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

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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; Büyük. zkan 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.

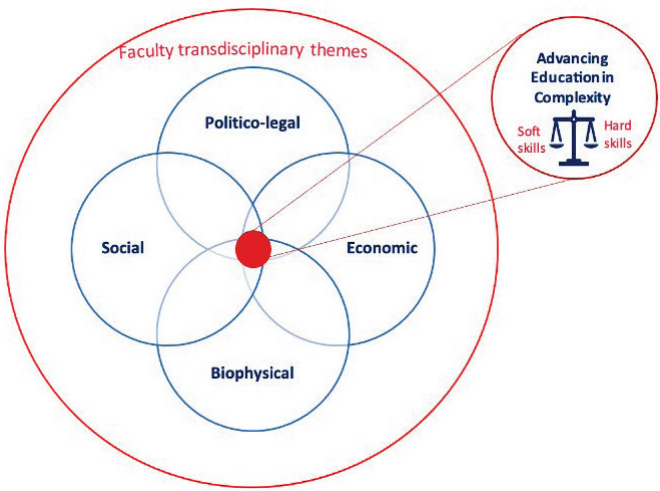

Figure 1.1: The research ecosystem model

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 evholution that can point one towards a deeply meaningful "why". Results of evholutionary 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 *Inkhulumo*, a model developed with teachers and students to address linguistic diversity, cultural relevance and systemic constraints. Through peer-led discussions in home languages, *Inkhulumo* cultivates interpretive authority and supports cognitive, social and emotional development. Unlike traditional teacher-centred instruction, *Inkhulumo* encourages student autonomy and co-construction of knowledge. The chapter concludes with recommendations for embedding *Inkhulumo* 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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