets rather than obstacles to learning. In the South African rural context, where many students navigate across indigenous languages, local knowledge systems and a formal English-medium curriculum, this approach is vital for fostering academic engagement, emotional safety and a strong sense of belonging.

QT accommodates these complexities by structuring dialogue that is both rigorous and flexible. In its *Inkhulumo* form, developed through a participatory research process, QT was not merely implemented, but collaboratively reimaged. Teachers and students were engaged as

co-designers in shaping the pedagogical model. Drawing from iterative cycles of observation, reflection and adaptation, the implementation process ensured that instructional strategies were rooted in local realities. In this way, QT aligned with the HCE call for adaptability and contextual responsiveness.

This co-design approach was not simply about surface-level cultural inclusion; it reoriented the pedagogical power dynamics. Teachers and students were not treated as passive recipients of an externally imposed model, but as active agents in the creation of meaningful educational practice. This aligns with ethical principles of HCE that learning should be participatory and grounded in mutual respect. The *Inkhulumo* adaptation of QT exemplifies a strong alignment with HCE by transforming classroom discourse into a culturally responsive, inclusive and participatory process. Grounded in the principles of student autonomy, co-construction and contextual responsiveness, *Inkhulumo* positions students as active agents in meaning-making, drawing on their home languages, lived experiences and community knowledge. This locally co-designed model disrupts hierarchical teaching norms and fosters relational trust, emotional safety and intellectual agency. By embedding these values in dialogic pedagogy, *Inkhulumo* operationalises HCE in complex rural settings, offering a scalable and ethical approach to educational transformation.

Conclusion and implications for practice

This chapter has demonstrated that QT, particularly in its localised form as *Inkhulumo*, offers a compelling model for advancing HCE in rural schools. By blending critical thinking, relationship-building and cultural relevance, QT transforms classroom culture, creating space for inclusion, student voice and shared meaning-making. Its theoretical foundation is grounded in learning theories that view knowledge as co-constructed through dialogue. This includes Vygotsky's insight that students learn best through guided interaction, and Alexander's framework for dialogic teaching as a vehicle for deep thinking and participation.

However, implementing QT in real-world classrooms, particularly those in rural contexts, is not without difficulty. Teachers often face competing

demands, including overloaded curricula and limited planning time, all of which constrain opportunities for structured dialogue. Additionally, shifting from traditional, monologic instruction to student-centred dialogue requires deep pedagogical change, which can be intimidating for educators accustomed to authoritative classroom roles. The lack of ongoing mentoring and systemic support further impedes sustained adoption. In the *Inkhulumo* study, some teachers initially expressed discomfort with relinquishing control to students and struggled to facilitate open-ended discussion. These challenges highlight the importance of relational trust and professional agency, both central to HCE, where teachers feel supported in experimenting with new practices and are empowered as co-designers of learning. Future recommendations include:

- To embed QT meaningfully in diverse rural classrooms, robust implementation support is essential. This includes co-designed training, peer coaching and leadership buy-in. Educators cannot carry transformation alone; school leaders and policymakers play a crucial role in enabling systemic and sustainable change.
- Embed dialogic pedagogy in national teacher training programmes to ensure that new teachers are equipped to foster student autonomy, participation and voice from the outset (HCE principle: Autonomy, co-construction).
- Support school-level adaptation so rural schools can tailor QT to their local language, culture and constraints, promoting context-sensitive learning experiences (HCE principle: Inclusivity, responsiveness).
- Fund locally-driven research and innovation hubs in rural districts to pilot and evaluate QT-based models like *Inkhulumo*, ensuring educators are engaged as co-researchers (HCE principle: Co-construction, teacher agency).
- Prioritise language inclusivity in learning materials and classroom talk, especially in the early and intermediate phases, to promote equitable access to knowledge and meaningful participation (HCE principle: Inclusivity, epistemic access).
- Reframe monitoring and evaluation systems to include indicators such as relational quality, student participation and dialogic

engagement, not just test performance (HCE principle: Relational trust, holistic development).

In conclusion, QT illustrates that a theoretically robust and practically adaptable pedagogy can meet the needs of real classrooms. It does more than raise achievement, it nurtures student connection, confidence and curiosity. By centring dialogue, culture and care, QT brings HCE to life in schools shaped by complexity and constraint, offering a grounded and ethical path toward inclusive, student-centred education.

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The Art(s) of Human Centred Education

Chapter Nine: Inclusive Pedagogical Approaches to Human Potential in South African Arts Education Through Meta-Research Lenses

Raïta Steyn

Faculty of Education, University of Pretoria, South Africa

Introduction

In the framework of the South African Government's inclusive policies, the Education White Paper 6, Special Needs Education (Department of Basic Education [DBE] 2001), provides regulations to better accommodate learners and students with special needs and disabilities. In the context of transformative, inclusive processes applied by the higher education institutes in the democratic South Africa, university students' involvement in community matters has gained momentum (Council on Higher Education (CHE) 2010). To this end, personal commitment of educationalists became a matter of high importance. Inclusive research on human strength and capabilities is an important issue worthy of recent attention within the frameworks of human rights campaigns and globalisation. Regarding the limitless possibilities of human potential, relevant demonstrations—often individually initiated—are brought to the fore by people with limited abilities who apply unconventional means of action for self-justification. Their almost superhuman efforts, aims and final astonishing achievements, whether physical or mental, never cease to amaze and evoke wonder: such as Stephen Hawking; the South African Oscar Pistorius, who, though now notorious, was an IAAF 2012 Olympic winner; and Musa Motha, who achieved Britain's Got Talent's first-ever group Golden Buzzer in 2023, among certainly many others.

Educationally, the inclusive viewpoint of the present research concentrates on the human potential and capabilities, focussing on two distinctive interconnected aspects: the one, external, concerns the collective, sociocultural context, as a powerful factor able to embrace every human being in an ideally harmonious and equally shared co-existence. The other, internal, refers to human nature, unique in its multifaceted and complex aptitudes and capacities. In the context of inclusive research methodologies, both aspects should be engaged in a continuous, interdependent interaction, as each completes and substantiates the other. In other words, any pedagogical plan or educational project aimed at mainstreaming the employability and entrepreneurship of differently abled persons (Sefotho 2017), no matter how well structured in theory, may fall short in practice without individual and collective awareness, acknowledgement and support from society. Furthermore, in my (Raïta Steyn) opinion, any educational strategy, design or programme aimed at supporting social awareness and consciousness regarding this issue, no matter how efficient, requires continuation. Further action is essential, as is the involvement of key stakeholders in adjusting the education system accordingly and socially indispensable.

Contextual framework and problem statement

White Paper 6 on Special Needs Education: Building an Inclusive Education and Training System is a policy document released by the South African Department of Education in 2001. This policy outlines the government's strategies and frameworks to transform the education system in South Africa to better accommodate learners and students, regardless of their barriers to learning. The target was to create an inclusive education system that supports the diverse learning needs of all students and safeguards the right of every child to receive quality education. In this policy document, notably, relevant provisions and principles of the South African Constitution, on inclusivity, representativity, human dignity, equality, freedom, non-racialism and non-sexism' (CHE 2022; South African Human Rights Commission [SAHRC] 2016), and the right to further education had been repeatedly revisited, discussed and reconsidered **for**

many years (author's own emphasis).

Consequently, an analytical report, published by the CHE (2022) with reference to the progress and challenges of transforming South Africa's higher education system, reflects the problematic of reformative policies. Notably, in the same paper (CHE 2022: 5), the term *disabled* is also mentioned in the following context: 'The National Plan [NPHE, 2001] also proposed that the participation rate in higher education should be increased in the long-term to address both the imperative for equity and the changing human resource and labour needs...'. To this end, the plan 'proposed that the participation rate should be increased by recruiting workers, mature students, particularly women and the **disabled**' [author's own emphasis], and 'students from the Southern African Development Community (SADC) countries as part of the SADC Protocol on Education'. (CHE 2022: 5). The report also highlights areas that need further attention, such as addressing historical inequities, enhancing access 'for people from under-represented groups', and modifying curricula to meet present-day needs (CHE 2022: 5–6).

As for Arts Education, in the context of the current subject matter (Creative and Visual Arts), the University of Pretoria's modules align with The South African National Curriculum and Assessment Policy Statement (CAPS), of the Department of Basic Education (DBE 2011). Divided into two main components, theory and practical, the University of Pretoria's policy supports community engagement in undergraduate programmes as strongly as possible, particularly at the fourth-year undergraduate level. 'Human rights, inclusivity, environmental and social justice' can be also well served through art education by '... infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa'. (DBE 2011: 5).

Inclusive social transformation through arts education

Methodologies and approaches

It is for the above-mentioned reasons that I (Raïta Steyn) have adopted my

arts education courses to include projects that address issues concerning disadvantaged and marginalised groups through an action-based research approach. In fact, my initiative materialised as early as 2018 through the multifaceted research project entitled *'We' and the 'Others'* (Steyn 2022). Based on established human and African philosophical principles, particularly on the concept of *ubuntu* (that is, shared humanity and collective learning) (Ewuoso and Hall 2019: 96–98), the project assists a community to mature culturally, morally and rationally, by means of action-based approaches (Lewin 1946; McNiff 2002). Since research on socio-cultural awareness about the human capability or incapacity—subject to definitional viewpoint—has not been sufficiently noticeable, the awakening of collective interest through cognisance is particularly pertinent, both locally and internationally. Due to the human potential for creativity, especially using multisensory approach (Chang et al. 2022; Steyn 2019), I believe, Arts Education can play a crucial role in terms of space and time in promoting and generating *knowledge* through the application of the following principles.

Knowledge through awareness

With the aim of promoting socio-cultural awareness and empirical knowledge through arts education, this study employs three case studies as a relevant pedagogical paradigm. In line with the *meta-research* methodology, the approach questions both implicit and explicit questions, highlighting how historically and culturally established “trues” once turned into collective concepts, continue to play a destructive role by perpetuating harmful stereotypes. Regarding the origin, development and acceptance of such stereotypes as given truths, earlier established theories and research approaches often shaped by personal perspectives, even in history, have often been accepted as neutral or factual. This has led from a socio-cultural viewpoint to the entrenchment of one-sided opinions and irrational collective concepts.

Knowledge through factual information

Within the framework of postmodernism, as articulated by Jencks (1989) and with the principles of *meta-history* research (Sansaridou-Hendrickx 2005: 255–273), views, theories and research methods concerning past events must be critically revised, and where necessary, enhanced or replaced with more inclusive perspectives. Consequently, broader conceptualised viewpoints and approaches, innovative, in my opinion, and inherently more flexible, can be emphasised to accommodate human diversity in a natural and adaptable manner. As in *meta-historical* writing, scholarly research should not be viewed as a pursuit of absolute truth, but rather as a quest for interpretative forms shaped by diverse modes of human expression. These include narratives, literary works, chronicles, artworks as well as hand crafts and oral traditions in terms of customs, rituals, storytelling and supernatural beliefs (Sansaridou-Hendrickx 2005: 255–273). Within this broad range of expression forms, the application of a *meta-research* approach (Ioannidis 2018), based on diversity and integration of perspectives and multisource information, can thus provide fertile ground for significant interdisciplinary exchange.

Knowledge through rational judgement

In this context, although sociocultural inclusion through education remains a complex and multi-layered endeavour for many educationalists and researchers (Mpu and Adu 2021), the related problems it presents can be solved, and obstacles overcome through the critical prism of *meta-research*. For the realisation of this humanly justified vision, the following factors should be seriously considered and accordingly fulfilled: a) provision of resourceful inclusive curricula and b) analogous teaching training with contextualised instruction. Scholarly, I built my contextual and historical framework on meta-research approach; educationally, in my case-studies, I expanded empirical knowledge through different pedagogical strategies. Kurt Lewin's (1946) foundational action-based pedagogy model, addressed social problems through a cyclical process of *planning, acting, observing* and *reflection*. This research approach was further

developed by McNiff (2002), who emphasised *reflection-in-action* and the importance of dynamic teaching/learning interactions as a reciprocal process of giving and receiving. Due to the diversity and pedagogical value of the three selected case studies, I applied the pattern as a knowledge exchanging process by organising my action-based research approach into the following stages: *preparing empirical exposure*; *learning by doing*; *learning by thinking* and *learning by teaching*—aligned with the ubuntu principles of shared humanity and mutual respect (Ewuoso and Hall 2019).

Case study A: The art of mouth painting: Empirical knowledge by creative participation

This case study focused on quadriplegic mouth painting workshops which took place locally on two occasions, at the Humanities Education Department in early 2022 and again in 2023, and once internationally. The latter took place in October 2022 at the Theatre Department of the Aristotle University of Thessaloniki (AUT), Greece, as part of an on-going educational exchange programme between the two respective universities.

The use of the (human) mouth as a tool for artistic expression is, broadly speaking, not a matter of personal choice, but rather a profound struggle between limited physical ability and boundless mental potential. In this case, a mouth substitutes the essential manual function, with facial muscles trained to perform their maximum capacity. Strangely enough, society has established a well-defined space for this form of artistic expression, though it is often constrained within the narrow thematic boundaries of “landscape” and “still-life”. These stereotypical associations, rooted more in sympathy for physical limitation than in genuine artistic appreciation, need to be refuted through an action-driven educational methodology. Thus, in reflection of the *Ubuntu* philosophy, ‘I am because we are’, individuals should be recognised not as objects of charity, but as equal participants in a shared community. As such, this action-based approach seeks to confront and disrupt entrenched collective stereotypes from an inclusive, socio-educational perspective, grounded in knowledge generated through active participation and structured as follows:

Stage 1: Preparing empirical exposure—Identifying stereotypes

As action research involves active engagement in real-world experiences, the planning phase focused on creating opportunities for meaningful exposure of all participants and awareness to the subject matter. To this end, a practical painting demonstration by mouth painters themselves was organised for the Art Education student-teachers (University of Pretoria 2023). As Chang et al. (2022) suggest, when educational processes are professionally handled and pedagogically guided, they can stimulate the creative potential of students, including those with disabilities. In practice, the initial sessions began with an introduction by the mouth artists, who shared their personal narratives and the life circumstances that led them to pursue art. Their demonstration revealed both artistic innovation and the distinctiveness of their personal styles. In this way, the planning phase laid the foundation for challenging societal stereotypes about disability and artistic value.

Stage 2: Learning by doing

The action research continued by exercises where student-teachers applied the guest-artists' instructions. Noteworthy is the response of the student-teachers who accepted the presented challenge with curiosity, wonder and even humour, yet with eagerness to participate. Once ready, student-teachers had the opportunity to try mouth painting techniques and create their own artworks by imitating the mouth painters. Under the constant guidance of the expert mouth painters who shared their empirical knowledge throughout the creative process, student-teachers, besides awareness of "the other", hopefully enhanced their empirical knowledge by exploring different ways of creativity.

Stage 3: Learning by thinking

The interactive discussions that followed the painting sessions, centred on overcoming physical challenges and exploring the potential of

unconventional artistic methods, proved pedagogically significant. Through narration, expression, comparison and above all, a deepened understanding of diverse human experiences, the mouth painting activities revealed new perspectives. As an observer, I noticed that the students, who were typically confident in their artistic abilities, surprisingly showed hesitation—as they were less in control—while others who usually struggled in art skills, excelled. The latter group’s self-confidence was notably boosted, as all student-teachers were required to begin from scratch, working with a technique entirely unfamiliar to them.

Stage 4: Learning by teaching

Practical, experience-based knowledge rooted in the South African context was spread internationally through a student exchange programme initiated by mutual agreement between the University of Pretoria and the AUT in 2021. As part of the ongoing project ‘We and the Others’, which began in 2019, a South African postgraduate art education student contributed to the project’s goal by spreading knowledge through awareness. The student’s engagement, situated within the framework of cross-cultural and inclusive arts education, included a discussion on the challenges faced by mouth painters and a short demonstration of alternative painting methods. This phase facilitated mutual exploration of different worldviews and promoted a shared understanding of how the arts can enhance humanity. The endeavour concluded in an exhibition organised by the South African student in the foyer of the University of Thessaloniki, featuring the AUT drama-students’ works. In addition to their creations using the mouth-painting technique, the works also addressed broader issues of social awareness.

Case study B: ‘Vision’ in visual arts: Artistic inclusion through shared acknowledgement

Policy ideals versus practical realities?

The visual arts CAPS document emphasises ‘equal educational opportunities’, ‘inclusivity’ and ‘social justice’, particularly through a call

to be ‘sensitive to issues of diversity such as ... disability...’ (DBE 2011: 5). However, these inclusive pan-humanly engaging policies can be challenged under a careful critical view, due to a contradiction between the ideal of an all-embracing inclusion and the reality of a limit-setting exclusion, noticed in the definition of visual arts aesthetics in the CAPS (DBE 2011: 8), stated hereby:

Visual Arts covers a broad field of creative practice that involves the hand, the eye, the intellect and the imagination in conceptualising and creating two-dimensional and three-dimensional artworks, objects and environments which reflect the aesthetic [my emphasis], conceptual and expressive concerns of individuals or groups.

As an arts educationalist, based on personal empirical knowledge, I felt directly the “indirect” nuance of the exclusivity in the above official statement. Motivated, therefore, by the distance between the ideally planned curriculum and its realisation and in line with my ongoing project, ‘We and the Others’, I planned a four-staged educational task, realised through an action-based approach.

Case Study B was centred on the concept of “*Vision*” in visual arts, by applying it on learners at a South African special school for the visually impaired and blind and fourth-year students-teachers. As part of their community engagement project, the aim was to challenge my arts education student-teachers’ perception that visual arts is exclusively “visual”, with its emphasis on aesthetics, and to showcase how tactile and auditory senses are equally important in both making and experiencing art. I consider my initiative as a response to the official definition of Visual Arts in the CAPS (DBE 2011: 8):

The subject Visual Arts is about self-expression and offers learners a way to engage meaningfully with, and respond to, their world. It provides opportunities to stimulate and develop learners’ intellect, engaging their creative imagination through visual and **tactile experiences** [my emphasis] and the innovative use of materials and technology in realising their ideas.

Preparing empirical exposure—Identifying stereotypes

The first phase intended to break down fixed assumptions through direct exposure to the subject matter, and factual insights, thus, laying the groundwork for meaningful experiential learning.

In preparation for exposing fourth-year arts student-teachers to the school for the visually impaired, I first asked them to complete a class activity reflecting on what they knew about the topic. It became evident that to most of the students' assumption, all learners attending a "blind" school were completely blind. Other common assumptions were that the school followed a curriculum different from CAPS, one designed specifically for the visually impaired. As such, many students believed that learners did not partake in the "visual arts" component of the subject creative arts in the intermediate and senior phases, due to its perceived reliance on aesthetic and visual engagement. As planned on their arrival at the school, the student-teachers attended a special lecture presented by the school psychologist and occupational specialist. They were introduced to the school's demographics and the range of impairments catered for, including blind learners, partially sighted learners and those with multiple disabilities. Physical causes associated with blindness were also openly discussed such as glaucoma, cataract, tunnel vision, prematurity, infections, childhood blindness, trauma, even albinism-related visual impairment. For some, the albinism condition seemed an unfamiliar issue. However, due to the importance of albinism, I included it in my research list and dedicated my third case-study to albinism.

Learning by doing—Ubuntu values of collective humanity

In the second phase after the presentation, the student-teachers were placed into pairs, one of which was blindfolded and led by their partner through the school passages to briefly experience what it feels like to be blind. The exercise was brief as it aimed to evoke sentiment of empathy through direct exposure to the core of the subject matter: physical limitation versus human potential. After this experience, the student-teachers went to the Grade 9 creative art class to meet learners engaged in tactile creations.

To gain insight into their personal perspectives, the art students first observed, then interacted with the blind learners while creating tactile artworks using materials such as clay, fabric and textured papers. Mabovula (2011) reminds us that the classroom becomes a platform where ideas are shared by community members in real-life contexts, a notion that is clearly reflected in this phase of the project, where blind learners and students-teachers engage in shared learning through tactile artmaking. Indeed, as an observer, I noted the following: the blind learner would draw something, and the teacher would outline it for them using a glue gun or a sewing wheel. The learner would then follow the raised contour lines and “colour” the drawing using various tactile materials. I also witnessed how partially sighted learners assisted blind learners with their artworks. This stage reinforced the students-teachers’ responses to the lived experiences of “others”, grounded in the understanding that learning is not isolated, but occurs in community and dialogue, affirming every participant’s humanity.

This experience, in my opinion, resounds the *Ubuntu* philosophy, which encourages collective creativity over individual mastery. In support of this, Vandeyar and Mohale (2022: 7) argue that Ubuntu philosophy-supported pedagogies transform classrooms into collaborative and inclusive spaces. Teachers are encouraged to facilitate group dynamics and promote learning as a “communal entity” advancing collective effort rather than individual achievement-focused endeavour. This approach is particularly relevant for twenty-first-century skills, as it supports learning through collaboration, inclusivity and adaptability.

Learning by thinking an introspection

As part of their practical task, the student-teachers were given a questionnaire asking them to post-reflect on their experience at the school for the visually impaired. “*What did I learn at this school*” but also, “*How does this visit change how I relate to others?*”. It encouraged a deeper awareness within the artistic and educational process. In the effort to refute stereotypical exclusive concepts suggesting that visual arts can only be pursued by the visually abled, visually challenged learners have indeed contributed by creating artworks that drew on ‘their **creative imagination** through visual

and **tactile experiences** and the **innovative use of materials**’ as stated in the CAPS (DBE 2011: 8) [author’s own emphasis]. The participating art students’ feedback also emphasised the importance of sensory experiences. The students’ views align with the approach the internationally acclaimed blind artist, John Bramblitt applies in his works. Bramblitt started painting after having lost his eyesight and learned to distinguish between colours through tactile sensations. By developing a unique method of feeling colour while creating his artworks, ‘he was discovering various pigments, trying their textures, and learning a haptic way to feel the differences in color’ (Bramblitt and Tate 2012: 102–105; Wołczyńska 2018). Bramblitt’s use of spatial vision instead of colour vision validates his human ability and shifts the focus from human limitation to artistic innovation.

During an observation at LUCA School of Arts in Ghent, Mühleis (2015), while reflecting on the inclusion of visually impaired and blind students, contests established models of art education. Instead of focusing on formal visual rules like shaping the “perfect circle” for life drawing, Mühleis aligns with more contemporary pedagogical approaches, which emphasise personal expression and conceptual depth. According to Mühleis (2015: 138), ‘contemporary art is not about a static whole, but about a perceivable coherence, a coherence that is not necessarily fixed by a line, but can be marked by an open horizon’. The strength of Mühleis’s approach ‘lies in viewing disabilities as a source of motivation in developing other capacities, rather than considering them as shortcomings in human existence. “Disabled” people, thus, should be regarded as differently-abled persons to partake in the development process locally and globally’. (Steyn and Sefotho 2021).

Learning by teaching—Ubuntu as knowledge sharing

Beyond embodying *Ubuntu* principles, the reflective introspection also encouraged student-teachers to reconsider what the CAPS (DBE 2011: 7) document on inclusion emphasises: ‘Inclusivity should become a central part of the organisation, planning and teaching at each school. This can only happen if all teachers have a sound understanding of how to recognise and address barriers to learning, and how to plan for diversity.’ In alignment

with the CAPS document and based on the student-teachers' experiences, the art education student-teachers began planning an inclusive exhibition that would serve as a shared platform, showcasing artworks from both the art education students and the blind learners. The students were tasked to create artworks that could be experienced through any sense other than sight, such as hearing, smelling or touching. The exhibition itself was an interactive hub of visually impaired learners and adults, student-teachers, parents and colleagues. To deepen the inclusive ethos, blind music performers were invited to contribute through live performance. This exhibition, motivated by the *Ubuntu* philosophy, "*I am because we are*", actively supported the project's transformative aim of inclusivity, realised through collective understanding and reciprocal participation.

Case study C: Horrors of albinism: Awareness through knowledge

The theme of this case study is different because it entails complicated, problematic issues which go beyond an arts educational approach in an institutionalised environment. The related irrational prejudices, stereotypical concepts and inhuman, victimising practices require a multifaceted, transdisciplinary involvement and dynamic approaches, as the subject matter involves historical, social, cultural, religious, civil and even judicial awareness. However, I believe, the role of education based on humanity can inspire other fields of specialisation to engage with similar endeavours.

During the visit to the visually impaired school, the student-teachers noticed that many learners had the condition of albinism. In the discussions related to the visit, I remarked how little the art education students knew about the condition, cause and sociocultural consequences. This realisation inspired me to involve art students further with my case study C, Horrors of Albinism. I aimed at combating the stigma and discrimination that individuals with albinism experience in South Africa. Conducted in partnership with the Molepo Theatre group and the Western Cape Albinism Foundation of South Africa, the study included a series of workshops, seminars and exhibitions locally and internationally, designed to increase

awareness about albinism and promote *ubuntu* through social inclusion.

Preparing empirical exposure

To raise awareness about albinism, I began with the basic question: *What is Albinism?* Etymologically, the term refers to the “absence of pigments” (albin-o/ism), derived from the Latin “albus”, and the Greek “αλφός” (alphós) had been, incorrectly, associated with white leprosy. Meaning, the term “white” is characterised by colourless skin, yellowish-white hair and eyes with pink or blue irises and deep-red pupils (Kimbassa 2016; Merriam Webster 1981: 49). Due to its typical features, albinism often attracts negative attention that leads to social stigma. To further prepare the art students for the next stages of the project, a relevant discussion and foundational information were provided to help conscientiously contextualise the subject. Since the existence of “albinism”, as a condition, can be traced in *religious, historical, mythological* and *literary* sources in terms of description, interpretation, collective convictions and concepts, the art education students could critically disseminate factual information and by relevant discussions to challenge misconceptions, destructive stereotypes and irrational prejudices, hopefully in South Africa and beyond. Indeed, ‘traditional beliefs surrounding people with albinism are greatly embedded in the mythological and the supernatural’ (Steyn 2022: 8) and in our contemporary period, studies on “modern” beliefs about albinism continue to reference traditional and mythological “truths”. As such, horrific superstitions surrounding people with albinism still influence Africans to the point where bodies or body parts are being sold, as they are believed to ‘carry good fortune’ (Steyn 2022: 8). A recent case related to superstitions involves six-year-old South African girl Joshlin Smith who, while not a person with albinism, was very fair-skinned and ‘was allegedly sold to a traditional healer for her eyes and skin colour’ (eNCA 2025).

As Steyn (2022: 6–7) explains:

Concerning *albinism*, there are two kinds of ‘sources’ of information to be considered in Africa. As illustrated in the Old Kingdom of Kongo history, the one covers traditional beliefs, often incorporating

superstitions interconnected with religions, magic, and the supernatural. The other ‘sources’ concern stories and presentations of albinism in popular literature, paintings, and other creative and performing arts forms. These two kinds of ‘sources’ should not be confused with the scientific observation and studies on albinism, especially if definitions are still connected with non-scientific notions.

Learning by doing

To “educate through demystification” I organised for the play, *Mama, I Want the Black That You Are*, to be performed at our university. My role as educator was to show the students how the performing arts can be a powerful tool to teach and raise awareness about albinism and the semantics surrounding it. Written and produced by Arthur Molepo, the play, sponsored by the Department of Arts and Culture, was based on real lives of people with albinism. The three main characters, a mother, a father and a girl with albinism, present a deeply unsettling, yet revealing narrative. Under pressure from the elders, the mother has her new-born child with albinism killed, an act driven by oral traditions and harmful cultural norms. Overcome with grief, she later saves and adopts another new-born baby girl with albinism. The girl’s stepfather then rapes after learning he is HIV-positive, believing that he would be cured. The stepfather eventually arranges for her to be sold. The main character, Regina Mary Ndlovu, herself a person with albinism, embodies both the humanity shown to her by her mother, and the barbarity of her father who exploits her, all within the context of deep-rooted societal prejudice (Department of Arts and Culture 2018; Molepo 2019).

Hereby, I present the characters to illustrate the points which became subjects of discussions relevant to the subject matter. The mother, both as a woman and victim, stands up for her own and her child’s rights, symbolising strength and resilience. The father, inhuman in his actions and decisions, along with the elders who exercised their power through stereotypes, reflect the absurdity of such beliefs and practices. Finally, the girl with albinism embodies the lived reality of what individuals with the condition go through.

Noteworthy is the effect the play had on spectators as a solid artistic

creative work, in terms of plot, acting, realism and universal meaning. The actress who performed the character with albinism, herself with the condition, strengthened the aspect of “reality” both humanly and artistically. The message has been clear: despite their victimisation, arts open the way forward to them to rightfully claim their place in society.

At this point of *Learning by doing*, I find it proper to mention the case of Salif Keita, the internationally acclaimed Malian songwriter and singer known as the “Golden Voice of Africa”. Despite Keita’s noble origins, he was rejected by his own family and socially ostracised by his Mandinka community because his albinism was seen as a sign of bad luck. However, strengthened by his artistic potential, Keita transformed his suffering constructively by founding the Salif Keita Global Foundation to protect and empower others with albinism and to fight the injustices they continue to face in Africa.

Learning by thinking

To deepen the students’ rational thinking, I invited Regina Mary Ndlovu to speak directly to the art education students. This led to discussions on “human rights”, “social justice”, “inequality”, “race”, “gender” and “other factors” as emphasised in the CAPS (DBE 2011: 5). As part of the discussion, students engaged in a controversial conversation that questioned who is considered Black and who is white. In the play, if one’s identity is defined by skin colour, the child with albinism does not belong anywhere. This line of thinking aligns with the title of the play, *‘Mama, I want the Black that YOU are’* (Molepo 2019). Kimbassa (2016: 18) confirms that in Southern Africa, the social identity of a person with albinism, that is, ‘too white to be Black’ or ‘Black in a white skin’, is mainly caused by politico-historical facts. Influenced by past apartheid laws, national identity was defined by skin colour, thus, manipulating social classification and position in the collective consciousness. Accordingly, Baker (2007: 74) challenged the concept that ‘all Africans are Black’, as albinism is not defined either as Black or white. However, both features exist in the absence of pigmentation in the African definition of the condition as “albino skin”.

Learning by teaching

As part of this initiative, Narcisse Kimbassa, researcher and representative of the Western Cape Albinism Foundation of South Africa also engaged in an online session with the students. Kimbassa addressed the stigma surrounding albinism and stressed the necessity of community-based awareness and support networks. This highlighted the importance of collaborative, constructive activism promoted mainly through education that supports human empathy and dignity. As prescribed, the student-teachers created artworks that expressed their personal viewpoint on the experiences of individuals with albinism. They were also expected to address collective concepts and stereotypes around albinism. Artistically, they could include relevant narratives and visual material. Alongside informative details related to albinism and the atrocities associated with the condition, their artworks were displayed in spaces open to public view.

The artworks were also taken to Greece to be displayed in an open exhibition at AUT. In the framework of the established collaboration and the interest expressed by the arts education department regarding the subject matter, a University of Pretoria student with albinism, Success Ndlovu, participated as a guest speaker for the Greek students, to convey (in English) his personal views about the condition to an international audience in Thessaloniki (RThess 2022). During the discussion the so called “Blonde Angel” case was brought to the fore, in which a fair-skinned Roma child was wrongly assumed to be a victim of human trafficking in Greece (Bonvoisin 2014). The widespread misunderstanding regarding the parents and their child demonstrated two highly destructive misconceptions at the same time: firstly, authorities and society explained the light-coloured features of the child compared to the dark skin of the Roma parents, incorrectly. Secondly, their social marginalisation in some countries caused by their distinct traditions and culture was misconstrued (Marushiakova and Popov 2016). This case points at racism, because in Europe, the condition is less noticeable compared to African socio-cultural context, where albinism is visually prominent. Indeed, for many students in Greece, the contextualisation of the issue on an international level was an enhancement to world viewing.

The above experience, based on visual material (photo and video graphic, media information), engaging panel discussion, artistic creations and theatre performance, have manifested the importance of visibility and real-life testimony in spreading knowledge through awareness and refuting prejudices. Locally, the participants in the project, Regina Mary Ndlovu, Narcisse Kimbassa and Salif Keita have, in their own right, each played a vital role in that effort. Their participation is an example of how human potential, showing talent, advocacy and resilience, can flourish even under the most challenging circumstances.

Conclusion

This chapter forms part of the broader research project, “We and the Others”, which seeks to promote a more empathetic and inclusive society through arts education by recognising difference as an essential dimension of human potential.

All three case studies highlight the transformative potential of recognising diverse human abilities and the limitless possibilities that emerge when persons’ talents are acknowledged through action-based approaches. Pedagogically, the case studies have demonstrated that planning, ideally human interaction, should be more realistic if classes were considered microcosmos of communities where learners need an educationally supportive environment to practice interdependency and less individual-centred approaches. Explaining concisely:

Case study A, *The Art of mouth painting*, has demonstrated how art, based on empirical knowledge and active interaction, is an educational tool to instruct inclusive participation. Aligned with the *Ubuntu* philosophy, learning through practice should be applied not individually as an isolated act but as part of a shared endeavour, sometimes shaped by non-traditional methods, such as using the mouth to create.

In Case study B, to challenge ‘Vision’ *in visual arts*, the art education student-teachers visited a school for learners with visual impairments. Their exposure to the core of the issue deepened the student-teachers understanding of art as something intrinsically human, which, through acquired skill and encouraged imagination, can overcome physical

limitations. This alternative approach, I believe, broadened the student-teachers' perspectives and strengthened their willingness to approach art in different, sensory-based ways too.

In Case Study C, *Horrors of albinism*, student-teachers were faced with the shocking realities that individuals with albinism continue to live with, due to concepts rooted in harmful superstitions, misconception and ignorance. Pedagogically, the experience firstly highlighted the value of scholarly verified factual information, that is, the constructive role of history; secondly, by confronting these issues via arts-based education, student-teachers acknowledged the struggle for survival, as persons with the condition, but also their human potential to grow and succeed especially through arts. The current study illustrated how empathy, critical thinking and creative interaction as teaching tools can motivate social change.

Internationally, the participation of South African students in Greece draws special attention to the importance of collaboration in the arts education programme at the University of Pretoria beyond the South African borders. Through their involvement and sharing of socio-cultural experiences, both Greek and South African students were exposed to different practices and views. Through their artworks, they expressed a broader worldview and appreciation for diversity. This research, motivated by the *Ubuntu* philosophy, was grounded in an action-oriented methodology that supports arts education as a dynamic pedagogical tool to unlock human potential and promote socio-cultural inclusion.

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Chapter Ten: High Levels of Adaptability, Proactivity and Resilience as Skills aligned with the Sustainable Development Goals in Early Childhood Education

Wietske Boon

Faculty of Education, University of Pretoria, South Africa

Introduction

Early childhood education (ECE) encompasses the education of children from birth to around age 9. In the South African context, young children attend playgroups, nursery schools, and preschools until the age when formal schooling becomes compulsory at five or six (Department of Basic Education, n.d.). At this age, they enter the foundation phase, consisting of Grades R (reception year), 1, 2, and 3. During the first nine years, children reach a variety of developmental milestones and learn new skills (Schwartz and Palviainen 2016). Teachers in the field of ECE are not only responsible for supporting children to reach these age-appropriate milestones and promote cognitive development, but also provide them with nurturing care, guide them in terms of social skills and emotional well-being and gain an understanding and knowledge about the world around them. This requires 'high-quality teacher-child interactions' (Blewitt et al. 2020: 2) and quality education. Blewitt et al. (2020) also point out that teachers need support and professional development opportunities to enable them for the task. In the context of sustainable development goals (SDGs), teachers should be equipped to integrate the concepts of sustainability into their teaching practices.

Agenda 2030 emphasises the importance of early childhood education (Britto et al. 2017; Samuelsson and Park 2017), and education of sustainability in this phase (Rodrigo et al. 2021; Samuelsson and Park 2017). For early learners to become global citizens and learn sustainability,

teachers must have a broad understanding of SDGs (Chapman and O’Gorman 2022). This makes teacher educators responsible for teaching SDGs to pre-service teachers and modelling classroom practices that are aligned with SDGs. More research in terms of sustainability in ECE is necessary, as sustainability is impacted by various systems such as interpersonal relationships and interaction with the environment (Davis and Elliott 2024). However, in the global effort to advance sustainable development, early childhood education requires further research to foster more consistent understandings of the topic (Engdahl and Furu 2022). Teacher education in the field of higher education, which plays a pivotal role in teacher training and leveraging SDGs, is also less researched and regarded as an emerging, yet less obvious profession (Høydalsvik 2019). To enhance teaching practices aligned with the SDGs, this chapter aims to explore the skills that teacher educators need to advance sustainable development in early childhood education.

Teaching SDGs

The United Nations proposed seventeen SDGs to reach the target as set out in Agenda 2030, which includes, but is not limited to, health and well-being (SDG 3) and quality education (SDG 4) (United Nations 2015). Reaching these SDGs requires knowledge, understanding and appropriate teaching practices, led by research and social responsibility towards preserving the planet. Implementing SDGs into teaching practices is not an easy task, as differences in worldviews, the interconnectedness of the different goals and complexity thereof pose different challenges (Filho et al. 2019). To leverage the SDGs, a top-down or bottom-up approach can be followed (Mazon et al. 2020). Following a top-down approach, higher education policy (Mazon et al. 2020) must motivate the promotion of SDGs in higher education institutions. On the next level, teacher educators are positioned to share their knowledge, values and skills with the student teachers through their teaching practices. Furthermore, teachers can promote SDGs by modelling behaviour that is aligned with the SDGs, such as providing examples of how the promotion of well-being and quality education is present in ECE (higher education) classrooms.

To gain a better understanding of the knowledge, skills, values and perceptions that are essential in teacher education in ECE, within the context of SDGs, questions can be asked, such as “which skills, related to the promotion of sustainability, are evident within higher education institutions in South Africa?” This can be done by exploring teacher educators’ current knowledge, values, skills and perceptions in terms of SDGs. Previous literature that focuses on teacher educators’ values and skills in terms of SDGs highlights the importance of social cohesion (Galtseva et al. 2020; Nakidien et al. 2021), ‘patience, empathy, tolerance’ (Nketsia et al. 2020: 62), ‘citizenship’ (Nakidien et al. 2021: 6), as well as environmental and economic values (Galtseva et al. 2020). It is argued that if teacher educators portray values and skills such as these during classroom and education practices, and the necessary skills and knowledge regarding SDGs are added into the curriculum content, future teachers could gain the necessary knowledge and teaching practices to integrate it into their own early childhood pedagogies. Following a bottom-up approach, student teachers can bring their own insights about SDGs into higher education institutions for further development within social contexts (Mazon et al. 2020) and further development by teacher educators, for instance, by integrating the student teachers’ knowledge and ideas into teaching practices and on- and off-campus projects, creating different learning opportunities. The question that arises from the above-mentioned literature is: Which skills and interventions are necessary to promote professionalism in the context of the SDGs within ECE departments in higher education institutions?

Learning theories

According to different learning theorists, a variety of factors have an influence on the learning process. While there are a variety of learning theories, for this chapter, experiential learning, social learning, self-directed learning and the transformative learning process in the context of the SDGs will be briefly referred to.

Experiential learning: Individuals learn through their environment and the experience within it. Experiential learning can be defined as

learning knowledge, values, skills and perceptions by being involved in an experience (Jarvis et al. 2003). The outcome of the experience is not significant, but what is, is a sense of awareness about the individual experience and the process that was followed (Peterson and Kolb 2017) for it to be a learning experience. Through this state of awareness within the situation, accompanied by self-reflection, new perceptions and values are created (Kolb 1984), leading to changed behaviour. This is a process that encapsulates all areas of being, which leads us to adapt to our environment (Kolb 1984), to grow (Peterson and Kolb 2017) and become a true version of ourselves (Jarvis et al. 2003). Considering learning and teaching SDGs, two processes are at play. Teacher educators should model values and skills that strengthen SDGs and create experiences for student teachers that are motivating to transform their thinking, values and perceptions in favour of SDGs. Furthermore, student teachers should be especially aware of their experiences, which requires the ability of self-reflection and use the opportunity to gain knowledge from their experiences within the learning environment.

Social learning: As mentioned earlier, learning is not an individual journey. We learn in and from social contexts (Jarvis et al. 2003). Individuals learn through observing other people, who function as models for behaviour, which we, consciously or unconsciously, repeat (Bandura 1969). Thus, if teacher educators and student teachers are exposed to a social environment which promotes SDGs, the social interaction and social modelling of behaviour can serve as a learning opportunity and motivation to practice sustainable behaviour. Higher education institutions, therefore, should foster a social environment in line with the SDGs.

Self-directed learning: Self-directed learning puts more responsibility on the individual teacher educator who needs to be open to new information and knowledge (Tough 1989), being able to adopt it into their teaching practices (Oltra-Badenes et al. 2023) and include it in the curriculum (García-González et al. 2020). This process may require mentorship (Knowles 2003; Tough 1989) from colleagues and participation in professional development activities. The teacher educator, thus, has a responsibility towards the transformation process to become more sustainable in their professional and teaching practices. On the other hand, student teachers

should be developed to have the skill to develop themselves further in an ever-changing world, adding knowledge to the areas in which they need further professional development (Petersen et al. 2020).

Transformational learning: When a teacher educator gains new knowledge or insights into SDGs and acts on it, transformational learning takes place. These changes can circle into changing the social system (Mezirow 1993). This transformational process is built on experience and self-reflection (Bates 2016; Mezirow 1993), as discussed earlier. In short, gaining knowledge and understanding and adapting values, skills and perceptions requires various role-players; however, it is mostly the responsibility and willingness of the individual to transform.

From the above-mentioned literature, it seems necessary that the current ECE teacher educators' values, skills, perceptions and awareness, literature and resources in terms of SDGs, are explored and highlighted. This will lead to a better understanding of what is needed to create change, sustain or mediate teacher educators' perceptions and professionalism towards Agenda 2030 and SDGs. Knowledge building in this regard will contribute to strengthening the top-down approach to implementing the SDGs into higher education teaching practices and curricula.

The current study aims to strengthen and expand the research on ECE teacher educators working in support of SDGs and Agenda 2030. The rationale for this aim is that ECE and teacher educators are uniquely positioned to strengthen the pipeline towards a sustainable future, as indicated in Agenda 2030 (United Nations 2015). The research questions that are proposed for the aim of this chapter are: Which skills that are related to the promotion of sustainability are evident within South African higher education institutions? Which skills and interventions are necessary to promote professionalism in the context of the SDGs within ECE departments in higher education institutions?

Phenomenology

To answer these questions, the current study is based on the principles of phenomenology, according to Husserl (1980), who explains that through phenomenological research, reality is exposed in its true form. Life

experiences are captured through our senses (Husserl 1980; Vagle 2018). Learning from experience is a process which involves sensory awareness, creating a whole bodily experience in the moment (Meyer-Drawe 2017), followed by thought processes, to make sense of the experience (Husserl and Findlay 1970). All parts of our existence are, therefore, involved in an experience (Meyer-Drawe 2017). Creating a learning experience in ECE in higher education can be complex and requires teacher educators to be experts in their fields of education.

Adaptability

Skills, values and perceptions are already formed during the early childhood years. However, learning is a continuous journey throughout the entire lifespan, and skills, values and perceptions in favour of SDGs can be acquired at any age. Furthermore, this is not necessarily an individual journey; it might require joint opportunities, collaboration, self-reflection and motivation. Adaptability is the ability to adjust one's thinking or behaviour (Martin et al. 2013). Adaptability, or the ability to change, is highly dependent on interpersonal communication (Sarmiento et al. 2024) but has been shown to positively influence well-being (Holliman et al. 2021; Waldeck et al 2021) and academic performance (Martin et al. 2013). In a constantly changing teaching environment, teaching professionals need to have the ability to manage change effectively (Granziera et al. 2016) while staying true to their values (Niemeyer-Rens et al. 2022).

Proactivity

When considering proactivity within the context of SDG 3 (health and well-being), Akay et al. (2024) found a correlation between proactivity and life satisfaction. For early career educators, this implies taking responsibility for teaching tasks and continuous professional development (Arif et al. 2023). This might present similarly in higher education contexts. Teacher educators' work performance and level of engagement have an impact on the quality of education (SDG 4) they provide for student teachers (Mişu et al. 2022). This correlates with Montero-Sieburth and Turcatti (2022), who

highlight the importance of early intervention and relationships (teacher educator and student teacher) as a way of being proactive towards future success. Alasmare et al. (2024) motivate effective classroom management, which includes, but is not limited to, teacher–student relationships, which is a driving force towards proactivity in education. According to Montero-Sieburth and Turcatti (2022), resilience is a skill that is essential for proactivity.

Resilience

Resilience is complex (Borazon and Chuang 2023; Mansfield et al. 2016), yet important and relevant to higher education institutions. Theron (2021) notes that the interaction between the student and the learning environment has an impact on the student’s ability to become resilient. Although the learning environment plays a significant role, other factors such as personality, interpersonal relationships and life events should also be accounted for. Academic resilience can be defined as a student’s ability to manage academic stress, setbacks and expectations. Academic resilience is also linked to academic success and the psychological well-being of students (Egan et al. 2022; Holdsworth et al. 2018; Mantzios et al. 2020; Martin and Marsch 2006). Broadly, psychological resilience is a person’s ability to adapt to significant life-altering events. Although resilience can be accompanied by stress, it also involves a process of personal growth (American Psychological Association 2020). Resilience can be related to self-reflection or ‘mindfulness’ (Mantzios et al. 2020: 302), ‘self-regulation’ (Hill et al. 2021: 181), the ability to adapt (Siders 2019), and transform (Few et al. 2017) or, in an educational context, the implementation of adjusted learning opportunities depending on the context in which it is used (Almerez and Duping 2022). Anthony et al. (2017) note that an all-inclusive definition for resilience does not exist and that the concept of resilience is different for every person based on personal and environmental factors (Hascher et al. 2021). Similarly, the learning process, which requires resilience, is different for each person. To gain a clearer understanding of how resilience and proactivity are present in higher education institutions, in terms of teacher-educator and student relationships, classroom practices,

and how they can be leveraged in terms of SDGs, more research is needed (Jonker et al. 2024).

Methodology

Vignette observations were conducted of a teacher educator in an ECE department at a higher education institution, having interpersonal contact with colleagues. The participant was female and appointed to a senior position. The time spent observing the participant in the following vignette was two and a quarter hours. Observation notes were made in Afrikaans, the language in which the researcher is most comfortable with speed handwriting, using a notebook and pen. As much detail as possible was added regarding the environment, the participant's verbal and non-verbal cues and emotional and bodily reactions (Agostini et al. 2024). During the observation process, the researcher was not looking for any specific details, nor did she reflect on the situation during that moment. From the observation notes, raw vignettes were crafted. The vignettes then followed a process of validation, which included resonance readings by three individuals who are not involved in the study. Their feedback, which consisted of positive feedback and suggestions on, for example, embodiment and word choice, was used during the continued crafting process of the vignettes. The vignettes were presented to the participant for a final stage of validation, before the final vignettes were ready (Agostini et al. 2024). One of these vignettes is presented to the reader to see the situation as it played out, through the eyes of the researcher, making it a self-explanatory piece of literature, as presented under the sub-heading preliminary findings and discussion.

Semi-structured interviews were conducted, which were piloted by South African and Austrian teacher educators as a means of validating the questions and following the Teach4Reach 2.0 protocol. A few questions were revised for the sake of clarity, removing unnecessary or repetitive questions. The interview consists of 26 questions focusing on professionalisation, practice, life-long learning, implementing SDGs at the university and at the policy level, current challenges and future visions. It took approximately 45 to 75 minutes to complete an online interview, which was recorded

and transcribed (Creswell and Creswell 2018) using the MS Word dictate application. The interviews took place between November 2024 and March 2025. The participants consisted of four female ECE teacher educators between the ages of 28 and 67, with different levels of experience in South Africa. Content analysis was done using the MS Word search application on the transcriptions from the four interviews to find words or phrases that are related to the findings from the presented vignette and related to resilience and proactivity as discussed in the literature review. These words included resilience or flexibility, adaptability, adaptation, change, growth, self-reflection, mindfulness, self-regulation, transformation, proactivity, professional development, engagement, intervention, implement, and relationship. Search results were considered if it was relevant to the content of the current chapter.

Participants were aware that participation in the study was voluntary and was conducted with the necessary consent. Data is managed with confidentiality and anonymity; alternatively, pseudonyms were used where necessary. Participants were informed of their right to withdraw from the study at any time. The study was conducted within the ethical clearance of the Teach4Reach 2.0 project and adheres to the ethical codes of the University of Pretoria, University of Innsbruck and University of Vienna.

Preliminary Findings and Discussion

The preliminary findings of the study, which is still in the phase of data collection, suggest that high levels of adaptability, proactivity and resilience are necessary skills to promote teacher educator professionalism and strengthen SDG 3 (well-being) and SDG 4 (quality education) within higher education institutions. From the first vignette observations that were done at a South African ECE higher education department, according to the guidelines stipulated in the methodology, the following vignette was crafted and translated from Afrikaans. This vignette captures a moment in which an ECE teacher educator is in conversation with a colleague. This vignette encapsulates bodily experiences and thought processes as it was present and captured through the sensory awareness of the researcher, in that moment. Through this process, this moment then also becomes a

learning experience, highlighting the finer nuances that are present.

Bernadette sits behind her desk in a quiet office. Her laptop is open in front of her. Overhead lights lighten the room. In front of her table are two chairs. Bernadette holds the telephone receiver in one hand, talking to a colleague on the telephone. Another colleague's head and shoulders appear from behind the door frame. Bernadette beckons her to come inside by stretching out her hand and bringing it closer. The big hand gesture invites her to come inside. Bernadette ends her telephonic conversation and puts down the receiver. She looks at Suné, who has a question about her leave form. Bernadette answers her query. The conversation leads to personnel—and then to personal matters. Bernadette engages in eye contact while they are talking. There are soft lines on her face. She holds her glasses in one hand, which rests on the table, her other hand on her lap. 'I will make time for you ... ' You just have to stay encouraged,' says Bernadette. As the conversation continues, the atmosphere lightens.

Bernadette is talking on the telephone when a colleague's head and shoulders appear around the corner. Bernadette does not leave her standing there or allow her to leave. She reacts to what is important at the time by inviting her inside with hand gestures while she concludes her telephonic conversation. Bernadette shows the ability to adapt to different tasks at a specific moment. She engages with her colleague as soon as her telephone conversation ends. They have a brief discussion about a leave form, personnel matters, and she also engages with her colleague on a more personal level. Bernadette says: 'I will make time for you... You just have to stay encouraged.' From this statement, it seems that her colleague's well-being is of importance to her; and she is willing and has the skills to adjust her own schedule in favour of the relationship, to be available for her colleague in the present, but also indicating her availability in the future. This verbal and non-verbal gesture also indicates her ability and willingness to be proactive in communicating with her colleague that when the need arises, she is willing to support her, showing her availability in future, taking responsibility for her role in a senior position. Bernadette's verbal and non-verbal gestures lead to a

change in the atmosphere, indicating the depth of her actions. Bernadette's gestures can also be an indicator of adaptability as a skill towards well-being, fostering high-quality relationships and creating positive learning environments. In line with Arif et al. (2023), who highlight the importance of taking responsibility as an early career teacher, this is also applicable to teacher educators in higher education institutions. Being adaptable, making time to discuss professional and personal matters, and promoting the well-being (SDG3) of colleagues or students, can be indicative of the proximity and relatedness of resilience and proactivity in higher education settings, as Montero-Sieburth and Turcatti (2022) point out. From a top-down approach to integrate the SDGs, this high-quality relationship is of significance (Blewitt et al. 2020). This vignette can serve as an example of how adaptability and proactivity, important skills to leverage sustainable behaviour (Akay et al. 2024; Benavot et al. 2024; Mişu et al. 2022), can be present in ECE departments in higher education institutions.

To extend the preliminary findings from the vignette, data from the semi-structured interviews were analysed as stipulated in the methodology. During interviews conducted with teacher educators at a South African ECE department, participants were asked which skills they identify as essential for effectively contributing to SDGs. The response in interview one was as follows: 'The first skill that pops up in my mind is adaptability. I think adaptability or flexibility, depending on how you want to put it, is important.' During interview four, the concept of professional teacher educator and how her personality affects her development, was explained as follows: '...professionals got to think it, they got to reflect. They got to do. And they got to change practices... So, every time that you do something, you've got to make those changes practically...' These statements highlight the importance of changing teaching practices regularly to meet the needs of the direct and indirect community, promoting SDG 3 and SDG 4. It also highlights the importance of proactivity in the sense that significant teaching practices forego appropriate learning experiences to strengthen SDG 4. In terms of adaptability and proactivity, it can present as teacher educators being available, making time in their schedule, even changing their daily planning to support colleagues or student teachers on an academic or a personal level. In the ECE classroom, it might present as

teachers having the ability to adjust their pedagogy to meet the needs of the learners in the classroom (Eslamian et al. 2017). This requires teacher educators, or teachers, to know what those needs are. The following response was recorded during the third interview: ‘Teachers [educators] should know children [students]...You should know their needs. You should know how to deal with their needs. You should know how to deal with their well-being. It’s not only the physical part.’ Väisänen et al.’s (2018) reference to teacher educators who are supporting student teachers’ experience of well-being and initiative to prevent burnout can be used as another example of how proactivity is present in higher education institutions. This again suggests the importance of high-quality relationships between teacher educators (Boon 2026) and student teachers.

In a different question on the challenges experienced on a university level regarding the integration of Agenda 2030 into teacher education, the response in interview one was as follows: ‘...not being open to change, resistance to change and saying that it’s not needed... I can definitely see resistance to change and not everyone being equally bought into the concept and the necessity of SDGs.’ This statement strengthens the importance of and the need for high levels of resilience in higher education, as change can often be stressful. It also signifies the need for ECE teacher educators to take part in professional development activities on how to deal with change, as resilience involves personal and professional growth (American Psychological Association 2020), self-reflection and ‘mindfulness’ (Mantzios et al. 2020: 302). Professional development was explained as: ‘Lifelong learning to me is the humility to acknowledge that you constantly need to learn... being willing to listen to feedback, as hard as it might be, the willingness to implement that.’ [interview 1], ‘I think just to be willing to learn, willing to grow, willing to understand, and to be a lifelong learner, you really need to be open to new ideas and open to collaboration.’ [interview 2] and ‘What is important for me would be to keep on reading. Keep on developing, self-development, attending workshops...’ [interview 3]. These statements also indicate that professional development requires a level of adaptability, proactivity and resilience.

From a top-down perspective, modelled behaviour, such as applying resilience, adaptability and proactivity, can contribute to a learning

experience of how SDG 3 and SDG 4 can present in all levels of ECE, when the recipient is receptive to learning. From a bottom-up perspective, a teacher educator can be receptive towards the changes they need to make to include the needs of their colleagues, students and the community they serve. These strategies can then be carried down to the ECE department at the school level.

A moment like the one captured in the vignette can serve as a learning opportunity (Agostini et al. 2024; Bandura 1969; Jarvis et al. 2003) for teacher educators on how, for example, adaptability and proactivity can be applied in a social and higher education context, to align with sustainable behaviour and SDG 3 and SDG 4. For example, the experience of a colleague or a teacher educator showing their willingness to change to accommodate their needs can, through social learning, be repeated in different situations. In terms of teaching practices that align with SDGs in ECE, teacher educators have the responsibility to adapt and be proactive and resilient. Although these are complex skills (Borazon and Chuang 2023), they can and should be developed throughout the educational system (see, for example, Johnson et al. 2014; Mansfield et al. 2016; Nolan et al. 2014). Professionalism in ECE departments in higher education institutions can be strengthened by being open to change, fostering high-quality relationships, participation in professional development activities and an adjusted curriculum for teacher educators to incorporate SDGs (García-González et al. 2020), across all phases (early childhood to higher education), relevant to the specific community that is served (Samuelsson and Park 2017).

From previous references (Galtseva et al. 2020; Nakidien et al. 2021; Nketsia et al. 2020), proactivity and resilience did not feature as two of the main skills in findings related to SDGs, however, other authors (Baron and Baron 2019; Ebersöhn 2014; Ebersöhn et al. 2015; Johnson et al. 2014; Mansfield et al. 2016; Nolan et al. 2014), recognise the importance of adaptability, proactivity and resilience (Alasmari et al. 2024; Arif et al. 2023; Montero-Sieburth and Turcatti 2022) in the teaching profession. Further research in terms of values (Samuelsson and Park 2017), skills, proactivity and resilience in education and practice (Vance et al. 2015) in terms of SDGs, especially in ECE (Borg and Gericke 2021) and related

higher education institutions, is necessary. Through the above-mentioned research, literature can add to the body of knowledge on promoting SDGs (Chankseliani and McCowan 2021).

Limitations

This chapter only reports on preliminary and limited sources of data, as the study is still in a phase of data collection. More vignettes and interview data have the potential to give more insight into these findings. Further research on adaptability, proactivity and resilience in the context of teacher educator professionalism and SDGs in ECE departments in higher education institutions is necessary. The data in this chapter focus on ECE teacher educators in higher education institutions in South Africa and cannot be generalised to different higher education departments or global ECE departments. The preliminary data can, however, be used as a baseline for future research in different departments across different countries.

Conclusion

This chapter reported on the pivotal role teacher educators in ECE play by following a top-down and bottom-up approach to teaching and strengthening SDG 3 and SDG 4. Therefore, their values, skills and perceptions should be as such to promote SDGs through their behaviour, classroom practice and curriculum. Aspects such as the willingness and ability to change, foster high-quality relationships, take part in professional development activities and adjust teaching practices to incorporate SDGs are skills and a responsibility, related to proactivity and resilience, which promote professionalism in higher education contexts.

While previous literature suggest that social cohesion (Galtseva et al. 2020; Nakidien et al. 2021), 'patience, empathy, tolerance' (Nketsia et al. 2020: 62), 'citizenship' (Nakidien et al. 2021: 6) as well as environmental and economical values (Galtseva et al. 2020) are necessary to promote SDGs, the current study demonstrated through preliminary findings, how adaptability can lead to proactivity, but requires resilience and in some cases professional development to strengthen the skills needed to ensure a

more sustainable future and therefore, promoting professionalism in higher education institutions.

Although suggesting further research in terms of adaptability, proactivity and resilience as skills for sustainable behaviour, these preliminary findings can be indicative of how teacher educators' skills influence their professionalism in their teaching practices (Gamage et al. 2021).

Funding

This study is funded with the support of Africa Uninet [P093].

Acknowledgement

The Teach4Reach 2.0 project team from which the interview questions were developed (Dittrich, Ann-Kathrin; Eloff, Irma; Agostini, Evi; Mathabathe, Kgadi, M.; Weinberg, Lucas; Rabani, Maryam Nia).

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Chapter Eleven: The Development of a Gender Awareness Programme that challenge Teachers' Perceptions and Pedagogical Practices in ECE

Renisha Singh and Keshni Bipath

Faculty of Education, University of Pretoria, South Africa

Introduction

Gender equality in early childhood education is pivotal to eliminating socio-economic challenges, including poverty, limited education and inadequate healthcare (Van der Gaag and Putcha 2015). Numerous studies emphasise the importance of promoting gender equality in Early Childhood Care and Education (ECCE) to enhance academic success, improve future employment prospects, and reduce societal inequalities (Aubrey 2017). Developing an environment that supports educational equality for both boys and girls is crucial for their growth and development (Abbott 2011). However, achieving gender equality in early childhood development (ECD) depends heavily on teachers' perceptions and pedagogical practices, as these shape children's experiences and understanding of gender (Nabbuye 2018). Despite these insights, limited attention has been given to the role of teachers in either perpetuating or challenging gender stereotypes within ECD settings. Research suggests that young children are highly susceptible to internalising gendered norms and stereotypes through their interactions within educational institutions (Gansen 2017). Therefore, understanding teachers' beliefs and practices is vital to creating inclusive learning environments and ensuring a more equitable start for all children.

Literature review: Teachers' pedagogical practices and gender identity in early childhood

The literature emphasises teachers' significant role in shaping children's gender identity development in early childhood education (ECE). Since children spend a considerable amount of time in ECD centres, teachers' practices and pedagogical choices have a profound impact on gender identity formation (Aina and Cameron 2011). This literature review explores the influence of teacher interactions, classroom practices and awareness programmes on gender identity development.

Teachers' interactions and gender identity formation

Gender identity formation is a multifaceted process influenced by various social, cultural and individual factors such as race, class, language, ethnicity and religion (Baig 2015). Teachers significantly impact this process through their instructional methods and interactions with children. Research highlights that teachers' interactions and pedagogical practices reinforce or challenge gender stereotypes, consciously or unconsciously (Robinson and Jones-Diaz 2017). Baig (2015) concluded that teachers' everyday classroom interactions facilitate the construction and perpetuation of gender norms. Through these interactions, school culture and broader societal expectations regarding gender are conveyed to children (Blaise 2010).

Classroom practices and gender stereotyping

Several studies have highlighted the differential treatment of boys and girls in classroom practices. Pardhan (2011) explored how teachers' gendered interactions reflect deep-rooted patriarchal values, leading to differential engagement with boys and girls. In many cases, boys were more visible in the classroom, received more attention and were presented with higher-order questions and greater challenges, particularly in science and mathematics (Halai 2010). Conversely, girls were more often compliant, independent and received less attention. Such practices contribute to the reinforcement of traditional gender roles and expectations (Pardhan 2011). Additionally,

gender differences in disciplinary practices were noted, with teachers using stricter disciplinary measures with boys while expecting girls to conform to norms of responsibility, passivity and politeness (Gansen 2021).

Classroom management and gendered practices

The literature also indicates that gender relations influence classroom management, impacting how teachers interact with boys and girls differently. Ahmed et al. (2018) observed that female teachers often focus on building relationships and fostering teamwork, while male teachers tend to adopt more authoritarian and assertive approaches. This differential treatment may reinforce gender stereotypes and unequal gender roles in young children's perceptions.

Policy and curriculum's role in gender identity construction

Policy documents and curricula are crucial in guiding teaching practices and shaping gender identities. The South African National Curriculum Framework emphasises the development of children's sense of identity and belonging, advocating for an anti-bias approach to address gender issues in early childhood (Department of Basic Education [DBE] 2015). Policies provide explicit and implicit directives for teachers to create inclusive environments that promote gender equality.

Awareness programmes to enhance gender identity

Teachers' perceptions and practices significantly shape gender development. However, there is a growing recognition of the need to challenge traditional gender norms and stereotypes. Research by Xu (2020) and Chapman (2016) suggests that gender awareness programmes can help teachers reflect on their biases and adopt gender-sensitive practices. Such programmes involve professional development workshops, encouraging gender flexibility, and developing child-centred discourses in early childhood settings (Warin and Adriany 2017). Teachers are encouraged to facilitate a range of activities that challenge traditional gender roles and promote gender equity.

Gender-responsive pedagogy and inclusive practices

The development of gender-responsive pedagogy is critical for promoting equitable classroom environments. Teachers must be aware of their gender biases and actively work towards providing equal opportunities for both boys and girls. This involves offering equal access to learning materials, ensuring equal participation in classroom activities, and using inclusive language during lessons (Ismail et al. 2022). Despite the challenges in implementing gender-responsive pedagogy, such as deeply ingrained gender norms, continuous gender awareness-raising activities can gradually lead to more equitable teaching practices (Ananga 2021).

Promoting gender equality through curriculum and resources

To foster an inclusive learning environment, teachers must critically assess and adapt classroom resources, such as books, toys and instructional materials, to disrupt gender stereotypes (Giraldo and Colyar 2012). Teachers should ensure that activities and themes do not favour one gender over another, allowing both boys and girls to explore various aspects of masculinity and femininity. By providing equal opportunities in all areas, such as sports, drama, and play activities, teachers can create an environment that supports gender flexibility and challenges traditional gender norms.

Addressing gender fluidity in early childhood education

Recognising children with fluid gender identities is crucial in creating inclusive learning spaces. Research by Proulx et al. (2019) indicates that schools with LGBTQ-inclusive programmes are less likely to face issues of bullying and suicidal thoughts among children. Thus, developing awareness programmes encouraging teachers to support gender fluidity can broaden children's experiences and disrupt stereotypical teaching practices (Parker 2016). Teachers' pedagogical practices significantly impact gender identity development in early childhood. The reinforcement of gender stereotypes

through teacher interactions and classroom practices perpetuates traditional gender roles, highlighting the need for awareness programmes and gender-sensitive training. Policies and curricula should guide teachers towards inclusive practices that promote gender equality. By challenging traditional norms and creating supportive environments, teachers can play a pivotal role in enhancing gender equity in early childhood education.

This literature review suggests that gender equality in ECE requires a multifaceted approach that involves challenging existing stereotypes, adapting classroom practices and raising teachers' awareness of their impact on children's gender identity development. Developing a gender awareness programme in ECE draws upon post-structural theory, focusing on critically interrogating teachers' perceptions and pedagogical practices. This approach recognises teachers' pivotal role in shaping gender-stereotypical development (Ball et al. 2013). The programme aims to challenge and transform these perceptions by fostering a deeper understanding of how discourses influence and regulate gendered behaviours.

Theoretical framework

Post-structural theory, which emphasises discourses, power, subjectivity and agency, is the foundation of this gender awareness programme. In this context, discourse is defined as established ways of speaking, thinking, feeling and acting that provide a framework for understanding gender norms (Blaise and Taylor 2012). These discourses regulate behaviours by establishing rules and practices that determine what is considered normal or acceptable for different genders (Foucault 1972). Through their pedagogical practices, teachers often unknowingly reinforce these traditional discourses of femininity and masculinity (Martin and Muthukrishna 2011).

For example, the discourse of femininity prescribes particular behaviours and ways of being for girls, emphasising gentleness and quietness, while the discourse of masculinity encourages dominance and loudness for boys (Blaise and Taylor 2012). Additionally, regulatory practices within these discourses label and punish deviations from established gender norms, leading to ridicule or exclusion, such as when girls play with boys or boys engage in activities associated with femininity (Bhana et al. 2011). Queer theory further complicates this

understanding by highlighting the influence of heterosexual norms on gender identity formation, and the marginalisation faced by those who deviate from these norms (Blaise and Taylor 2012).

Role of critical reflection

Central to post-structural theory is critical reflection, which enables teachers to interrogate dominant beliefs about gender embedded in the hidden curriculum of ECE (Gelot 2019). Through reflective discussions, teachers are encouraged to question why certain groups dominate others and to become aware of the power dynamics that shape their pedagogical practices. This reflection helps teachers understand how their experiences of prejudice, discrimination and homophobia influence their perceptions of gender identity (Blaise and Taylor 2012).

The gender awareness programme aims to cultivate this critical awareness by engaging teachers in discussions about gender, power, inclusion and exclusion. These discussions are designed to develop analytical thinking and encourage the adoption of anti-bias approaches in the classroom. By critically reflecting on their experiences and the discourses they perpetuate, teachers can gain insight into how their practices influence children's construction of gender identities (Blaise and Taylor 2012).

Pedagogical practices

The programme emphasises the importance of shifting teachers' pedagogical practices to challenge entrenched gender norms. It aims to empower teachers to disrupt the traditional discourses that define femininity and masculinity by creating inclusive and equitable learning environments. This shift requires moving away from reinforcing stereotypes towards developing strategies that promote diversity, challenge biases and encourage all children to explore a wide range of identities and roles. By understanding and challenging the discourses that shape their perceptions, teachers can reframe their pedagogical practices to support a more inclusive approach to gender in ECE. The gender awareness programme aims to create a reflective space where teachers can critically engage with issues of gender, power and agency, thereby transforming their practices to foster a more equitable

educational experience for all children.

The development of a gender awareness programme that challenges teachers' perceptions and pedagogical practices in ECE was guided by a post-structuralist theoretical approach. Post-structural theory emphasises the critical reflection necessary to understand power relationships within institutions (Foucault 1972). It challenges conventional norms and structures, allowing the uncovering of embedded inequalities. In this study, post-structuralism provided a dynamic framework for exploring and reflecting on gender and power through discourses, subjectivity, and agency (Martin and Muthukrishna 2011). The research design was centred on participatory action research (PAR) principles to create opportunities for teachers to interrogate gender biases critically, reflect on their teaching practices and collaboratively construct new knowledge (Chevalier and Buckles 2019).

Research design and approach

The current study utilised a case study approach to enable in-depth exploration of teachers' perceptions and practices within the context of ECE. A case study was deemed appropriate as it allows for multiple data collection techniques and provides an informative understanding of phenomena within their natural settings (Yin 2012). For purposes of the current study, data were collected through a combination of observations, interviews and PAR workshops to gain a nuanced understanding of teachers' gender perceptions and pedagogical practices. The purpose of the PAR workshops was to provide a space for dynamic engagement and reflection among participants, while facilitating the transformation of their perceptions.

Sampling and participants

The study involved a purposive sample of twelve teachers from four registered ECD centres. The selected teachers were required to have five or more years of teaching experience with 3- or 4-year-old children and hold an ECD teaching qualification. All participants were female, as no male

teachers were employed at the selected ECD centres. The group was diverse in terms of racial composition, including Caucasian, Asian, Indian and African teachers from lower and middle socio-economic ECD centres. The sample size was small, reflecting the principles of PAR, which emphasise deep understanding and close relationships between participants and the researcher (Wood et al. 2017).

Description of research sites

The current study was conducted at four distinct ECD centres in Gauteng Province, South Africa. The research sites were selected based on their diverse socio-economic contexts and pedagogical approaches, which included Reggio Emilia, Montessori and traditional ECE methods. These centres varied in terms of physical infrastructure, resources and teaching philosophies, contributing to the richness of the study.

- **Suburban Centre A** (Midrand): A middle-class ECD centre with dedicated play and learning areas, including a library and art area.
- **Suburban Centre B** (Centurion): A Reggio Emilia-inspired ECD centre focusing on creative and observational skills, with separate play and art spaces.
- **Suburban Centre C** (Midrand): A Montessori-based ECD centre with defined learning zones, including sensory, mathematics, and practical life areas.
- **Township Centre D** (Ivory Park): An ECD centre attached to a government clinic in a densely populated informal settlement, with limited resources and classroom space.

Data collection

Data were collected in four phases using five key collection techniques: observations; interviews; PAR workshops; group discussions and reflections.

- **Phase 1: Observations:** The researcher conducted observations to examine teachers' classroom interactions and identify existing gender norms in their pedagogical practices. This phase provided a baseline understanding of how gender was constructed and reinforced within the ECD environment.
- **Phase 2: Interviews:** Semi-structured interviews were conducted with the teachers to elicit their perceptions of gender and their current pedagogical practices. The interviews explored teachers' awareness of gender stereotypes and their influence on children's experiences.
- **Phase 3: PAR workshops:** In this phase, PAR) workshops were conducted to engage teachers in reflective discussions and activities. The first workshop aimed to build relationships among participants, with a focus on exploring and challenging traditional gender perceptions. The activities were designed to establish trust, encourage open feedback and facilitate collaborative learning (Wood et al. 2017). During the workshop, teachers watched a video that challenged gender stereotypes and participated in developing posters to reflect their learning. Guiding questions included:
 - How do teachers feel about challenging gender stereotypes?
 - How can teachers' gender perceptions and pedagogical practices be challenged?
 - How can teachers be made aware of gender stereotypes?
- **Phase 4: Feedback and reflection:** In the final phase, teachers provided feedback on the workshops' effects on their perceptions and pedagogical practices. This phase involved group discussions and reflections on the knowledge gained and its application in their professional contexts. Participants shared photographs and personal stories to illustrate their learning experiences. The reflective discussions aimed to support participants in developing new knowledge that would influence their professional development (Zuber-Skerritt 2018).

Data analysis

The collected data were analysed using thematic analysis, identifying recurring themes across the interviews, observations and workshop discussions (Lawless and Chen 2019). The analysis focused on key themes related to teachers' perceptions of gender, dominant discourses' influence, and the impact of the reflective discussions. Emerging themes were categorised and presented to the group for verification, ensuring the findings reflected participants' collective experiences and perspectives.

Ethical considerations

The study adhered to the university's ethical guidelines and obtained informed consent from all participants. The purpose and aims of the research were explained, and participants were informed of their right to withdraw at any stage. Pseudonyms were used to protect participants' confidentiality and anonymity. The potential benefits of the study were also shared with the participants to ensure transparency and trustworthiness.

Findings and discussion

The data analysis in the current study focused on exploring and understanding the perceptions and pedagogical practices of ECD teachers concerning gender inequality. The thematic data analysis revealed three key themes: teacher perceptions of gender inequality; pedagogical practices and gender inequality and changes in perceptions and pedagogical practices after intervention. The study's findings are drawn from observations, interviews and collaborative discussions, which were organised into categories and connected to emerging themes.

Teacher perceptions of gender inequality

The findings revealed that teachers in ECD centres held specific gendered perceptions that influenced their interactions with children. Three sub-categories of gendered perceptions were evident:

- **Curriculum resources and hidden curriculum:** Teachers' perceptions of boys and girls were often reinforced by curriculum resources, which portrayed stereotypical gender roles. Participants noted how boys were depicted as engaging in adventurous activities and wearing shorts, while girls were shown doing passive or domestic tasks. Teachers unconsciously addressed children based on these stereotypes, referring to girls as "angels" and boys as "strong". This hidden curriculum shaped children's experiences and reinforced gender expectations.
- **Discipline strategies:** Gendered perceptions influenced how teachers disciplined children. Participants consistently noted that boys needed firmer discipline due to perceived aggressive behaviour, while girls were seen as softer and needing gentler correction. This differential treatment was a significant manifestation of gender inequality in the classroom environment, which reinforced stereotypical perceptions about boys being more disruptive and girls being more compliant.
- **Classroom management and gendered activities:** Teachers managed classroom activities in ways that reinforced gender norms. For example, boys were often given more active and structural tasks like playing with blocks, while girls were encouraged to engage in quieter activities like dressing up. The division of activities and the allocation of time for engagement indicated a gendered approach to classroom management, with teachers unconsciously reinforcing traditional gender expectations through their pedagogical practices.

Pedagogical practices and gender inequality

The findings also highlighted that teachers' pedagogical practices played a significant role in reinforcing gender stereotypes. Two sub-themes emerged:

- **Influence of hidden curriculum on boys' behaviour:** Teachers reported that boys received more attention because they were

perceived as louder, more active and less focused. This reflected teachers' perceptions and a result of the hidden curriculum embedded in classroom practices. Boys were given more attention and often portrayed as requiring greater supervision; an approach that reinforced gendered notions of boys as challenging and girls as compliant.

- **Influence of hidden curriculum on girls' behaviour:** Observations showed that girls were often praised more but received less attention from teachers. Girls were described as more emotional and compliant, needing less discipline than boys. Teachers unconsciously reinforced these perceptions, thereby perpetuating gender norms through their interactions. Classroom resources and activities, such as storybooks that depicted girls as passive characters, further entrenched these gender stereotypes.

Challenging gender stereotypes in teachers' perceptions and pedagogical practices

Phase 1 of the study revealed that teachers were reluctant to challenge gender stereotypes within the classroom. They did not intervene when children played in gendered ways, such as boys constructing and girls making mud cakes. Teachers were also unaware of the subtle reinforcement of gender roles through curriculum resources that depicted boys and girls in stereotypical roles. These findings indicate a need for critical reflection on how resources and classroom activities contribute to gender bias.

However, the introduction of the gender awareness programme provided an opportunity for teachers to reflect on their practices and develop greater conscientisation about gender stereotypes. Teachers became more aware of the need to critically evaluate resources and challenge traditional gender roles in the classroom. For instance, teachers began to pay more attention to selecting books portraying boys and girls in diverse roles. They encouraged all children to participate in various activities without preconceived notions of what was appropriate for each gender.

Changes in perceptions and pedagogical practices

After participating in the gender awareness programme, teachers showed a shift in their perceptions and practices. The change in awareness became a catalyst for transforming the early learning environment into a more gender-equitable space. Teachers reported being more mindful of their attitudes towards gender, the influence of the curriculum on gender perceptions, and the need for inclusive classroom activities. One participant noted, ‘I make sure both boys and girls do the same activities’, indicating a conscious effort to avoid reinforcing gender roles.

Teachers’ collaborative reflections and actions, guided by the principles of PAR and post-structuralist thinking, aimed to create a more inclusive space for all children. This awareness allowed teachers to critically examine and adapt their perceptions, discipline strategies and classroom management practices. The study revealed that challenging teachers’ perceptions can lead to meaningful changes in pedagogical practices, transforming the classroom environment.

Conclusion and recommendations

This study explored the development of a gender awareness programme aimed at challenging teachers’ perceptions and pedagogical practices in ECE. The findings revealed entrenched gendered perceptions among teachers, influenced by hidden curricula, classroom resources and daily practices. These perceptions shaped their discipline strategies, classroom management and interaction with children, reinforcing traditional gender norms. However, the gender awareness programme catalysed change, leading to a noticeable shift in teachers’ understanding and attitudes toward gender. Teachers became more reflective of their own biases, critically evaluated classroom materials and consciously worked towards creating an inclusive and equitable learning environment.

The study underscores teachers’ perceptions of their critical role in either perpetuating or challenging gender stereotypes in the classroom. It highlights that transforming ECE spaces requires a shift in teachers’ awareness of their pedagogical practices and classroom dynamics. By

challenging traditional gender norms and embracing gender inclusivity, teachers can contribute to broader social transformation, fostering a learning environment that values equality for all children through the following recommendations.

The first five years of a child’s life are crucial in shaping their identity. Therefore, the study recommends implementing the Renisha Singh Gender Awareness Pedagogy (RS-GAP) Framework within the ECD sector (See Figure 11.1). This framework aims to address and challenge gender stereotypes embedded within teaching practices, resources and social interactions. The RS-GAP framework envisions a collaborative approach involving parents, teachers, community stakeholders and ECD internal stakeholders in creating an inclusive and gender-equitable learning environment.

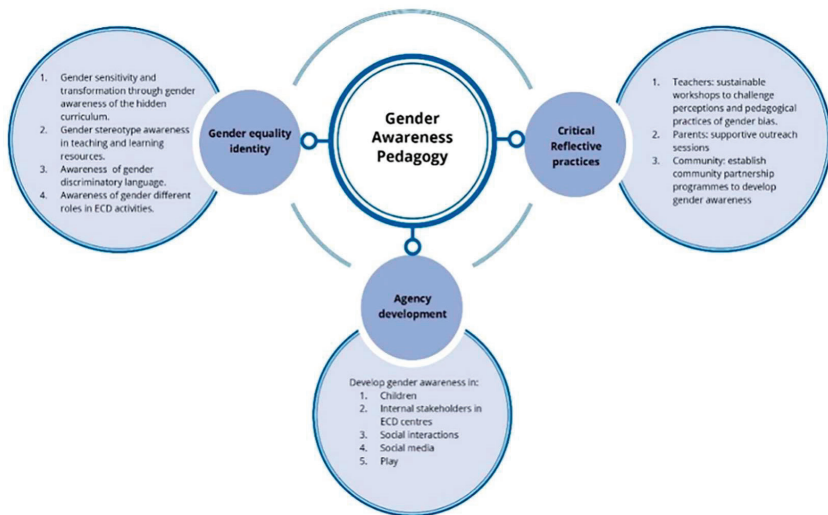


Figure 11.1: The RS-GAP

Source: Authors’ own

Key components of the RS-GAP framework are outlined below:

- **Professional development workshops:** Continuous professional development and training on gender equality

should be provided to ECE teachers. These workshops should raise awareness about hidden curricula, gender biases and their implications for classroom practices. Training sessions should also provide practical strategies to promote gender equity in teaching methods, discipline strategies and resource selection.

- **Critical review of curriculum resources:** Teachers and school administrators should critically evaluate and select classroom resources, such as books, learning materials and activities, to ensure they represent diverse and non-stereotypical gender roles. Guidelines and checklists can be developed to help teachers assess resources and eliminate gender-biased materials.
- **Reflective practice and collaboration:** Encourage teachers to engage in reflective practice and peer collaboration to examine their perceptions and classroom practices continuously. Establishing communities of practice or regular discussion forums where teachers can share experiences and insights can help maintain the momentum of change initiated by the awareness programme.
- **Gender-inclusive classroom management:** Teachers should implement gender-inclusive strategies in classroom management and interactions with children. This involves consciously balancing attention between boys and girls, offering all children equal opportunities to participate in activities and addressing children by name rather than reinforcing gender stereotypes through language.
- **Longitudinal monitoring and evaluation:** Schools and educational institutions should establish mechanisms for monitoring and evaluating the impact of gender awareness programmes. This will help track changes in teachers' practices and perceptions over time, identify areas for further improvement and sustain gender equity initiatives in the long term.
- **Policy advocacy and curriculum reform:** This study's findings highlight the need for broader advocacy at the policy level to include gender sensitivity training in teacher education programmes. Curriculum reforms should integrate gender

equality as a core component of early childhood education to create systemic and lasting change in ECD centres.

- **Teacher training workshops:** Conduct targeted professional development workshops to raise teachers' awareness of gender bias and its impact on their pedagogical practices. These workshops should include practical strategies to challenge stereotypes in classroom activities, interactions and resource selection. Teachers should be equipped with skills to promote gender equity in everyday ECE practices.
- **Parental guidance sessions:** Host outreach sessions that guide parents on cultivating gender awareness at home. These sessions should emphasise the importance of balanced language use, equitable activities and critical media consumption. Parents should be encouraged to reflect on and challenge gender stereotypes that may unconsciously shape their interactions with their children.
- **Community and partnership programmes:** Establish community-based partnership programmes to raise awareness about gender stereotypes and their effects. Collaborate with community organisations, local government and stakeholders to promote inclusive gender norms beyond the classroom. By integrating community efforts, the framework can create a more holistic and sustainable approach to gender awareness.
- **Curriculum and resource evaluation:** Advocate for the critical review and revision of ECD curricula and teaching materials to eliminate gender bias. Schools and educational policymakers should use the RS-GAP framework as a guideline to ensure that all learning materials and activities promote gender equality and reflect diverse gender roles.
- **Monitoring and support systems:** Implement systems to monitor and evaluate the effectiveness of the RS-GAP framework. Schools should evaluate teachers' practices and children's responses regularly to ensure ongoing progress toward gender inclusivity. Additionally, provide continuous support and mentorship to teachers and staff to reinforce gender-equitable

pedagogical practices.

- **Collaborative dialogue and reflection:** Encourage open dialogue and reflection sessions among teachers, parents and community members. These sessions can provide opportunities to share experiences, address challenges and foster mutual learning on gender awareness. A culture of collaboration will support ongoing conscientisation and commitment to gender equity.
- The RS-GAP framework promotes a sustainable and comprehensive approach to gender equality by fostering gender awareness among all stakeholders. Implementing this framework in ECE will lay a strong foundation for children to develop gender-equitable identities, positively impacting their academic, career and socio-economic outcomes.

By implementing these recommendations, ECE teachers can continue to challenge gender stereotypes, creating a foundation for more inclusive and equitable early learning environments that positively impact the development of all children.

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Chapter Twelve: Contextual Intelligence and Educational Policy: Evaluating the Influence of the Basic Education Laws Amendment Act on South African Schools

Dr René Beyers-Prinsloo

Faculty of Education, University of Pretoria, South Africa

Introduction and background

South Africa's education system continues to bear the hallmark of structural inequalities inherited from the apartheid era. Although landmark reforms such as the South African Schools Act 84 of 1996 (hereafter referred to the Schools Act) signified a critical move toward inclusivity and democratic school governance, enduring challenges around equitable access, language policy and governance structures persist (Kruger et al. 2024). These challenges often surface in disputes between school governing bodies (SGBs) and provincial education departments, particularly in relation to learner admissions and the application of language policies. The persistent tension between decentralised autonomy and the drive for centralised policy coherence has led to significant reforms, most notably the Basic Education Laws Amendment Act (hereafter referred to the BELA Act), which aims to strengthen governance while promoting greater educational equity.

Initially introduced to the National Assembly on 10 January 2022 as the Basic Education Laws Amendment Bill (BELAB), the BELA Act was signed into law by President Cyril Ramaphosa on 13 September 2024 as Act No. 32 of 2024 (Republic of South Africa [RSA], 2024). This legislation introduces substantial amendments to the Schools Act and the Employment of Educators Act 76 of 1998 (EEA), aligning policy with the evolving educational demands of a democratic South Africa (Kruger et al. 2024; Mbinqo-Gigaba 2023). Although the BELA Act affirms

constitutional values such as equity, access and inclusivity, some of its most debated clauses pertain to the centralisation of authority over public school language and admissions policies, previously the domain of SGBs.

Following a three-month suspension period to allow for public consultation, the President Ramaphosa approved the full implementation of the BELA Act, including its controversial provisions on language and admissions policies, in December 2024, without any amendments (Juta 2024). These provisions, now enacted as law, grant provincial Heads of Department (HODs) overriding authority in determining school language and admissions decisions, significantly shifting decision-making power away from local school communities. While this centralisation aims to ensure standardised practices and eliminate discriminatory barriers, it has also raised concerns about policy responsiveness to school-specific needs (Kruger et al. 2024).

This shift in governance prompts a critical inquiry: Can centralised decision-making structures accommodate the complex and varied realities of individual schools across South Africa? This question is particularly urgent when viewed through the lens of contextual intelligence, which emphasises the importance of tailoring decisions to the socio-economic, cultural and political environments in which they are applied (Marishane 2020). The BELA Act, by consolidating authority in provincial bureaucracies, raises important questions about whether decision-makers are sufficiently equipped, both institutionally and intellectually, to engage with localised and individual school contexts.

This chapter investigates the implications of the BELA Act through the lens of contextual intelligence, drawing on theoretical models of discretion, school autonomy and multi-level governance. It explores whether the BELA Act's centralisation of power enhances or impedes effective school leadership and governance, particularly considering the diverse demographic and geographic contexts in which schools operate. By focusing on the language and admissions policies now governed by the BELA Act, this chapter contributes to the discourse on how educational policy should navigate the balance between national equity goals and local responsiveness, with the aim of achieving sustainable, inclusive education reform in South Africa.

Methodology

This chapter adopts a conceptual and document-based research approach to explore how the BELA Act affects South African schools, using the lens of Contextual Intelligence Theory. Instead of collecting new empirical data, the chapter relies on a structured analysis and interpretation of secondary sources such as legislation, policy frameworks, literature and relevant court decisions.

The approach aligns with what Cohen et al. (2018) describe as a non-empirical, legal-analytical method, one that critiques and evaluates policy changes by interpreting current legal texts and situating them within theoretical models. Specifically, the chapter draws on Sternberg's (2005) Triarchic Theory of Contextual Intelligence and Marishane's (2016) model of contextual intelligence to assess how local realities influence the implementation of education reforms. Central to this inquiry is a critical examination of legislative instruments such as the Schools Act and the BELA Act, alongside pivotal Constitutional Court cases like *Hoërskool Ermelo* (2010) and *Rivonia Primary* (2013). The chapter synthesises literature on school autonomy, centralisation and governance to explore how national policy interacts with the varied contexts of public schools, particularly in relation to language and admissions. By applying these techniques, this chapter contributes to a deeper understanding of educational policy implementation in South Africa. It does so without engaging human participants, making it both theoretically robust and ethically non-intrusive.

Historical contextualisation of South African Schools Act and governance tensions

Since the late twentieth century, decentralisation has gained global traction as a reform strategy across sectors, including education. According to Dyer and Rose (2005), decentralisation is often framed as a key component of modernisation, and Karlsen (2000) argued that it enables more flexible, locally responsive governance. In post-apartheid South Africa, the democratic transition aligned strongly with this global trend. Educational

reforms placed significant emphasis on community participation, local accountability and the devolution of decision-making power to school level (Du Plessis 2020).

The Schools Act institutionalised this vision of participatory democracy in education. The Schools Act was founded on the principle of shared responsibility between the state and the public (RSA 1996c). Its preamble explicitly calls for a system in which citizens accept responsibility for the organisation, governance and funding of schools in partnership with the State. This vision was reinforced by Section 4(m) of the National Education Policy Act 27 of 1996, which promotes broad public participation in policymaking and stakeholder representation in governance structures across the education system (RSA 1996b).

Together, these Acts established a governance framework based on decentralised authority, most notably through the creation of SGBs. SGBs were granted significant powers over language policy, admissions and general management (RSA 1996c). The intent was to foster context-sensitive decision-making, ensure democratic responsiveness to local needs and build community ownership over schools.

However, as education governance evolved, tensions began to surface. Despite the legislative commitment to decentralisation, provincial and national education departments have increasingly exerted control over areas originally entrusted to SGBs. Du Plessis (2020: 167) describes this paradoxical shift as ‘decentralised-centralism’, a hybrid governance model where decentralisation exists in law, but is frequently overridden by bureaucratic and policy control. This dynamic has become especially evident in contentious areas such as language policy reform, school closures and curriculum mandates (Du Plessis 2020).

Although the Constitution promotes co-operative governance and discourages unnecessary legal disputes between levels of government, courts have frequently been called upon to adjudicate conflicts between SGBs and education departments. These legal interventions reflect Weiler’s (1990) insight that decentralisation challenges a state’s capacity to maintain coherent policy implementation and institutional legitimacy. Beckmann and Prinsloo (2009) further argue that successive policy amendments have subtly, but systematically eroded SGB autonomy. While the rhetoric

of community participation remains, practice increasingly reflects a shift towards recentralisation.

These developments suggest that South Africa's original decentralisation vision, enshrined in the post-apartheid educational reforms, is now under increasing pressure. The centralising trajectory embedded in both policy and practice has amplified tensions around school autonomy, particularly in areas such as language rights, admissions and professional discretion. Understanding this historical arc is essential for assessing the implications of the BELA Act and the extent to which it advances or undermines the participatory and context-responsive principles that originally guided the Schools Act of 1996.

The objectives of the BELA Act

The BELA Act aims to enhance South Africa's educational legislation by updating the Schools Act and the EEA to reflect the evolving needs of the education sector. Central to its objectives is the alignment of educational policies and structures with the Constitution, particularly Section 29(1)(a) and Section 7(2), which mandate the right to basic education and the duty of the state to promote and fulfil this right (RSA 1996a). In doing so, the BELA Act reinforces democratic values, social justice and equality, in line with Section 1 of the Constitution (RSA 2024).

This constitutional alignment ensures that all schools adopt inclusive practices, such as resource allocation for underprivileged schools and diversity programmes aimed at historically marginalised communities. A key contribution of the BELA Act lies in its effort to resolve longstanding ambiguities within Schools Act and the Employment of Educators Act, as emphasised in the BELA Act's preamble (RSA 2024). These ambiguities have historically contributed to tensions between SGBs and provincial education departments, especially in the context of language and admissions policies in dual-medium schools.

The *MEC for Education in Gauteng Province v Rivonia Primary School* (2013) case exemplifies these tensions. In this case, the Constitutional Court ruled that while SGBs have the authority to determine admission policies, their decisions are subject to review by provincial education

authorities (Du Plessis 2019). Importantly, the Court stressed that such a review must be exercised reasonably and in the best interests of the learners, highlighting the delicate balance between local autonomy and provincial accountability. This judgement underscored the need for more explicit statutory guidance, an area where the BELA Act seeks to provide clarity through strengthened legal provisions (Kruger et al. 2024). By modernising outdated legal frameworks, clarifying the roles and responsibilities of educational stakeholders, and strengthening alignment with constitutional values, the BELA Act positions itself as a key legislative tool for promoting a more inclusive, equitable and effective education system in South Africa (RSA 2024). While the BELA Act presents a progressive legislative vision, its success will depend on how effectively its provisions are applied within South Africa's diverse and complex educational contexts. The issue at hand is analysed from the perspective of contextual intelligence in the next section.

The role of contextual intelligence in evaluating the BELA Act's impact on school policy

Applying contextual intelligence theory to the BELA Act reveals how its implementation could reshape public school language and admissions policy across diverse school contexts. To address the challenges of centralisation, provincial education departments should establish advisory councils composed of local stakeholders to provide context-specific insights into policy decisions. Contextual intelligence refers to the ability to identify contextual factors in each situation and to adapt one's discretion to influence or act in a way that serves the best interests of learners (Kutz 2008a). This framework is especially pertinent in assessing the implications of the BELA Act, which introduces revisions to public school admissions (Section 5 of the Schools Act) and language policy (Section 6 of the Schools Act) (RSA 1996c). One of the more contentious elements of the BELA Act is its move to centralise authority within provincial education departments (Kruger et al. 2024). Although the goal is to establish fair and consistent standards across all schools, this approach to uniformity can unintentionally disregard the diverse and complex contexts unique to individual school environments.

For example, according to Madiba and Mabiletja (2008), a rural school

in Limpopo faced challenges in implementing a new admissions policy that did not account for the community's linguistic diversity, highlighting the importance of localised decision-making. This underscores the need for admissions policies that are responsive to local linguistic and cultural dynamics. Furthermore, Madiba and Mabiletja (2008) contend that in recent years, the Department of Education has tended to respond to language policy challenges in a reactive manner, rather than through strategic, forward-looking planning. For example, in the Polokwane Circuit in Limpopo, a school principal was suspended after facing strong community opposition, which led to learner absenteeism and ultimately contributed to the phasing out of African languages (Madiba and Mabiletja 2008).

Comparable difficulties in implementing centralised language policies are also apparent beyond the educational sphere. A recent case study of the Limpopo Provincial Legislature demonstrates that, despite constitutional commitments to multilingualism, English continues to dominate official communication and documentation (Madima et al. 2024). Madima et al. (2024) argue that although indigenous languages are formally recognised, they remain sidelined due to insufficient political commitment, inadequate interpreting infrastructure and weak implementation strategies (Madima et al. 2024). This top-down approach, lacking meaningful localisation, raises concerns within a contextual intelligence framework, particularly regarding the HOD's ability to accurately interpret and respond to local school contexts (Madima et al. 2024). It mirrors the concerns raised by the BELA Act, where provincial authority may fail to accommodate the unique socio-linguistic contexts of individual school communities (RSA 2024). The case highlights the broader necessity for decentralised, context-responsive language policy frameworks at all levels of governance (Madima et al. 2024).

Localised factors such as community demographics, cultural diversity and socio-economic conditions play a critical role in shaping effective admissions and language policies (Du Plessis 2019). By reducing the autonomy of individual schools, the centralised approach may fail to address these unique local contexts, ultimately undermining both the application of contextual intelligence and the pursuit of effective, locally

responsive governance (Du Plessis 2019). These recommendations align with Marishane's (2020) contextual intelligence framework, emphasising the integration of past experiences and future needs to adapt policies effectively. Ultimately, unless contextual intelligence is embedded into BELA Act's application, especially at the HOD level, the Act's progressive intentions risk being undermined by local contexts it fails to recognise.

Controversy surrounding the role of contextual intelligence in policy implementation

The BELA Act has sparked significant controversy due to its centralisation of authority over school admissions and language policies, granting HODs the power to make critical decisions in these areas, a shift criticised by the Democratic Alliance (2022) as undermining local governance structures. While the intention of such centralisation is to ensure uniformity and equity, this shift raises significant concerns regarding the implementation of these policies at school level. Critics such as Kruger et al. (2024) question whether HODs, operating at a provincial level, possess the capacity to fully understand and respond to the unique socio-economic, cultural and contextual realities of individual schools, which are integral to effective policy execution. This disconnect between provincial decision-makers and local school contexts risks creating a gap between the policy's intended goals and its actual impact.

Furthermore, the BELA Act has been cited as an example of the government's broader centralisation tendencies, which seemingly erode the powers traditionally held by SGBs and principals (Kruger et al. 2024). These local entities are often better positioned to ensure the practical and context-specific implementation of admissions and language policies. By reducing their authority, the BELA Act not only risks undermining the role of contextual intelligence, it also creates potential barriers to the smooth translation of policy into practice. The centralisation of decision-making may lead to policies, that while theoretically sound, fail to address the operational realities and challenges faced by schools, particularly in under resourced or rural areas (Kruger et al. 2024). As a result, the BELA Act highlights a critical tension in educational governance: balancing the need

for standardisation with the flexibility required for effective and inclusive policy implementation.

BELA Act: Amendments to school policies

The BELA Act introduces significant changes to the Schools Act, particularly through amendments to Section 5, which governs school admissions policies, and Section 6, which pertains to language policies (RSA 2024). These amendments reflect the Department of Basic Education's (DBE) broader aim to standardise practices across schools and promote inclusivity. However, these legislative changes have sparked considerable debate, with critics questioning their implications for school autonomy and their alignment with the principles of contextual intelligence. This section explores the amendments to Sections 5 and 6 in detail, along with the DBE's justifications for these changes, highlighting their potential impact on the governance and functionality of schools (RSA 2024).

Amendment of Section 5: Admission policy

The amended Section 5 of the Schools Act, as enacted through the BELA Act, grants the HOD of a provincial education department the authority to instruct a public school to admit a learner (RSA 2024). Additionally, the SGB is required to submit its admission policy, along with any proposed amendments, to the HOD for endorsement prior to implementation. According to the explanatory memorandum accompanying the original BELA Bill, the HOD must consider specific factors when reviewing such policies. If the policy is not endorsed, the HOD is obliged to provide feedback outlining which aspects require revision (DBE 2022: Section 2.4.3, Memorandum on the Objects of the Basic Education Laws Amendment Bill).

However, without the application of contextual intelligence, that is, an understanding of the unique socio-economic, cultural and educational realities of individual schools, this centralised authority may risk undermining the best interests of learners and their communities. The amendment shifts decision-making power away from local governance

structures, potentially weakening the SGB's ability to design admission policies that reflect school-specific needs.

The DBE's justification for the admissions policy amendment

The BELA Act formally amends Sections 5(5) and 5(7) of the Schools Act to clarify the allocation of authority in school admissions. Section 5(5) confirms that School SGBs remain responsible for developing admission policies within the framework of the Act and relevant provincial legislation (RSA 1996c). However, under the BELA Act, the final authority to decide on admission applications resides with the provincial HOD, who is tasked with ensuring compliance with learners' constitutional right to education (RSA 1996a, Section 29(1)).

This shift addresses persistent ambiguities about the relationship between school-level policies and provincial oversight. The HOD is no longer merely reviewing for alignment but is empowered to instruct a school to admit a learner, even when it conflicts with the existing SGB policy (DBE 2022, Section 2.4.3). Importantly, the Act now requires all SGB admission policies to be submitted to the HOD for approval. Policies that fail to align with provincial frameworks or that undermine equitable access may be rejected, provided that written justification is given, and revisions are requested (Kruger et al. 2024).

The DBE justifies these amendments as necessary to prevent discriminatory or exclusionary practices and to harmonise school governance with broader provincial equity objectives. In doing so, the BELA Act seeks to formalise a more consistent, centralised process for admission decisions while still recognising the role of SGBs in drafting policies, although under enhanced provincial scrutiny. This balance aims to ensure that school-level governance does not obstruct learners' access to public education, in accordance with constitutional and policy obligations.

Amendment of Section 6: Language policy

Language policy in public schools is central to education in South Africa, shaping learners' access to quality education and supporting their

development. To address this, the BELA Act introduces significant changes to the processes for establishing and revising school language policies. Under Section 5(a) of the BELA Act (RSA 2024), SGBs must submit their language policies and any amendments to the HOD for approval. The HOD may either endorse these policies or return them with recommendations for revision. Additionally, the HOD has the authority to instruct schools to adopt an additional language of instruction, provided such decisions follow prescribed procedures and consider specific factors (DBE 2022, Section 2.5.2).

The procedural requirements include notifying the SGB of the intent and rationale for proposed changes, providing the SGB an opportunity to respond and holding public hearings to gather community input. The SGB must also provide feedback on the contributions received (DBE 2022, Section 2.5.8). Furthermore, the HOD must prioritise the learner's best interests, as outlined in Section 28(2) of the Constitution (RSA 1996a). These amendments aim to align language policies with constitutional principles while addressing South Africa's linguistic diversity.

However, the BELA Act's implications in a linguistically diverse country raise concerns. A hierarchical language structure persists in South African schools, with English dominating as the Language of Teaching and Learning (LoTL), followed by Afrikaans, with African languages ranked lowest. Despite constitutional mandates and policy reforms, this hierarchy continues to shape LoTL choices, even though research highlights the benefits of using learners' home languages as LoTL (Kruger et al. 2024; Van Staden et al. 2020).

Critics argue that centralising authority in the HOD risks undermining an understanding of individual school contexts. Kruger et al. (2024) caution that HODs, without sufficient community engagement, may make decisions that fail to respect learners' language rights under Section 29(2) of the Constitution. Limitations on these rights, according to Section 36(1), must be reasonable and justifiable (RSA 1996a). Effective implementation of these changes requires HODs to conduct thorough contextual analyses and apply contextual intelligence. Only through a contextually intelligent approach, grounded in school-specific needs and community realities, can language policies uphold constitutional rights and foster genuine inclusivity in South African education.

The DBE's justification for the proposed language policy amendment

The DBE justifies its language policy amendments, now formally enacted through the BELA Act, as aligning with constitutional principles and established judicial precedent (RSA 1996c; RSA 2024). Central to this justification is the Constitutional Court judgement in *Head of Department, Mpumalanga Department of Education v Hoërskool Ermelo* (2010), which emphasised the importance of constitutionally compliant language policies that prioritise the rights and interests of learners. The DBE maintains that the amendments to Section 6 of the Schools Act provide a legal mechanism for advancing inclusivity and fairness, balancing learner needs with constitutional imperatives (RSA 1996c).

The *Ermelo* case involved an Afrikaans-medium school that denied admission to English-speaking learners based on its SGB-drafted language policy. The Court ruled this exclusion unconstitutional, citing violations of the rights to equality (Section 9) and education (Section 29) of the Constitution (RSA 1996a). While acknowledging the significant role of SGBs, the judgement clarified that their decisions may be subject to review by provincial HODs (Kruger et al. 2024). This ruling affirmed that learners' best interests must guide all policy decisions, a principle that underpins the BELA Act's new provisions.

In addition, the *Ermelo* and *Rivonia* judgements affirm the constitutional principle articulated in Section 28(2): that a child's best interests are paramount (RSA 1996a). These rulings support the argument that professional discretion, whether by SGBs or HODs, must be exercised in ways that are both constitutionally compliant and contextually informed. Constitutional adherence does not negate the value of local knowledge; rather, it necessitates decisions that integrate normative standards with lived school realities. This underscores that while SGBs retain a recognised legal role in governance, their discretion is not absolute. The BELA Act, by centralising certain powers, especially over admissions and language, codifies a framework that shifts the final authority to provincial HODs, particularly in cases where learner rights might be compromised.

In *MEC for Education, Gauteng Province v Rivonia Primary School* (2013), the Constitutional Court reinforced this role of oversight, confirming that

provincial departments may intervene where SGB decisions risk infringing on access to education. These cases highlight the persistent tension between decentralised school governance and provincial authority, a dynamic the BELA Act now formalises in law (Kruger et al. 2024).

While these legal precedents aim to protect learner rights and foster inclusion, the BELA Act's expansion of HOD power raises implementation concerns. Specifically, how provincial officials will interpret and respond to diverse linguistic and cultural school contexts remains a key concern. From the lens of contextual intelligence, effective oversight requires sensitivity to each school's demographic realities, community background and language needs (Marishane 2020).

Drawing from the principles established in these judgements, the DBE's proposed amendments aim to bridge the gap between current practice and constitutional mandates. By limiting exclusive SGB control and reinforcing the state's duty to protect learner rights under Section 29(2) of the Constitution (RSA 1996a), the policy changes are intended to cultivate a more equitable and inclusive educational environment. However, evaluating whether this legal shift leads to equitable outcomes necessitates a framework that accounts for the variation across local school context. The following section outlines the principles of contextual intelligence and differentiated school autonomy.

Interrogating the role of HODs through contextual intelligence

Although the BELA Act assigns HODs a central role in overseeing the implementation of language and admissions policies (RSA 2024), this concentration of authority introduces both constitutional and practical concerns. Considering South Africa's complex and varied educational contexts, it is essential to critically assess whether HODs can exercise their discretion in ways that are responsive to the specific needs of individual schools. Anchored in the concepts of contextual intelligence and professional discretion, this section examines the extent to which HODs, embedded within provincial bureaucracies, are institutionally and practically prepared to engage meaningfully with the everyday realities

faced by schools across the country.

Although existing literature predominantly frames school principals as the primary agents of contextual intelligence, these insights are equally relevant to HODs, who, under the BELA Act, are now expected to exercise complex discretionary authority across diverse educational settings. Yet, a crucial distinction must be acknowledged, unlike principals, HODs are typically geographically and institutionally distanced from the specific school communities impacted by their decisions. This presents a significant dilemma: how can HODs exercise professional discretion grounded in contextual intelligence without direct exposure to a school's unique cultural, linguistic and socio-economic realities? When doing so, HODs must act in accordance with constitutional obligations, particularly Section 28(2), which states that a child's best interests are of paramount importance, and Section 29(1), which guarantees every learner the right to basic education (RSA 1996a). These constitutional provisions provide the normative foundation upon which contextually intelligent discretion should be applied (Beyers 2023). In contrast, principals operate within their local environments and therefore possess a more intimate understanding of contextual dynamics. Without deliberate strategies to bridge this contextual divide, there is a real danger that HOD-level decision-making, despite good intentions, could inadvertently promote centralised uniformity, undermining the very responsiveness and inclusivity that educational policy reforms aim to achieve. This structural distance raises feasibility concerns about the extent to which HODs can authentically interpret, contextualise and apply policy with the level of nuance that school-level actors possess.

To lead effectively in diverse school settings, principals must develop contextual intelligence, which encompasses the ability to adapt decisions to dynamic and context-specific variables (Kutz, 2008b). According to Sternberg (2005), this involves three interrelated abilities: analytical; creative and practical. Analytical ability includes evaluating and comparing information (Marishane 2020), while creative ability refers to innovation and generating novel ideas. Practical ability, crucial for school leadership, involves applying knowledge to solve everyday problems by adapting, shaping, or selecting situations (Marishane, 2020). Kutz (2008b) outlines

three overlapping competencies of contextual intelligence: understanding past events; being aware of present factors and envisioning a preferred future. Principals must apply intuition, using past experiences to guide present decisions (Dane and Pratt 2007), especially when time is limited or contexts are complex. Effective professional discretion stems from this intuitive competence (Benner, 2001; Molander et al. 2012).

In South Africa, the Principal Standards Policy (RSA 2016) recognises the increasing complexity of school contexts, calling for context-sensitive leadership. Boote (2006) and Du Plessis (2019) emphasise that discretion must align with each school's unique needs. Thus, school improvement depends on principals' ability to make informed, contextually responsive decisions (Marishane and Mampane 2019). According to Kutz (2013) and Marishane (2020), two critical elements of Contextual Intelligence Theory impact school leadership today, namely influence and context. Kutz (2013) identifies influence as the essence of leadership, while Marishane (2020) explains it involves the leader's choice to adapt to or shape the environment. A contextually intelligent principal draws on past experience, present insight and future imagination to guide such decisions. Additionally, the theory acknowledges the complexity of socio-cultural contexts in which leadership is enacted. In South Africa's diverse education landscape, success depends on a principal's ability to navigate cultural, economic and geographical differences (Marishane and Mampane 2019). Effective leadership requires alignment between purpose, context and agency (Leithwood and Riehl 2003), reinforcing the dynamic nature of contextually intelligent decision-making.

Contextual intelligence enables school principals to apply professional discretion appropriately within their unique environments (Kutz 2008b; Marishane 2016). Beyers (2023) argues that principals must assess and adapt their professional discretion based on a deep understanding of dynamic, context-specific factors. Participating school principals in the study by Beyers (2023: 324), consistently highlighted that a 'one-size-fits-all' approach is ineffective, as each school operates within a unique context shaped by cultural, socio-economic, linguistic and geographical factors, necessitating carefully tailored and context-sensitive decision-making. Principals argued the importance of evaluating both policy and contextual

factors before making decisions. They noted that rigid policy frameworks often limit their discretion, especially in diverse South African schools. The principle of *audi alteram partem* (hear the other side) was also deemed essential in guiding fair decisions (Oosthuizen and De Wet 2021).

Contextual demands, ranging from accountability pressures and media influence to COVID-19 and diversity in school demographics, shape how discretion is applied (Braun et al. 2011). Emotional intelligence was widely recognised by participants as integral to contextual intelligence and sound leadership (Marishane 2020). Moreover, fostering a positive school culture and climate was seen as vital for enabling thoughtful and responsive leadership. Ultimately, affirm that professional discretion, grounded in contextual and emotional intelligence, is critical for effective school leadership (Beyers 2023). This theoretical lens affirms that the success of the BELA Act's implementation depends not just on legal authority, but on the ability of decision-makers to act with contextual sensitivity and constitutional fidelity. The following section explores how contextual intelligence can be embedded in education policymaking frameworks.

Contextual intelligence as a framework for educational policymaking

The theory of contextual intelligence, rooted in Sternberg's Triarchic Theory of Human Intelligence (1985), highlights the capacity to adapt decisions and leadership behaviours to dynamic, context-specific factors. Kutz (2008a) frames this as an intuitive skillset that enables actors to identify contextual variables, interpret situational dynamics and adjust responses in ways that exert appropriate and effective influence. Marishane (2020) extends this to educational leadership, emphasising that effective decision-making requires synthesising past experiences, present realities and future possibilities to inform adaptive, community-responsive strategies. This understanding is particularly relevant in a country as socio-culturally diverse as South Africa (Leithwood and Riehl 2003; Marishane and Mampane 2019).

Applied to education governance, contextual intelligence provides a valuable lens for evaluating the implementation challenges and equity

implications introduced by the BELA Act, particularly in relation to language and admissions policy reforms. However, as Du Plessis (2020) and Kruger et al. (2024) caution, such centralisation may create disconnects between provincial decisions and school-specific realities. Without structured mechanisms for local engagement, HODs may lack the nuanced understanding required to make equitable and legally sound decisions in alignment with Section 28(2) of the Constitution (RSA 1996a), which foregrounds the best interests of the child. Contextual intelligence addresses this by prioritising community-specific factors such as linguistic composition, socio-economic diversity, historical marginalisation and cultural norms (Madima et al. 2024; Madiba and Mabiletja, 2008). For example, Beyers (2023) found that school principals frequently rejected one-size-fits-all directives, citing the importance of adapting decisions to the socio-cultural and linguistic make-up of their communities. Principals argued that professional discretion must be exercised through a dual awareness of legal mandates and local dynamics, supported by values such as fairness and procedural justice (Oosthuizen and De Wet 2021).

SGBs, by virtue of their embeddedness in local contexts, play a key role in tailoring language and admission policies to school needs. However, the BELA Act risks weakening SGB discretion, as noted at the SAELA conference (Beyers-Prinsloo 2024), raising concerns about whether top-down policy can meaningfully reflect local complexity. Marishane (2020) argues that policies can only achieve inclusivity if local actors have the agency to interpret and implement them contextually. Ultimately, contextual intelligence offers a bridge between legal authority and lived reality. As Van der Merwe (2013) points out, leadership functions cannot be divorced from local knowledge, especially when school principals and SGBs are expected to comply with increasingly centralised mandates. Differentiated implementation strategies, such as regional advisory panels, contextual audits or participatory forums, could empower HODs to make better-informed decisions while ensuring constitutional compliance. Embedding contextual intelligence into BELA's governance framework could promote a more equitable, responsive and sustainable model of educational governance, one that honours both policy consistency and community voice.

Contextual intelligence and Du Plessis's differentiated levels of school autonomy

Considering the BELA Act's move toward standardised, centralised governance, Du Plessis's model offers a compelling alternative that preserves the adaptability and responsiveness essential to equitable school policy implementation. To address this concern, Du Plessis (2019) presents a model for differentiated levels of autonomy, emphasising the importance of tailoring responses to the specific needs of different settings and times. Contextually intelligent school leadership is underscored as a critical factor for achieving sustainable progress in schools. This model focuses on capacity building at the local level by considering various contextual factors, such as the political environment and cultural diversity (Du Plessis and Küng 2019). It advocates for a contextually intelligent approach to the formulation and implementation of legal provisions and amendments, ensuring that policies are relevant and effective within diverse school contexts (Du Plessis and Küng 2019). The model also acknowledges that individuals operate within multiple contexts simultaneously, necessitating unique skills for effective management and leadership (Kruger et al. 2024). The model promotes adaptive legal implementation by recognising that individuals operate within multiple overlapping environments, requiring leadership that is both responsive and nuanced. By promoting an understanding of contextual diversity, this approach encourages contextually intelligent strategies for capacity building and overall school improvement (Du Plessis and Küng 2019). In doing so, Du Plessis's framework offers a pathway to implement BELA's aims more equitably by embedding flexibility and local insight into otherwise standardised procedures.

Centralised approach versus local autonomy

The BELA Act promotes a more centralised approach to school governance, particularly in language and admissions policies. While this standardisation intends to ensure equity and consistency (Kruger et al. 2024), it risks being too rigid and disconnected from the lived realities of individual schools and communities. Without meaningful consideration of contextual factors,

such centralisation may hinder responsive and inclusive educational reform. A reassessment of the balance between provincial oversight and local autonomy is therefore essential. Empowering SGBs and school leaders through contextual intelligence enables more flexible and community-sensitive decision-making (Du Plessis 2019; Du Plessis and Küng 2019). Such an approach ensures that policies reflect the socio-cultural, economic and logistical conditions of the communities they are intended to serve. Ultimately, promoting differentiated local autonomy, informed by context and guided by the Constitution's emphasis on the best interests of the child (Section 28(2)) provides a pathway to more equitable, effective and sustainable policy implementation in South African education (RSA 1996a).

Challenges of a 'One Size Fits All' approach

In South Africa, diverse socio-cultural backgrounds, socio-economic conditions, historical inequalities and geographical factors (rural and urban) present complex challenges for school governance. Marishane and Mampane (2019) highlight that the ability of principals to navigate these complex contexts often determines their success. Schools operate in varied environments, and rigid centralised policies, such as those enacted through the BELA Act, may overlook the specific challenges and opportunities inherent in these settings (Kruger et al. 2024).

Beyers (2023: 324) offers empirical support for this critique, with participating principals consistently emphasising that a 'one-size-fits-all' governance approach is ineffective in South Africa's diverse education system. The principals argued that policies must be both procedurally fair and contextually grounded, considering cultural, linguistic, socio-economic and geographic differences. Beyers (2023) further argues that rigid frameworks often constrain school principals' ability to exercise professional discretion, which is essential for ensuring the best interests of learners in each specific context. Therefore, tailored, context-sensitive governance strategies are essential to ensure that educational policies not only comply with national standards, but they also meet the nuanced needs of individual school communities. Embedding contextual intelligence into

policy implementation, particularly through empowering local decision-makers such as principals and SGBs, enhances equity, effectiveness and the sustainability of educational transformation.

Contribution to educational policy discourse

The discourse on educational policy underscores the importance of contextually intelligent policymaking, which requires educational leaders and policymakers to understand and navigate the unique cultural, social and political landscapes in which schools operate (Marishane 2020). In the context of the BELA Act's increased centralisation of authority, these insights affirm the necessity of grounding legislative implementation in localised realities and stakeholder engagement (Du Plessis 2019; Marishane 2020). This approach emphasises the integration of insights from various education stakeholders and the careful consideration of specific challenges and opportunities within local contexts. By fostering a nuanced understanding of these factors, policymakers can implement strategies that are responsive to the needs of communities, leading to more effective governance and leadership. Tailoring educational strategies in this way enhances the overall quality of education, ensuring that policies are equitable, inclusive and aligned with the diverse realities of school environments.

Shifting dynamics of power

The shifting dynamics of power in educational governance, as enacted through the BELA Act, reflect a significant transfer of authority from SGBs to the state. This shift could reduce the autonomy and decision-making capabilities of SGBs, resulting in more uniform policies that may fail to effectively address local needs and contexts. Centralisation risks diminishing the role of contextual intelligence, which is critical for effective governance as it enables responses tailored to the unique cultural, social and political landscapes of each school. The loss of SGB autonomy may undermine the responsiveness and effectiveness of school-level governance, leading to less adaptive policies that fail to reflect the diverse realities of

school communities (Kruger et al. 2024).

The Federation of Governing Bodies of South African Schools (FEDSAS) has raised concerns about the proposed amendments, which grant provincial heads of education the authority to determine schools' admission and language policies (Oosthuizen 2023). This shift contradicts the principle of collaborative governance, which ensures decisions are made inclusively and in alignment with the specific needs of local communities (Oosthuizen 2023). Dr Deacon, Chief Executive Officer of FEDSAS, further critiques the amendments, arguing that they undermine the intentions of the two White Papers on education, potentially steering the system towards a totalitarian model where parental involvement is diminished, and improvements in education are unlikely to materialise (Oosthuizen 2023). These critiques highlight the risks of centralisation in eroding local governance structures and limiting the adaptability of educational policies. Taken together, these critiques underscore the need for a more balanced approach, one that recognises the importance of national standards while empowering schools through contextually grounded decision-making. Such a shift not only disrupts collaborative governance, it risks marginalising school-level contextual intelligence, the very foundation for responsive, inclusive and constitutionally aligned policymaking.

Conclusion

The BELA Act centralises decision-making at the state level, significantly reducing the autonomy of SGBs. This centralisation raises important concerns about the erosion of local governance capacity and risks undermining contextually intelligent policymaking, a cornerstone of effective and responsive leadership in South Africa's diverse school environments. The amendments may lead to rigid, one-size-fits-all policies that fail to reflect the unique socio-cultural, economic and geographic realities of individual schools. FEDSAS has voiced strong objections to these changes, arguing that they contradict the principles of collaborative governance and diminish the meaningful role of parents in shaping school policy. According to Deacon, the amendments risk steering the system toward a more authoritarian model, which may hinder, rather than advance,

genuine improvements in education (Deacon, as cited in Oosthuizen 2023). While the DBE justifies the amendments as necessary to ensure equitable access, critics caution that this logic may fall short if implementation fails to consider school-level diversity and stakeholder engagement. Reassessing the balance between national oversight and school-based discretion is, therefore, crucial. Localised decision-making, grounded in contextual intelligence, offers a compelling framework to navigate this complexity. It ensures that education policies are not only constitutionally sound, but also practically effective, tailored to community realities and capable of driving inclusive, sustainable change. Without this balance, the BELA Act risks becoming contextually ignorant, limiting its potential to transform education meaningfully.

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Part Three

Monitoring, Evaluating and Amplifying Impact: A Strategic Approach to Human-Centred Education

Chapter Thirteen: A Strategic Approach to Advancing Human-Centred Education in Complexity

Brian Chicksen

University of Pretoria, South Africa

Introduction

The world today faces unprecedented complexity and deep-seated challenges which, in some instances, are accelerating unabated. These global challenges threaten our continued human and planetary existence and span all dimensions of sustainable development: politico-legal; social; economic and the environment. In 2025 alone, a range of macro disruptions with attendant power imbalances are evident. Geo-political and economic conflict with rising populism and nationalism are changing established world orders; poverty and inequality within countries, across countries and across regions remain unaddressed and drive breakdowns of social cohesion; and the worsening impacts of climate change threaten humanity's future sustainability.

At country levels, complexity is informed by global forces and macro developments, as well as by multifaceted in-country dynamics. In the South African context, for example, in addition to dynamics in the macro environment, high levels of poverty, inequality and unemployment are aggravated by rampant corruption with a decline of the institutions that are needed to maintain and strengthen societal integrity. Losses from the public fiscus through wastage, mismanagement and corruption depletes the resources needed to bring about transformative change. The consequence is that complexity and the severity of challenges increase, while the ability to respond to them decrease, creating a vicious cycle of decay.

Global and national challenges with their attendant complexity are acutely experienced in the lives and well-being of people at community levels. This is particularly the case for those who are marginalised or

vulnerable. As within the national landscape, complexity and the conditions experienced are also influenced by specific community-level issues.

Across this hierarchy of complexity, we are clearly dealing with ‘wicked problems’ as articulated by Rittel and Weber (1973: 161–162) over five decades ago. The issues and challenges faced are inextricably linked to each other across spatial and temporal dimensions. Navigating and resolving such complexity, thus, cannot happen through linear or singular approaches, and central to bringing about transformative change, applying the concept of leverage is essential.

Quality education is well recognised as a critical vehicle to positively change the life opportunities of individuals and their communities. It thus, serves as a powerful source of leverage, which can be applied across the complexity hierarchy from local communities to national, continental and global levels. Testimony to the relevance and importance of education as a lever, is it being the primary focus of one the United Nations’ (UN) 17 global sustainable development goals (SDGs)—SDG 4. Notwithstanding limitations of the SDGs, including the rapid approach to their term in 2030, they represent a collaborative effort across an expansive coalition of countries in pursuit of a shared and sustainable future. This is outlined in the 2015 declaration ‘Transforming our world: the 2030 Agenda for Sustainable Development’ (United Nations 2015). In the broader sustainable development context, quality education traverses the politico-legal, social, economic and environmental dimensions of human and planetary co-existence.

Coupling human-centredness to quality education seeks to reconnect us with our basic humanity and to ensure that the solutions we individually and collectively generate are both relevant and attuned to improving the human condition. In this chapter we explore human-centred education in the context of complexity, the leadership and culture imperatives that create the conditions for a human-centred approach and propose a possible framework to advancing human-centred education in complexity.

Human-centred education at different orders of complexity

Exploring the relationship between human-centred education at different orders of complexity is a necessary starting point. Quality education (SDG 4) and its interfaces within the SDG framework represent first order complexity, whereas its linkages and dependencies in the broader sustainable development landscape represent second order complexity (Chicksen 2025).

Human-centred education within the SDG framework—First order complexity

In the 2015 UN declaration, the SDGs are presented discretely, without detailed clarification of the inevitable linkages and dependencies between them. Exploring their inter-relationships helps to make more sense of them and begins to identify opportunities for leverage to navigate complexity.

Acknowledging that there may be various ways of describing relationships between the goals, in 2021 the University of Pretoria developed a conceptual framework to advance accelerated action towards achieving the goals (University of Pretoria 2021). The framework is anchored on the belief that sustainable development and the SDGs are centred on the human condition. Critical and sequential components of the human condition include meeting the minimum requirements of our basic humanity—on being human; achieving the conditions and advancing the efforts needed to realise our full human potential; having realised our full potential, using our talents and skills to improve our human existence; advancing development in ways that are mindful of, and respect our planetary boundaries; embracing co-existence with all forms of life; and leveraging partnerships to amplify impact across the raft of SDGs. The 17 SDGs are clustered within these different categories as shown in Figure 12.1.



Figure 13.1: The UP SDG organising framework

Source: University of Pretoria (2021: 10)

Within this organising framework, the primary pathway is left to right with meeting the basic conditions of humanity serving as a prerequisite to realising ones’ potential and improving the human condition. Quality education features early in the pathway and thus, creates leverage to improve human existence in the context of planetary boundaries and co-existence with all forms of life. At the same time, SDG 4 has a two-way relationship with basic humanity, in that it is a key means towards addressing poverty and hunger.

Based on the linear nature of the SDGs and their relationships within the framework, this is categorised as first order complexity.

Human-centred education through a sustainable development lens—Second order complexity

Framing human-centred education through a sustainable development lens reveals a more complex set of interrelationships. Each of the four dimensions described represent a different face to the human-centred education conversation. At the same time, they have complex interfaces with each other, significantly amplifying complexity. These relationships are shown in Figure 12.2.

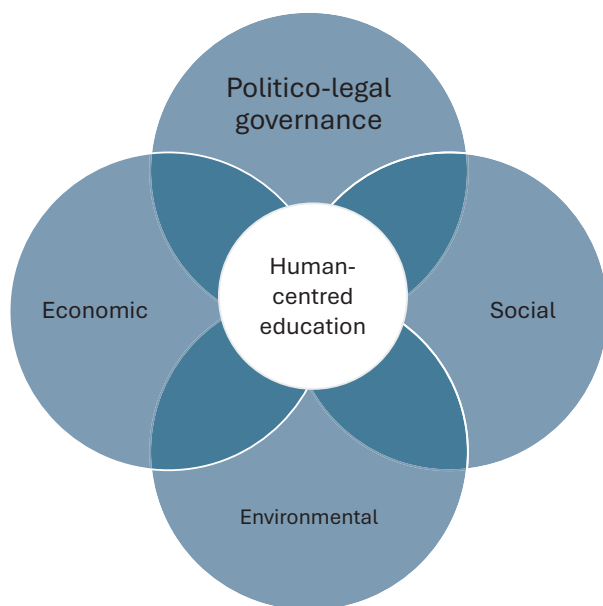


Figure 13.2: Human-centred education in the sustainable development context

As an example of this multifaceted set of relationships, the dual and unequal education system during South Africa’s apartheid era was clearly a dehumanising and political issue which was legislated. The consequences played out starkly in unequal access to quality education, worsening inequality and a wide range of negative social and economic impacts. Conversely broadening access to human-centred education is central to navigating the complexities and inequalities which continue to haunt South Africa and the African continent. Such education is also mindful of our co-existence with the planet and all forms of life.

The role of leadership in human-centred education

A human-centred leadership philosophy is critical to advancing human-centred education. Drawing from MacGregor’s Theory Y (MacGregor 2006), human-centred leaders create the conditions for people to realise their full potential and thus, make a difference. In a similar vein, Frankl describes ‘making a difference’ as being central to our human existence

(Frankl 1992). This contrasts with a Theory X philosophy which is akin to Taylor’s scientific management (Taylor 1911) where people are generally regarded as an extension of the machines that they operate.

Anchored on a human-centred leadership philosophy, and applying a systems leadership approach (MacDonald et al. 2018), leaders set direction and develop strategy. Central to their work is influencing the institutional tone and shaping the institutional culture required to achieve the desired strategic intent. The strategy and culture are given expression through policies and institutional systems, with the desired outcomes being engaged and capable people who deliver high performance. In the context of human-centred education, both staff and students thrive as they realise their full potential towards achieving their own *and* the institutions objectives. This is an iterative process as shown in Figure 12.3.

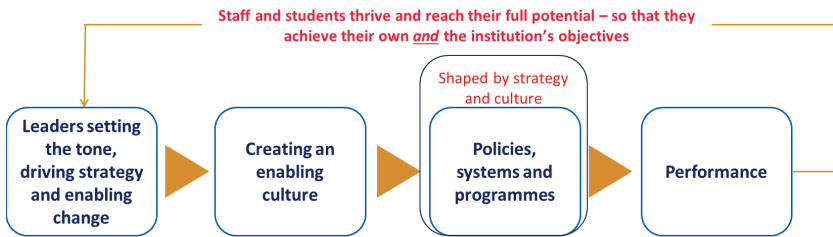


Figure 13.3: The work and role of leadership in human-centred education

This approach calls for leadership at multiple levels of institutional hierarches—both formal and informal—with leaders acting as agents and catalysts for transformative change. The enabling culture is underpinned by two fundamentals: the levels of trust between different participants; and the conditions created for the generation and application of innovative and creative solutions (Chicksen et al. 2018). High trust levels reflect humanity and a spirit of *Ubuntu* (I am because we are), while the conditions for innovation and creativity speak to one’s identity as institutions for higher learning.

Creating an enabling culture

An enabling culture does not develop by chance and requires intentional approaches and efforts. The University of Pretoria has developed a model for designing, evaluating and strengthening the human-centred culture which forms a platform for human-centred education (University of Pretoria 2024). Central to this approach is shifting the culture from being primarily transactional as seen in linear systems, to one that is transformational where individuals and systems are adept at navigating complexity.

The approach considers the two fundamental dimensions of trust and solutions. Each may have two extreme positions: low levels of trust or high trust levels; and the generation and application of linear and constrained solutions, or the generation and application of innovative and creative ones. While these dimensions have certain interdependencies, they are sufficiently discrete to form a 2x2 matrix as shown in Figure 12.4.

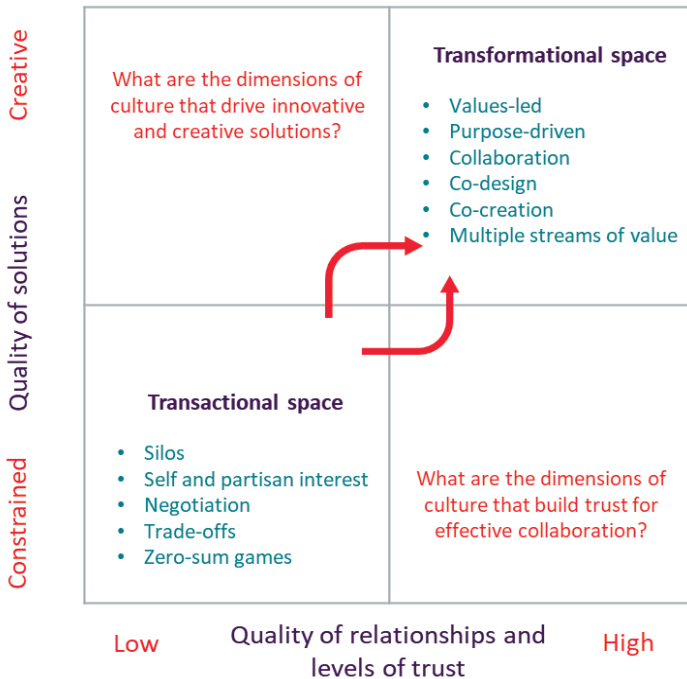


Figure 13.4: A two-pronged approach to designing a transformative culture

Source: Chicksen et al. (2018: 8)

In the setting of low levels of trust between different constituencies with attendant poor-quality relationships and the generation and application of constrained solutions, we find ourselves in a transactional space. Other features of this space include constituencies working in silos, often driven by self or partisan interest. When conflict inevitably arises, negotiations seek compromises and trade-offs and when these are unsuccessful, the courts are approached resulting in winners and losers—a zero-sum game.

An example of this in the South African educational ecosystem has been seen with disputes around various sections of the Basic Education Laws Amendment Act No. 32 of 2024 (Republic of South Africa [RSA] 2024). The act serves to update the legal framework for schooling and represents the biggest legislative reform since 2005 (Veriava 2024). At its heart are the ‘best interests of the child’ (Republic of South Africa [RSA] 2024: 14) principle, and the intent to broaden access and advance equality in education. Some sections such as school admissions and language policies have, however, generated both fierce support and criticism from different constituencies. These opposing positions are likely to be driven by partisan interests and are characterised by low levels of trust between those on either side of the conflict. The disputes are consequently heading to the courts for resolution, and the likely outcome is that one side will win and the other will lose.

The transformational space, on the other hand, is characterised by high levels of trust between participants, with the generation and application of innovative and creative solutions. Key features of the transformational space include being values-led and purpose-driven, collaborating and co-creating solutions for multiple streams of value by applying leverage to the right parts of a complex system. Playing in the transformational space is contingent on a human-centred leadership philosophy, a meaningful understanding of the complexity at hand as seen through the different perspectives of the various stakeholders, and the co-designed solutions being human-centred. Shifting from the transactional to the transformational space requires a two-pronged approach which comprises strengthening trust levels between participants and creating the conditions for innovative and creative solutions.

The prevailing culture is central to either enabling or preventing the shift, and it should be intentionally designed to enable it. At the University of

Pretoria, this is undertaken through co-design workshops at departmental, school and faculty levels. Recognising that culture is multifaceted, and comprises several dimensions, the critical dimension of the desired culture needed to build trust, and those needed to enable the generation and application of innovative and creative solutions are determined. Dimensions of culture which build trust are akin to universal human values and commonly include authentic caring, honesty and integrity, fairness and accountability. Those which enable innovation and creativity include courage, experimenting, critical thinking and collaboration.

Having determined these dimensions, workshop participants describe what they mean with each dimension and how they should be experienced in the desired culture. This process establishes a common language for shared meaning on each dimension, and a clear articulation of what it looks like and feels like in a human-centred culture. The combination of cultural dimensions with their different attributes forms the designed human-centred culture.

Translating the designed culture to Reason's levels of cultural maturity (Reason 1997), the human-centred leadership philosophy described earlier, positions the culture at a proactive level of cultural maturity. The designed culture and maturity framework also enable evaluation of the prevailing cultural maturity. Coupled to an analysis of why the prevailing culture is at a particular level of maturity, actions to shift the culture to a higher order of cultural maturity can be determined and implemented.

Navigating complexity

An enabling internal culture and establishing meaningful relationships across internal and external stakeholder groups forms a foundation for navigating complexity. These relationships are underpinned by valuing people, treating each other with dignity and respect and the philosophies of mutual benefit and shared value (London and Hart 2011). Within the context of mutual benefit, there is also shared risk and shared reward. Through shared risk, different stakeholders have some form of "skin in the game". This is not limited to financial risk but also includes social risk such as where community members face cultural and other forms of community

resistance for trying out new ways of doing things.

At the outset, it is important to make sense of the complexity faced. The issues or sets of challenges at hand are the starting point and should determine the voices that need to be around the table. Adopting an inclusive approach enables a broad array of perspectives for a more holistic mapping and understanding of the ecosystem within which the challenges are placed.

Multiple stakeholders have an interest and legitimate stake in education. Human-centred education acknowledges and values this, along with the different forms and sources of knowledge that they bring. Stakeholders include providers, policymakers, students themselves and the families and communities that they come from. Achieving a shared understanding of the challenges sets the scene for the co-design of solutions and collaborative implementation which are essential for co-ownership and sustainability. Additionally, an inclusive approach is likely to improve the quality of solutions developed, and the establishment of formal and informal relationships and networks is an important contributor to system resilience (Zolli and Healy 2012).

While there are a range of tools, such as root cause analysis, which can be used to evaluate challenges, ecosystem mapping is particularly useful. With challenges at the centre of the ecosystem, consequences, antecedent events, underlying drivers and contributing factors can be determined and clarified. Furthermore, linkages and dependencies between components across the ecosystem can be surfaced. Initiatives to drive transformative change should target underlying drivers for meaningful impact. Impact is further amplified where applying leverage to linkages and dependencies may create multiple streams of value. At the same time, potential unintended consequences should be considered, allowing for them to be addressed proactively.

An integral part of co-design is the development of a basket of indicators which will reflect success and impact. These should be seen from the perspectives of different stakeholders, since different constituencies accrue different forms of value and benefit. Value can be categorised into value that is protected through the management of risk and the prevention of adverse events, or new value that is created through capitalising on opportunities.

In both instances, the mix of indicators include both quantitative and qualitative measures which should seek to describe the difference that the suite of initiatives have made. In complex open systems, attribution of impact from the various initiatives is often difficult, as other dynamics are at play. Establishing baselines of the predetermined metrics is important, however, may not be sufficient. In evaluating performance, critical thinking and analysis with honest judgment by the mix of participants is needed.

A framework to advance human-centred education in complexity

The proposed framework is shown in Figure 12.5 and comprises four components: articulation of the intent; a set of principles which shape decision-making and actions; important enablers and a set of process requirements.

<p>INTENT</p>	<p>Advancing human-centred education in complexity for transformative societal impact.</p>	
<p>Principles <i>Implementing this framework is underpinned by the following principles:</i></p>	<p>Enablers <i>Key enablers of the framework include:</i></p>	<p>Process requirements <i>Successful implementation of the framework is demonstrated by processes for:</i></p>
<ul style="list-style-type: none"> - A leadership philosophy of human-centredness. - Embracing different perspectives and different forms and sources of knowledge. - Meaningful engagement with mutual respect. - Understanding complexity and being comfortable with ambiguity. - Issue-driven collaboration with different stakeholders for co-design and co-creation of solutions. 	<ul style="list-style-type: none"> - An enabling institutional culture. - Intentionally shifting from transactional to transformative approaches. - Capability in complex systems thinking and transdisciplinary work. - Critical thinking and analysis. - Co-ownership with shared risk and reward. 	<ul style="list-style-type: none"> - Building capacity in and nurture human-centred leadership. - Shaping an enabling institutional culture. - Building capacity in complex systems thinking and transdisciplinary work. - Collaborating with internal and external stakeholders around specific issues. - Co-designing initiatives for collaborative implementation. - Monitoring, evaluation, report and provide feedback. - Learning, improving and transferring knowledge.

Figure 13.5: A proposed framework to advance human-centred education in complexity Source: Chicksen et al. (2018: 14)

The framework organises different aspect of advancing human-centred education in complexity, seeking to demystify a difficult topic and thus, stimulate further dialogue. The approach is consistent with Rumelt’s conceptualisation of strategy which comprises understanding the challenges faced, establishing an approach to respond to them (policy) and developing a coherent set of actions (Rumelt 2011). Content of the framework is also drawn from previous work on a strategic framework for higher education to achieve SDG 4 targets (Chicksen 2024).

A pathway to impact

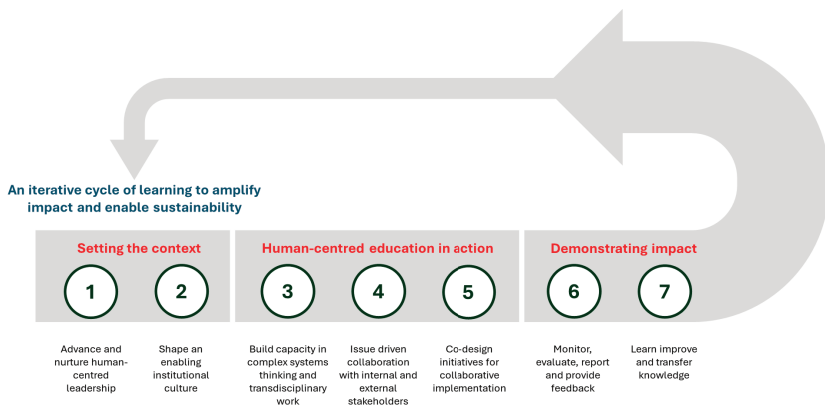


Figure 13.6: A pathway to impact
Source: Chicksen et al. (2018: 15)

The process requirements within the framework are structured in a sequential way, uses a plan-do-check-act logic and outlines key dependencies between the requirements. The process requirements can, thus, form the high-level steps of a pathway to impact (Figure 12.6), with each step determining the activities and work to be undertaken for that step. The sequencing of the steps and their related activities enables coherence of action.

Human-centred leadership is the starting point, with leaders setting the tone and shaping the institutional culture. In addition to discipline-based and education-related competences, building capacity in complex systems thinking and transdisciplinary work is important to navigating

complexity. Individuals must step out of their disciplinary silos and interact agilely within diverse contexts and with varied stakeholders. Using a suite of technical, managerial and emotional competences, and working as change agents, educators mobilise the different stakeholders around key issues to co-design initiatives for collaborative implementation. A mix of quantitative and qualitative indicators for success are incorporated into the design of initiatives, and these are evaluated at baseline, during and after implementation. Performance is analysed and evaluated providing the basis for feedback, further learning and knowledge transfer.

Concluding remarks

As previously described, education serves as an important driver to improving the human condition and to expanding life chances. Education, as seen through a traditional lens, however, may not be adequately geared towards navigating complexity and the deep societal challenges faced in South Africa and indeed the African continent. Using a design-thinking approach based on the concept of validity, changing the paradigm to one of human-centred education is likely to generate greater and more far-reaching impact. This is coupled to transformative leadership, strengthening competences in complex systems thinking and the ability to work in diverse contexts with different stakeholders.

Design of the framework and its subsidiary pathway to impact is supported by several heuristics, and while the strategic approach presented has been neatly packaged, the process is likely to be messy, arduous and will require much hard work. That is the very nature of complexity and the need to establish enduring relationships with people and the concepts presented seek to make sense of the messiness for more coherent action with impactful and enduring change.

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Chapter Fourteen: Concluding Thoughts and Way Forward

Saloshna Vandeyar

Faculty of Education, University of Pretoria, South Africa

This scholarly volume, *Advancing Education in a Complex World: A Human-Centred Approach*, offers a rich tapestry of theoretical and empirical contributions that collectively challenge conventional paradigms of education. Through the diverse lenses of philosophical grounding, research praxis, subject-specific pedagogy and policy critique, the chapters converge on a singular imperative: to reimagine education systems as fundamentally human-centred in both intent and execution.

The opening chapter establishes the conceptual foundation for understanding human-centredness within the broader terrain of complexity. The subsequent contributions then operationalise this foundation across multiple contexts—from research supervision, STEM education and mathematics instruction to early childhood development, curriculum reform and policy analysis. Central to this discourse is the recognition of education as an ecosystem—relational, dynamic and embedded in socio-cultural, political, economic and ethical realities.

Human-centred education positions people at the heart of educational decision-making, practices, and design (McGill 2021). It is founded on the principle that learning environments should foreground human needs, relationships and overall well-being. This orientation disrupts conventional assumptions about education by reconsidering its purpose, how learning occurs and the nature of relationships within educational contexts. Human-centred education provides a compelling alternative to narrow, test-driven models, advocating instead for a holistic approach that balances academic rigor with inclusivity, personal growth and well-being. Systems described as human-centred are intentionally developed with close attention to stakeholders, their interactions and the contexts in which they operate (Shum et al. 2019). As such, human-centred education supports lifelong, inclusive and emancipatory learning practices.

At its core, human-centred education reconceptualises education by foregrounding values such as care, empathy, flexibility and creativity. It seeks to cultivate individuals who are equipped to shape their own lives while contributing constructively to society. Human-centred education approaches emphasise the development of key interpersonal and intrapersonal competencies, including communication, adaptability, assertiveness, empathy and creative problem-solving—capabilities that are essential for navigating an unpredictable and rapidly evolving world (Shum et al. 2019). Ultimately, human-centred education aims to enable young people to live purposeful lives and to participate in building a just, inclusive and flourishing future (Thomson et al. 2020). It provides learners with the knowledge and professional capacities required to foster compassionate and equitable societies.

Human-centred education, as elaborated throughout this volume, is not simply about care or empathy in isolation. It demands critical engagement with paradigmatic worldviews (Chapter Two), reintegration of personal meaning in the sciences (Chapter Three), and systemic transformation in pedagogy (Chapter Four, Chapter Five and Chapter Eight). It calls for inclusive frameworks that address both cognitive and affective domains (Chapter Nine, Chapter Ten and Chapter Eleven), and policy responses that reflect contextual intelligence rather than centralised control (Chapter Twelve).

Several key themes emerge from this body of work. First, *Interconnectedness*: A recurring recognition of the intersection between the personal, political and pedagogical realms. Second, *Critical Reflexivity*: Authors advocate for a continual re-examination of inherited assumptions, practices and institutional frameworks. Third, *Inclusion and Equity*: Whether through arts education, gender awareness or linguistic diversity, the need for inclusivity is foundational. Finally, *Transformative Practice*: There is a shift from prescriptive models to participatory, dialogic and adaptive modes of teaching, research and leadership.

The interplay of diverse disciplinary perspectives, enriched by the vibrant infusion of innovation and ingenuity, reflect the dynamic ways in which education can be advanced within an increasingly complex global context. Central to this progression is a human-centred approach that

compassionately engages with the multifarious dimensions of complexity. This orientation seeks to achieve a thoughtful equilibrium between technical competencies (hard skills) and interpersonal or affective capacities (soft skills), affirming the enduring significance of a humane ethos in educational praxis.

Suggestions for the way forward

1. Embedding Human-Centred Approaches in Teacher Education

Human-centred education begins with how teachers are prepared. Teacher education programmes must, therefore, move beyond technical competence to foreground relationality, care, dignity and contextual responsiveness as core professional values. Adopting a human-centred ethos means recognising pre-service teachers as whole persons whose identities, histories and lived realities shape their professional practice. Initiatives such as *Inkhulumo* model and gender awareness programmes exemplify how dialogical, inclusive and contextually grounded approaches can be embedded within teacher preparation. These models demonstrate that human-centred education is not an abstract ideal, but a scalable and sustainable practice that equips teachers to engage ethically and empathetically with diverse learners and communities.

2. Rethinking Curriculum and Assessment

A human-centred approach demands curricula that are responsive to learners' diverse ways of knowing, being and becoming. Curriculum design—across disciplines such as mathematics, robotics and the arts—must, therefore, value multiple intelligences, cultural epistemologies and human values alongside disciplinary knowledge. Equally important is the reimagining of assessment practices. Traditional assessment regimes often marginalise learners by privileging narrow forms of achievement. Human-centred assessment, supported by both conventional and emerging digital technologies as demonstrated in Chapter Six, can create more inclusive

and equitable opportunities for demonstrating learning. Such approaches foreground assessment for learning, rather than merely of learning, reinforcing learner dignity and agency.

3. Fostering Contextually Intelligent Leadership

Human-centred education cannot flourish without leadership that is sensitive to context and complexity. Educational leadership and policymaking must, therefore, shift away from one-size-fits-all solutions toward decentralised, contextually intelligent governance. As illustrated in critiques of the BELA Act, policies that ignore the socio-cultural, historical and economic realities of schools, risk undermining human dignity and local agency. Contextually intelligent leadership recognises schools and communities as relational spaces, requiring policies that are flexible, participatory and responsive to lived conditions. This orientation is essential for ensuring that educational reforms serve people rather than systems alone.

4. Strengthening Research–Practice Integration

Human-centred education calls for knowledge production that is collaborative, ethical and transformative. Participatory Action Research (PAR) and other engaged methodologies exemplify how research can be embedded within practice to address real-world educational challenges. By positioning educators and learners as co-researchers, these approaches honour local knowledge and lived experience. Strengthening the integration between research and practice ensures that scholarship does not remain abstract or detached but becomes a catalyst for meaningful change within educational communities.

5. Advancing Interdisciplinary and Transdisciplinary Dialogues

The complexity of contemporary educational challenges necessitates approaches that transcend disciplinary boundaries. Human-centred

education benefits from interdisciplinary and transdisciplinary dialogues that bring together insights from philosophy, science, technology, the arts and policy. Such integration enriches educational thinking by acknowledging that human learning is multifaceted and interconnected. By fostering cross-disciplinary collaboration, education can better address ethical, technological, cultural and social dimensions of learning, creating more holistic and responsive educational pathways.

6. Prioritising Holistic Learner Development

At its core, human-centred education is concerned with the flourishing of the whole learner. This requires moving beyond narrow academic outcomes to cultivate resilience, creativity, agency, empathy and ethical citizenship. Educational environments must, therefore, be intentionally designed to support learners' emotional, social and moral development alongside cognitive growth. In an era marked by uncertainty and complexity, prioritising holistic development equips learners not only to succeed academically, but to navigate life with purpose, responsibility and adaptability.

In summary, this volume extends beyond a compilation of academic reflections to offer a compelling call to action. It urges scholars, educators, policymakers and communities to reimagine and reconceptualise education as a profoundly human endeavour—one that is relational, contextually grounded, ethically driven and responsive to the intricacies of our complex world. The way forward lies in embracing this complexity with compassion, contextual awareness and a commitment to transformative change.

“Education advances not when systems become more efficient, but when they become more humane—attuned to dignity, difference, and the lived realities of those who inhabit them.”

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About the authors

Professor Saloshna Vandeyar, a National Research Foundation rated scientist, is the first and former Deputy Dean: Research and Postgraduate Education in the Faculty of Education at the University of Pretoria, South Africa. The focus of her research is on social, cultural and cognitive justice education, with a particular focus on race in(equalities) and the ways in which all other kinds of inequalities are produced and reproduced in educational spaces by educational processes, practices and discourses. She is the recipient of three international awards (Comparative and International Education Society (CIES) 2012, American Educational Research Association (AERA) 2011, and the International BMW Award for Intercultural Education, 2006); five national awards (National Science and Technology Forum (NSTF) Senior Black Researchers Award 2007, the Higher Education South Africa's Leadership Fellowship 2013, Gauteng Woman in Excellence award 2018, Education Association of South Africa (EASA) Research Medal 2011 and the most recent, Medal of Honour from Education Association of South Africa 2025). Prof Vandeyar was a finalist in the Standard Bank Top Woman awards in the category Woman in Science (2019); the first runner-up of the Women in Science Award (2017), a finalist for the NSTF Lifetime Award (2014) as well as for the Shoprite Checkers Woman of the Year (2006). Five institutional research awards (Best Researcher Award 2019, Laureate Award for Educational Innovation 2012, Exceptional Young Researcher Award 2009, Dean's Award for International Scholarship 2013, Gold Medal for Research, Excellence and Achievement 2009 and Research Perseverance 2002; Two community awards for research and two merit awards for teacher professionalism and teaching excellence. She serves on several editorial boards; has published widely; and has presented many invited keynote addresses. Of note, she has recently developed a theoretical framework called Pedagogy of Compassion for diverse educational spaces.

Professor Michael Anthony Samuel (School of Education, University of KwaZulu-Natal) is currently involved in designing and supporting

postgraduate studies and mentoring capacity development of supervisors in a range of contexts nationally and across the continent. His research interests include higher education studies, curriculum development and professional development. Prof Samuel's books, (1) Changing patterns of teacher education in South Africa and (2) Continuity, complexity and change: Teacher education in Mauritius, explore the challenges of (inter) national reform initiatives in teacher education policy development. His methodological insights are captured in his book (3) Lifestory research: Epistemology, methodology and representation. (4) Disrupting higher education curriculum: Undoing cognitive damage explores options for imaginative curriculum redirection. In 2023 Prof Samuel launched a co-edited anthology on (5) Transforming postgraduate education in Africa. He is the 2022 recipient of the South African Education Research Association (SAERA) Research Recognition Award for his distinctive contribution to educational research. Prof Samuel serves on the editorial board of the journal of the Scholarship of teaching and learning in the South and the Journal of Education of Teachers. He is the recipient of the Turquoise Harmony Institute's National Ubuntu Award for Contribution to Education. He is also in the top 100 most cited education scientists in Africa in 2024: <https://www.adscientificindex.com/top-100-scientist/?tit=Educat>

Dr Brian Chicksen has a medical background as a Specialist Physician, however, his work over the past twenty years has been in the strategy and sustainable development arena. In his current role, Dr Chicksen provides support to the University Executive and Deans, around strategic issues and those related to sustainable development. This has included leading development of the University's annual Sustainable Development Report. Previously, he worked for 22 years at AngloGold Ashanti Limited, in a variety of positions. AngloGold is the world's third largest gold producer, with a footprint across four continents. Prior to leaving the company, as Vice President Sustainable Development: Health and EVP Support, Dr Chicksen was accountable for designing the global sustainable development strategy, assisting with its implementation across the business, and developing the Group's Annual Sustainable Development Report. Brian has held non-executive positions on the Global Compact Network, South Africa Board,

AngloGold Ashanti Health (Pty) Limited, the Hospice Association of the Witwatersrand (Chairman), and Rand Mutual Assurance Ltd. He has been a Visiting Fellow at Leeds University Business School and has been a ministerial appointee to the South African Safety in Mines Research Advisory Committee (SIMRAC).

Dr Philip Mirkin currently lectures in physical science education at the University of Pretoria after spending most of his 35-year career in government, Waldorf and Montessori schools in South Africa and New Zealand. The twin foci of his PhD and current research are autoethnography and using the ideas from Aristotle, Goethe and Smuts to develop holism evolution, what he calls Evholution, as an academic theoretical framework. Dr Mirkin also writes science poetry which he uses in his teaching and research.

Dr Wietske Boon is a postdoctoral researcher, research supervisor, counsellor and author in the field of early childhood education, early childhood development and learner support. She presents lectures, workshops and seminars on an ad hoc basis for various institutions and organisations. Dr Boon authored a children's book, and a scholarly book on multilingual preschool environments. Other fields of interests include play-based education, school readiness and socio-emotional well-being. Wietske has an honours' degree in psychology, a masters' degree in play therapy, and completed her PhD in early childhood education at the University of Pretoria. The focus of her PhD study was on the socio-emotional development of three-year-olds, and the language/s of education within the learning environment. Her current research interests include teacher education, well-being and quality education in context of the sustainable development goals (SDGs). Dr Boon's postdoctoral research study is done within the Teach4Reach 2.0 project, which is a collaborative and international project.

Professor Ugorji I Ogbonnaya is a Professor of Mathematics Education at the University of Pretoria, South Africa. His research interest includes students' problem-solving proficiency in mathematics.

Professor Celeste Combrinck is a senior lecturer in Assessment and Quality Assurance in Education (AQA). She works in the Education Faculty at the University of Pretoria in South Africa. Celeste supervises postgraduate students and presents research methodology courses. As a social scientist, she designs and refines educational and psychological assessments through mixed methods research (MMR). Celeste's mission is to enhance human thriving by contributing fair and accurate indications of growth and agency through rigorous measurement practices and methodological pluralism. She is a Rasch Measurement Theory (RMT) student and is devoted to pursuing meaningful measurement. Her research interests span educational and psychological measurement, international large-scale assessment studies (ILSAs) and strategies to enhance human thriving. Through her work, she strives to advance the field of educational assessment by promoting robust and equitable measurement practices.

Dr René Beyers-Prinsloo is a Lecturer in the Department of Education Management and Policy Studies in the Faculty of Education at the University of Pretoria. Appointed to her first full-time lectureship in 2024, Dr Beyers-Prinsloo has since made significant contributions to the field of Education Law. She has presented her research findings at international conferences in Bulgaria and has published several journal articles. In recognition of her dedication and expertise, she was honoured with the Best Model Lecturer Award in 2023, further attesting to her commitment to excellence in education. Dr Beyers-Prinsloo's research interests lie in the realm of education law. Her PhD research was titled: Professional Discretion of Public School Principals: An Education Law Perspective.

Dr Soene Botha is a dedicated educator and researcher, passionate about innovative teaching methodologies and inclusivity in education. Holding a Master's degree in Computer Integrated Education, Soené is finalising her doctoral research, which explores how Whole Brain® thinking and action research can revolutionise coding and robotics curricula for Grade 4 learners. With experience teaching Mathematics, Afrikaans and Robotics to Senior Phase students, she is also an academic mentor, supervising honours research students at the University of Pretoria. Soené has contributed

significantly to the educational landscape through her research, including studies on assistive technologies for learners with cerebral palsy and the integration of technology in classrooms. She has presented her findings at national and international conferences and co-authored peer-reviewed publications. Recognised for her commitment to quality education, Soene has received accolades such as the Research Indaba Prize for Best Completed Master's Thesis. Her work reflects her belief in the transformative power of education, combining creativity, technology and action research to equip learners and educators for the challenges of the twenty-first century.

Professor Raïta Steyn is an Associate Professor in Art Education in the Department of Humanities Education at the University of Pretoria. Her research focuses on religious art and art education, with an emphasis on promoting social awareness, inclusiveness and human empathy through innovative teaching approaches in Visual Arts. She has published widely, including works on Afro-Byzantine religious art and cultural traditions in Nubia, Ethiopia and Southern Africa. Prof Steyn has led numerous local and international projects addressing issues such as the African Renaissance. Her projects challenge societal stereotypes, promote social justice and explore inclusive art practices, including engaging vision-impaired individuals in Visual Arts. Since 2015, Prof Steyn has served as the National External Examiner in Design for *Umalusi*. From 2015 to 2016, she was appointed Chief Marker for Design under the Department of Basic Education. In 2016, she also worked as an Internal Moderator for Design.

Dr Marisa Leask is a postdoctoral fellow in the Centre for the Study of Resilience at the University of Pretoria. She holds multiple qualifications, including a master's degree with distinction, and has been recognised with awards for her academic excellence. As part of the Flourishing Learning Youth (FLY) project, her doctoral research focused on the enablers and constraints of implementing school-based interventions in rural contexts, developing a methodological framework for intervention implementation. This research was a collaboration with Pennsylvania State University and their Quality Talk approach to classroom discourse to improve students' comprehension and critical-analytic thinking. She is the South

African Doctoral and Early Career Network Representative for the World Education Research Association. In addition to her academic role, Dr Leask has extensive experience in human resources leadership and talent development in the corporate environment, which she draws on as a Senior Coach Practitioner. Dr Leask currently serves as a member of the Research Committee of Coaches and Mentors of South Africa (COMENSA).

Dr Fru Vitalis Akuma is a lecturer in the Department of Science, Mathematics and Technology Education, at the University of Pretoria. He facilitates natural sciences and physical sciences content and methodology modules. Dr Akuma also supervises postgraduate students and mentors students on work integrated learning. Additionally, he contributes to his departmental publication units.

Mr Roger M Mayani is a Mathematics teacher at the Gauteng West Department of Education. He obtained a degree in Mathematics Education from the University of Pretoria. Mr Mayani is currently completing a PhD degree in the Department of Science, Mathematics and Technology Education at the University of Pretoria.

Professor Keshni Bipath has 36 years of experience in education. Her career consists of being a Foundation Phase educator, Head of Department, Assessment specialist and E-Learning specialist at the Gauteng Department of Education, and currently an associate professor. She coordinates B.Ed (Early Childhood Care and Education), Early Childhood Education Post-Graduate Programme, and is a member of the Postgraduate Committee at the University of Pretoria. Prof Bipath is passionate about professionalising the ECD workforce, policy implementation, transformational pedagogy, literacy development of young children and relationship-building amongst parents and teachers in the Early Childhood Care and Education sector. She has published numerous articles and presented papers at international and national conferences on Early Childhood Care and Education, educational effectiveness and improvement in South Africa.

Dr Renisha Singh is a committed foundation phase educator with over 20 years of experience in private and public education. She currently teaches at a primary school in Midrand, and serves as a part-time lecturer, postgraduate research assistant, and educational coordinator. Renisha has excelled in online lecturing at private higher education institutions, supporting students academically as a lead lecturer. Her dedication extends to community service, where she volunteers to teach children and serves as a child protection officer in Midrand. Renisha's passion for gender equity in education influenced her doctoral research at the University of Pretoria, which focuses on pedagogy in early childhood education. She has published research that challenges teacher perceptions and pedagogical practices and is currently involved in a research project on gender and STEM qualifications in private educational institutions. Renisha remains deeply committed to fostering inclusive education, advancing pedagogy and empowering communities.

Dr Nadia Swanepoel has been a lecturer in Early Childhood Education at the University of Pretoria since 2017. She obtained her doctorate in 2023 and focused on enhancing Grade 3 teachers' mathematics word problem solving instruction through professional development initiatives. She is passionate about teaching and learning and strives to help students make sense of mathematics. Dr Swanepoel is involved with several research projects and regularly addresses audiences around the world about the importance of making mathematics enjoyable for big and small. She is currently supervising several postgraduate students who are researching ways in which mathematics can be made practical and accessible to all.

Prof Maryke Mihai obtained a BA-degree (1984), Higher Education Diploma (1985), Honours in Afrikaans (1986), MEd (2007) and PhD in Computer-Integrated Education (2015) from the University of Pretoria. She taught Afrikaans to high school learners for twenty years. Since August 2008, Prof Mihai has been employed as lecturer at the University of Pretoria, was promoted to senior lecturer in 2020 and associate professor from 2025. Her research interests include computer-integrated education, languages, assessment, instructional design and management.

Professor Pieter du Toit is an Associate Professor and Research Associate in the Department of Humanities Education, University of Pretoria. His research niche is action research. Prof du Toit specialises in academic staff development. He is a registered HBDI® practitioner specialising in Whole Brain® thinking. More than 40 Master's and PhD students have completed their studies under his supervision. Prof du Toit has published numerous articles, books and chapters. He has also acted as guest editor of two journals. Apart from numerous conference papers presented, Prof du Toit has acted as guest speaker at national and international level and facilitated workshops on action research, academic staff development and Whole Brain® thinking, among others. Host universities include universities in the USA, UK, Germany and Belgium. Prof du Toit held a postdoctoral fellowship from the Flemish Government; he was hosted by the University of Antwerp.

Advancing Human-Centred Education in Complexity

Edited by
Saloshna Vandeyar

Advancing Human-Centred Education in Complexity advances the proposition that human-centred education (HCE) is not only timely, but essential to reimagining education systems in an era of persistent complexity, inequality and rapid technological change.

This volume brings together theoretical frameworks and empirical research that collectively challenge conventional educational paradigms. Rather than treating care, empathy, compassion and relationality as peripheral concerns, the volume positions them as foundational to meaningful learning and equitable educational practice. It argues that effective education must balance technical competencies with interpersonal and affective capacities, grounded in an understanding of interconnected social, political and economic ecosystems.

Drawing from diverse disciplines the volume demonstrates how HCE operates across multiple contexts and levels of the education system. It introduces new models and frameworks, including the *Inkhulumo* dialogic model, the Pedagogy of Compassion framework, the CRAFT framework for AI integration, and utilises contextual intelligence as a lens for educational leadership.

The volume closes with reflections and recommendations on embedding HCE in teacher education, curriculum design, research practice and policy — offering a scholarly and practical contribution to the ongoing project of building more humane, inclusive and equitable education systems.

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ISBN 978-1-0483-0140-3



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