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Disruptions in higher education:
Impact and implication

Volume 1

Higher Education in the melting pot

Emerging discourses of the 4IR and decolonisation

FELIX MARINGE (ED.) BOOK EDITOR C5

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EDITOR
Felix Maringe

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Peer review declaration

The publisher (AOSIS) endorses the South African 'National Scholarly Book Publishers Forum Best Practice for Peer Review of Scholarly Books'. The manuscript was subjected to a rigorous, two-step peer review prior to publication, with the identities of the reviewers not revealed to the author(s). The reviewers were independent of the publisher and/or authors in question. The reviewers commented positively on the scholarly merits of the manuscript and recommended that the manuscript be published. Where the reviewers recommended revision and/or improvements to the manuscript, the authors responded adequately to such recommendations.

Research Justification

This scholarly collected work aims to address challenges faced by higher education in South Africa, accepting the difficulty to try to understand the requirements of the task and to deal with its newness. The book examines how higher education has fulfilled its transformational imperatives since 1994, including how it responds, inter alia, to the demands of the automation economy and the Fourth Industrial Revolution (4IR). The book demonstrates that higher education in South Africa is at the crossroads. It faces a rare moment in its developmental trajectory as two hugely appealing ideologies sit side by side to influence its future direction. Coming a little earlier was the call for the decolonisation of the sector, championed by students in the 2015-2016 Rhodes must Fall and Fees must Fall protests. However, although the discourse of the 4IR awakened the consciousness of the academy in South Africa in 2019-2020, it has been festering quietly for a little longer as the 4IR gained momentum around the world. Whilst decolonisation represents a deeply internal impetus for transformation, the 4IR provides an external momentum. As a sector, the need to gather evidence about the nation's preparedness to deal with potentially contradictory discourses is both urgent and prudent. The book thus provides space for research that speaks to the opportunities and challenges of adopting both ideologies to influence the future of higher education in South Africa. The theoretical and empirical research recorded in this book is both original and current, and provides fresh perspectives on the notion of the clash of ideologies in the South African Higher Education sector. Whilst each chapter makes specific contribution through conceptual engagement, innovative empirical designs and specific recommendations to the sector, the book lays a basis for a new theoretical perspective, which speaks to the development of a new knowledge ecosystem that engages the local as a platform for global engagement. This approach seeks to draw synergies from the two ideologies, which the sector cannot ignore or even choose to prioritise. The authors of the various contributions had a free hand in choosing the most relevant scholarship approach for the problems they were investigating. As such, both empirical and theoretical methodologies were utilised and justified, as long as these contributed new perspectives to the implementation and application of the ideologies in higher education in South Africa. None of the chapters in the book were developed from doctoral theses even if evidence might have occasionally been drawn from the existing research studies of postgraduates. The work presented in this book is new and current. As part of the review system, all articles were inspected for resemblance through iThenticate analyses, and the authors took meticulous care that proper recognition is given to all relevant sources. Scholarship presented in this book is free of plagiarism and represents high academic standards. It is not a textbook written for any level of study in South African universities. However, it has been written as a scholarly contribution, which appeals to the needs of specialists in the field of higher education in South Africa and beyond, and to academic, policy and postgraduate researchers.

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Abbreviations, Boxes, Figures and Tables Appearing in the Text and Notes

List of Abbreviations

AGE	Afro Global Episteme
AI	Artificial Intelligence
AR	Augmented Reality
CALP	Cognitive Academic Linguistic Proficiency
CC	Creative Commons
COL	Commonwealth of Learning
CRT	Critical Race Theory
EI	Emotional Intelligence
GEM	Global Education Monitoring
HE	Higher Education
HEI	Higher Education Institution
IKS	Indigenous Knowledge Systems
IMF	International Monetary Fund
IoT	Internet of Things
IR	Industrial Revolution
IQMS	Integrated Quality Management System
IT	Information Technology
LoLT	Language of Learning and Teaching
MOOC	Massive Open Online Course
MRTEC	Minimum Requirements for Teacher Education Qualifications
OECD	Organization for Economic Cooperation and Development
OER	Open Educational Resources
PBL	Problem-based Learning
PSET	Post-School Education and Training
RCS	Rethinking Campus Spaces
RS	Refugee Students
STEM	Science, Technology, Engineering and Mathematics
TPACK	Technological Pedagogical Content Knowledge
UCT	University of Cape Town
UNESCO	United Nations Educational, Scientific and Cultural Organization

VC	Vice Chancellors
WEF	World Economic Forum
WITS	University of the Witwatersrand

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Chapter 1

Clash of ideologies in post-colonial education systems: Convergences and divergences

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Abstract

The Fourth Industrial Revolution (4IR) and the decolonisation of higher education (HE) are the next big ideologies that contribute to the development of HE, especially in post-colonial societies. Are these discourses complementary or oppositional? Whilst the 4IR is based on global developments and

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imperatives, the decolonisation of HE is growing out of more localised contexts of discontent in countries that have been subjected to experiences of colonial occupation over long periods in their histories. It can thus be said that the discourses of the 4IR represent a centre to periphery model of development, whilst those of decolonisation trace a periphery to centre approach. We argue in this chapter that because of the dispersed and uncoordinated nature of peripheries, the momentum for decolonisation is likely to be swept away by the force of a stronger and more coordinated impetus from the centre. Effectively what this means is that by design or by sheer coincidence, unless post-colonial scholarship remains true to the ideals of decolonisation, the momentum for decolonisation will be swept away by a more powerful discourse of the 4IR. This would be another victory of the centre over the periphery and would mark a strengthening of the stranglehold of a largely Western ideology over an emerging ideology from the peripheries of the post-colonial world. The chapter develops this argument by providing a critical discussion of key conceptual ideas first and utilising complexity theory to examine the extent to which the two ideological positions converge or diverge, and in whose interest. The chapter then draws some implications related to how the two ideologies can contribute mutually to the development of societies in post-colonial societies.

Introduction

Ideologies have a powerful influence on educational development and on the course of its transformation. When two powerful and persuasive ideologies occupy the minds of educational actors and planners at the same time, their separate and combined influence can be both disruptive and constitutive, depending on the divergences and convergences underlying their assumptions. The central focus of this book and this chapter is to explore the epistemological, ontological, axiological and methodological assumptions behind the ideologies of decolonisation and the Fourth Industrial Revolution (4IR), which occupy the same space and time in the experience and development of HE in South Africa. There are two main assumptions: firstly, decolonisation is internally driven, having been instigated by students in 2015-2016 through the Rhodes and Fees must Fall protests. However, the 4IR is externally driven by globally competitive technological and digital innovations, which are already transforming workplaces and the nature of work across the economies and in HE too. The second assumption we make is that whilst the 4IR has a largely external economic gaze, decolonisation has a largely internal gaze focusing on social justice, the correction of past injustices and equal opportunities for all. This chapter provides a theoretical argument regarding how these powerful ideologies are likely to sit together in the melting pot, that HE in South Africa is situated currently, discusses the notions of clash of ideologies and utilises complexity theory to illuminate our thinking around these ideas.

The chapter begins with a critical engagement of key conceptual ideas, which help to shed light on how ideologies have influences on educational development in the past and in the present. Its major contribution is in the comparison of the assumptions behind the two ideologies, which can be used as analytical and evaluative frameworks for future work in HE. The chapter then provides synopses of the rest of the chapters in the book and concludes with important observations on how the two ideologies can be utilised in new knowledge ecosystems to guide the future development of HE.

Critical review of conceptual ideas

We begin with a critical discussion of a basket of ideas to provide a good basis for conceptualising the argument.

Ideology

Change in societies has always traced the contours of dominant ideologies. Whilst the prevalence of an ideology does not always translate into its full implementation in society, rarely do societies behave in ways, which differ markedly from their dominant ideologies. For example, in Zimbabwe, scientific socialism became the dominant ideology through which educational changes were developed in the post-independence era. Under scientific socialism, schools focused on new ways of educating learners, which included the development of manual or labour skills alongside academic learning under the banner of Education with Production. According to Dixon et al. (2013), ideologies are systems of socially shared ideas, beliefs and values used to understand, justify and challenge a particular political economic or social order. For example, the aspiration to become a democratic and equal society following the collapse of apartheid in South Africa created the need for developing differentially supported school systems in which those in the least wealthy locations received the highest government financial support whilst those in previously advantaged communities received far less support. Ideology thus shapes our thinking, actions and interactions in relation to what happens in society. The 4IR is fundamentally a field of conceptual ideas that define the role of technology, the Internet, the world wide web, digital technologies, amongst others, that are set to revolutionise how we think, work, act and relate to each other, and how this will, in turn, shape the way we conceptualise and implement our educational programmes. Over the years, various forms of technology have significantly shifted the way we communicate, organise and relate to each other, and have become significant tools in delivering education in many of our classrooms. In global south communities, especially in post-colonial societies, there is a sense in which global north ideologies are coming under an increasingly critical focus. This provides the basis for the claim we make about a potential clash of ideologies at the onset of the 4IR.

In a recently revised edition of the ground-breaking book on Ideology and the Curriculum, Michael Apple (2017) made a particularly poignant argument. He suggests that education is society's tool to create, recreate and maintain social stratification. Schools legitimise both the inclusion and exclusion of cultural values. The cultural values of the dominant groups find space in the school curriculum, whilst those of the marginalised communities are effectively excluded. The question then is whose values are being protected through the ideology of the 4IR and the decolonisation of education? Will these values find equitable space in the new curriculum, or will one ideology trample its weight over another in this almighty clash of ideologies?

Marx and Engels (1976) and Althusser (1970) have provided us with enduring understandings about ideology and how ideology is a key controlling pillar for social and societal development. Essentially, ideology provides how societies and social systems reproduce themselves in their developmental trajectories. According to Marx and Engels (1976), society comprises of two main groups, the ruling class and the working class, which exist in a state of perpetual conflict, but which maintained cohesiveness because of the force of state ideological apparatuses. Through laws, regulations, rewards for labour and sanctions for wrongdoing, the ruling class imposed its values and ideas over the working class to maintain a false sense of orderliness and cohesion, which essentially kept the classes apart but in mutual coexistence. Marx and Engels, however, posited that a fair world would only be created when the working class take ownership of the means of production through violent revolution and/or forced negotiation.

Central to Althusser's (1970) theory of ideology is the notion of reproduction of the relations of production upon which state survival and continuity are premised. Societies must perpetually and continuously reproduce the productive forces comprising of labour power and other resources or means of production. Labour power is reproduced through restricted minimum wages set at levels which do not create upward social mobility of the workers but maintain their working-class status, always struggling to make ends meet, but grateful to the state that they have jobs to work in. Few workers are allowed to cross the boundaries, mainly to be living examples of how being a humble and faithful servant can be rewarding and enhance one's upward mobility. Labour power is also reproduced through education and training, wherein HE has a special place of influence through processes of reproducing skills and knowledges deemed necessary in the labour market. A major criticism of the performance of HE systems is that graduates from universities are not industry ready. By producing industry-ready graduates, universities become powerful sources for the reproduction of labour, which perpetuates and reproduces the values, attitudes and behaviours necessary to maintain the status quo. However, by so doing, universities contribute to the role

of state apparatuses, which seek the reproduction of societies and the values, attitudes and behaviours deemed essential for its maintenance and perpetuation. Rarely does the training of doctors veer into the study of traditional medicines, which have been at the heart of the health and survival of indigenous communities for millennia. To become an accomplished and respected musician, one must go through a curriculum that teaches standard Western musical instruments, such as the violin, the piano, clarinet, keyboard, saxophone, amongst others. Rarely do music students in our universities have to study traditional musical instruments, except as part of optional course offerings outside standard Western instruments without which the qualification cannot be offered.

Althusser provided us the idea of interpellation to describe processes by which ideology is constitutive of individuals in society. Essentially, Althusser suggests that we are because of ideology, which we either recognise or misrecognise and through those processes, we gain our identities, both as producers and as products of our consciousness. A system that does not alter its ideological orientation can only reproduce the ideology which preceded it. The key ideological mechanism by which South Africa sought to transform itself was by becoming a democratic society as it sought to replace the repressive and oppressive authoritarian ideology of its apartheid predecessor. However, democracy is an underlying ideology of most of the free world and the concepts and values, such as equality, equity and social justice, by which it is sustained are not new to both the old and new worlds. Although South Africa has toyed with the notion of Ubuntu, the idea has not set its roots firmly into the consciousness of people and has tended to be a subject of academic discussion than a real underpinning framework that informs what we do, what and how we think, how we do things, and how we evaluate success and failure of our endeavours. Ubuntu is an ancient African idea that describes the humanity of individuals and their societies. In 'I am because we all are', there are several important and practical ideas. At the very core of this understanding is the supremacy of the group over the individual. Unlike Western societies that eschew individualism and individuality, Ubuntu gives primacy to group thinking, its democratic agency and value to which individuals subordinate themselves. The democratic consensus rather than individual appellation is paramount to the ways we should organise our teaching and learning, our knowledge production endeavours, the ways we assess students, amongst others. Thinking around these issues has either remained stagnated or pushed to the peripheries in both policy and strategic intends of our universities.

In 2015-2016, students took to the streets agitating for the decolonisation of HE through the University of Cape Town (UCT) and University of the Witwatersr and (WITS) and led #RhodesMustFall and #FeesMustFall protests.

On the back of these protests, students achieved a major victory as the government acceded to the demand for a fee free HE for poor students. Since then, decolonisation of HE has become a major ideological lens through which HE in South Africa has been meant to be transformed. The jury is still out there whether six years down the line HE in the country has been or is being decolonised. The available evidence suggests that more has been achieved, albeit not nearly enough in the symbolic dimension than in the other areas, especially the epistemic dimension (see, for example, Maringe, Ndofirepi & Osman 2021; Ndlovu-Gatsheni 2019). Reasons for the slow progress might include a lack of strategic prioritisation of the idea, at both the systemic and institutional levels; a multiplicity of understandings about the ideology, which could lead to conceptual paralysis, a national polity and economy that appears to be more inclined towards the global neo-liberalism and the unresolved land question, which places the means of production squarely in the hands of colonial masters, not in the hands of the working-class majority.

The 4IR is yet another ideological dimension that is competing for space in HE spaces of many countries, including in South Africa. Based on unprecedented developments in technology and digital platforms, through major capabilities enabled by, for example, artificial intelligence (AI), robotics and automation, big data, the phenomenally expanded Internet of things (IoT), amongst others, it is argued that the 4IR will revolutionise the ways we think of work, careers, and more importantly, future HE curricula, how we teach and how we will assess students in classrooms of the future. Many argue that the current and ongoing coronavirus disease 2019 (COVID-19) pandemic has given a big push to the adoption of technologies in teaching and learning. With the abrupt closure of universities following the outbreak of the COVID-19 during early 2020, and a strongly held belief across nations of the world that the education and training of students needed to continue despite the pandemic, universities turned to online and remote teaching and learning, which were compatible with the requirement for social distancing, a major global response to limiting the spread of the virus. Emerging evidence on the impact of online teaching and learning indicates that the benefits of this intervention are very unevenly spread as students from low-income households and other disadvantaged contexts face severe interruptions because of weak signals, erratic Wi-Fi and the crippling costs of data bundles (Maringe et al. 2021). More broadly, remote teaching and learning have substantially reduced the benefits of social interaction, which supports the social construction of knowledge, a central plank in the mechanisms of knowledge production in HE (Kemp & Grieve 2014). This, however, suggests that HE systems tend to veer towards educational solutions, which do not necessarily benefit the most disadvantaged, who, in the case of South Africa and other less developed countries are in the majority, a theme that has its roots in colonial and apartheid ideologies on which systems of HE were founded.

The notion of the clash of ideologies

Ideological clashes occur when two or more ideologies compete for prominence in the lives of people. The most enduring clash, we suggest, has been the capitalist and socialist ideologies. On one hand, capitalism is by design an ideology through which rewards are allocated to people based on their talent, contribution and background. It is a profit-driven ideology, which prioritises individuality, individual development and competitiveness. It primarily protects privilege, which is strongly linked to socio-economic background. The adage 'Each man for himself, God for us all' probably provides the most accurate description of its underpinnings. On the other hand, socialism, an ideology developed by Marx and Engels, seeks to promote the value of equality of humankind and the fair and equitable distribution of the 'common good'. Under socialism, the common good is allocated to all in an equitable manner (scientific socialism) or in an equalitarian way (communism). The notion of equitable implies the distribution of the common good based on formulas, which seek to correct previous imbalances. In this approach, the previously marginalised are allocated more of the common good. For example, formerly disadvantaged schools in South Africa are given full government subsidy, whereas those in formerly privileged communities are not government subsidised. It looks clear that the notion of ideological plurality, rather than singularity provides a sound basis for stable postmodern societies. For example, the most stable societies in the world are those, which combine the value of capitalism and socialism. In the United Kingdom and the United States of America, for example, the practice of social benefits, unemployment benefits and the dole have become an integral part in the distribution of the common good to the citizens of those countries. Meanwhile, the economies are fiercely competitive, and the idea of profit making is the biggest engine for growth in those countries. However, ideologies do not only clash at national or similar macro-levels, they do so at micro-levels, such as teaching and research levels. In research, for example, two ideologies have persistently clashed for prominence. Positivism, whose epistemological assumption is that knowledge exists out there independent of the knower. To access this knowledge, all one needs are valid and reliable instruments to measure it. Under anti-positivism or post-positivism, knowledge and knowing are social constructs through which the knower is integral part of the process of knowledge generation and knowing. Largely, the two ideological positions have led to distinct strands of research: the quantitative and qualitative paradigms with different epistemological, methodological, axiological and assumptions about truth, knowledge and the process of knowing. In different ways, the paradigms have driven quite distinct research traditions and have influenced research capacity development in different parts of the world. Essentially, post-positivism grew as a critique of positivism to the extent that once upon a time, the ideologies were at war (see, for example, Datta 1994; Kuhn 1962; Richards & Daston 2016).

Today, however, the different research ideologies are largely seen as complementary; each contributing a different understanding of truth and reality and so together producing a more rounded conception of phenomena (Wray 2011). Arguments have shifted therefore from a focus on the assumptions behind the research ideologies to value perspectives and judgements about which version of truth and reality is more important. In this chapter, we are centrally concerned with how the powerful ideologies of the 4IR, and the imperatives of decolonisation confront or complement each other in development trajectories of post-colonial countries.

Post-colonial countries and educational ideology

As Europe began experiencing the industrial revolution, the need for finding cheap resources became a strategy of choice in the countries of the global north. Africa, the so-called dark continent, became an object of exploration and exploitation. Apart from Ethiopia and Liberia and following the Berlin ruling on country boundaries in Africa, all the remaining 52 countries came under the colonial rule. Britain, France, Germany, Portugal and Spain were the key colonisers of Africa. Colonisation was the imposition of economic and socio-political ideologies of a foreign nation over another for extracting natural resources to fuel industrial growth in the colonising country. As local citizens often resisted the takeover of their land and resources, colonisation was a form of violence over others in a ruthless bid to control and own the means of production and resources in the colonised nations. Strategies used included cultural displacement, language replacement, forced labour, poor remuneration, segregation and separate development, and the institutionalisation of racial superiority and inferiority. Resistance against colonisation in different countries attained different levels of intensity, with guerrilla warfare being used as the chief weapon to dethrone the colonial governments. In all cases, responding to the pressure and impact of resistance by the locals, independence was finally achieved through negotiated settlement across the African continent. Key elements of colonial education tended to include the following:

1. Relegation of local languages to second-tier status or their elimination altogether from the curriculum.
2. The implementation of foreign language learning based on the language of the colonising country.
3. Teaching and learning largely based on rote learning approaches, which encouraged artificial understanding.
4. Curricula practices and organisation, which separated theory from practice.
5. Educational progression constrained severely by bottlenecks at different levels and cycles, resulting in broadly elitist educational provisioning.

6. The use of Western-based literature to support learning.
7. Knowledge based on Western epistemic frames with complete marginalisation of the local knowledge systems.
8. School assessment outcomes were largely economically driven and based on the obnoxious normal curve dependent on quotas envisaged for critical economic activities.
9. Separate schools for children based on race, which were differentially resourced.
10. Teachers for these schools were trained in different training institutions to highlight the different curricula ends of the institutions.

Post-colonial regimes across the African continent made education a priority developmental goal. Improved or universal access based on the mantra of education for all and various attempts at marrying theory and practice through the development of work-related educational programmes, the reform of examinations and the innovative training of teachers, including bringing back indigenous languages into the school curricula, became some of the more widely adopted strategies in the post-colonial dispensations across the previously colonised countries. More recently, there is a cry for decolonising education that has gripped many post-colonial countries. And in the past two years, the need for education to respond to the imperatives of the 4IR has been highlighted. The question is how the two ideological assumptions can sit together? In what ways do their assumptions converge and diverge? These are not straightforward and easy questions to address. We considered that utilising complexity theory would help us to navigate the complexities of understanding how ideologies that have a contemporaneous existence would shape the educational intentions of post-colonial nations.

Complexity theory

Complexity theory arose as a criticism of the overly deterministic and pervasive perspectives used to explain cause and effect, input and outcome, and the linearity of relationship between phenomena. In social matters especially, complexity theory highlights a recognition of the inevitability of heteroscedasticity of lines of relationships. For example, why is that the same teacher using the same materials and methods with the same group of learners cannot reproduce the conditions of success of a previous lesson in the next one. Why, for example, is it a fallacy to expect equity of learning by exposing all learners in schools to the same content and methods of teaching? Teaching and learning are far more complex than that. There does not seem to be many direct links that exist between different variables in the social world, at least the notion of linearity of relations is less pronounced in this area. The world of social sciences and social relations is much too complex to be explained by simple cause-effect relationships. Therefore, whilst random control designs

are the gold standard for quantitative studies, complexity theory is fast becoming the gold standard for qualitative research studies. We have drawn several assumptions about complexity theory we can use to design an analytical framework to test whether the assumptions behind the 4IR converge or diverge with those of decolonisation:

1. **The world (the social world in particular) is not as orderly as we assume it to be**. The social world is a lot more chaotic than is projected to be. Although going to university is strongly associated with social mobility and access to well paid jobs, there is no guarantee that everybody who attains university education will experience the same benefits. In the context of the clash of ideologies, it will be important thus to explore the underpinning assumptions behind the ideologies through which forms of social ordering is anticipated. In other words, what kinds of world views grow out of these ideologies and do these world views represent convergences or divergences?
2. **Progress is determined not only by specific and predictable strategies**, fully controlled through human effort and resources, but also by accidental, once-off events through which society marshals substantial resolve to derive the benefits of those events.
3. **Context is a major variable through which progress can be determined but not predicted.** There is no one size fits all for all problems and challenges in society. In South Africa, schools are organised in quintiles. Quintile 1 is for the poorest schools in areas afflicted with multiple deprivation, whilst quintile 5 has the richest schools serving children of some of the most affluent communities in South Africa. To bridge the opportunity and poverty gaps between schools in these quintiles, learners in quintile 1 schools do not pay any fees at all, as these are subsidised by government, whilst those in better quintiles do pay fees. Whilst learner and school performances generally trace the contours of socio-economic status, there are some schools and learners domiciled in circumstances of multiple deprivation, which perform as well if not better than ones in circumstances of privilege and status do.
4. **The connectedness of things, even in their diverse and oppositional ways is the fabric that holds systems together, not simply their synergy and apparent commonalities.** The so-called ordered world is based on assumptions of tidiness, linearity, predictability and that like for like determines connectedness. In complexity theory, it is the adaptability of systems to difference, the resolve and resilience to survive even the most challenging circumstances and the recognition of the universality and horizontality of societies rather than its division and verticalisation. The connectedness of America, the so-called paragon of democracy to Israel, seen by many as the last post of apartheid on the face of the earth, is hard to explain. In different ways, similarities and differences connect systems

and societies in ways not easily explainable but which often challenge the assumptions of the predictable world governed by laws of science and of society.

5. **Diversity and deviance are the chief architects of change and transformation, much more so than are similarity and compliance.** Systems that strive to achieve equality often find that human beings and the social systems they belong to never attain full equality. Rather than using equality as a developmental objective, it is more realistic to find ways of recognising, giving voice to, and encouraging participation and democratic engagement of people from diverse backgrounds in the leadership, management and governance of organisations. The homogenising of people's private thinking and views about things is also a rather elusive goal, which proponents of change and development assume are required to embrace a collective sense of people buy-in. Complexity theory suggests that non-compliance is more likely to prevail amongst organisational members than compliance and the homogenisation of thinking. The challenge for organisations is thus to keep a healthy balance of organisational deviance and conformity, rather than aiming for conformity only.

Decolonisation and educational transformation

Essentially, decolonisation is a process that began with subtle resistance by local indigenous populations against the ideas of the white settlers who colonised the entire continent of Africa. With time, the relatively quiet struggles became open warfare in the second phase of the fight against colonialism characterised by the growth of armed struggles against the white settler regimes. Essentially, across the entire continent, colonial governments were defeated, and their places were taken by local indigenous governments. Some argue that this was the first phase of decolonisation, marking the overthrow of white settler regimes from power. With this, new constitutions were drawn across the continent and political transformation was achieved. Within this phase of decolonisation, several changes were relatively easily implemented, for example:

- Democratic constitutions and policies were developed, for example, governments were elected democratically.
- Discrimination based on colour, ethnic origin, sexual orientation and language was outlawed.
- Access to education was opened, especially to previously disadvantaged communities.
- The percentage of black students has been rising over the years from a mere 12% prior to 1994 to almost 90% in 2017.

- The number of black academic staff has also been increasing rapidly over the years. Prior to 1994, black academics comprised a paltry 12% compared with 67% in 2017.
- The number of female academics in universities in South Africa outweighs that of their male counterparts. About 57% of all academics in South African universities are female compared with 43% male academics.
- The number of female students in HE has increased substantially over the years in line with post-democracy gender friendly policies in the country. Female students comprise almost 53% compared with 47% male students.
- Local languages have generally been introduced as subjects across all universities, whereas previously, these were minimally offered in predominantly black universities.
- Whilst there are still Afrikaans speaking universities in South Africa per se, the subject is no longer compulsorily offered to students and in many universities, students now get the option to be taught either in Afrikaans or in English.
- Previously, prior to 1994, most universities were led by white predominantly male vice chancellors (VCs). In 2017, the majority are led by black VCs. Of the 26 VCs, 14 are now black VCs, whilst only three are white VCs. In 2017, of the 26 VCs, only two are female VCs.

A lot can, therefore, be celebrated in South African universities as evidence of a decolonising sector. However, this has been the easy part as the next section shows.

Decoloniality

The phenomenon of coloniality is used to describe a tendency by formerly colonised states to revert to the past status quo of a colonised nation. Ndlovu-Gatsheni (2012) cited Maldonado-Torres who defines coloniality as an invisible power structure that sustains colonial relations of exploitation and domination long after the end of direct colonialism (Maldonado-Torres 2007:243). In other words, despite a change in government and new constitutions, including the series of changes as exemplified earlier, three critical elements of human development and influence tend to remain stable and unchanging. Mignolo (2011), for example, suggested that the three elements of power, knowledge and maintaining a tendency towards the status quo. For example, the coloniality of power is at the core of the present global power structure where ideas of development fall clearly within a genealogy of discourses that presented Africans as people whose being was constituted by negations and lacks: lacking writing, lacking history, lacking civilisation, lacking development, lacking democracy, to lacking human rights (Grosfoguel 2007:213). Africa was,

therefore, in need for development, and the templates for this development could only be sanctioned by the Western powers. The narrative of power became conflated with ideas of modernity and post-modernity, which in their analysis of development, the integration of Western values and systems became the yardstick by which progress was measured. In the coloniality of knowledge, the global systems connive to legitimise Western knowledge systems as not just the most important but also the most valid. Having Western knowledge gained through attending universities in the global north is almost a guarantee for accessing the best and most well-paid jobs in most economies of the global south. The bulk of university curricula in global south institutions are replicas of what is taught in global north universities with very little if any relevance to the requirements of development in the local contexts. The coloniality of 'being' (Mbembe 2015) describes a tendency by local people to continue despising their local culture and values, and to show a strong preference for adopting Western values and cultures. Under colonialism, development was basically the extent to which local people abandoned their whole ways of living and adopted Western ways of living. Local people virtually abandoned their religious beliefs, which were replaced by Christianity. The ability to speak Western languages was seen as evidence of attaining higher levels of human development compared with just having an ability to speak local languages. Traditional remedies that had served indigenous populations for millennia were dumped in preference for Western medicines controlled by the big pharma. In education, the tendency is to continue to place trust in Western forms of education and knowledge systems as the most authentic and of the highest quality. Traditional and indigenous forms of education are placed in the lowest ranks of hierarchies of significance and importance, not just by the Western world but also by the locals themselves. This is further endorsed by the labour and economic systems, which place Western language as a requirement for accessing key jobs rather than local languages. In any case, the entry to universities in South Africa as elsewhere on the African continent requires entrants to have a pass in English, whilst local languages are not a general requirement for entrance to universities. Decolonising decoloniality provides the most formidable problem in the transformation processes of universities. Firstly, it is about changing people, their attitudes, their values and value systems, and shifting power bases from large global players, a feat nearly impossible by small local players like our universities existing in the shadows of Western dominance. To illustrate, much as we consider the criteria for excellence on global university rankings as favouring universities in the global north, there is little we in the global south can do to change things. Consequently, our universities continue to chart their developmental aspirations on templates that suit global north universities rather than the ones which reflect their specific competencies, priorities and challenges.

Indigenisation

The greatest mistake made by Western nations when they colonised Africa was to construct hierarchies of knowledge where Western knowledge was perched at the top of the tree, whilst indigenous knowledge systems were either denigrated as non-existent or as far too inferior to be worth including as part of any worthwhile curricula. Unfortunately, champions of Indigenous Knowledge systems (IKS) begin from a similar assumption, that is, to suggest that we need to prioritise IKS in the curriculum. By so doing, we will be committing the same mistake of the colonisers. IKS cannot and should not be seen as more superior to Western knowledge systems. The challenge must be to find ways of having these speak to each other in ways that seek to integrate the knowledge systems or in ways which seek to identify convergences and divergences as a basis for creating synergies between and amongst different knowledge systems.

Indigenous Knowledge systems are defined differently by people in different spaces. For example, the term 'indigenous knowledge' is used to describe the knowledge systems developed by a community as opposed to the scientific knowledge that is generally referred to as 'modern' knowledge (Ajibade 2003). Indigenous knowledge is the basis for local-level decision-making in many rural communities. It has value not only for the culture in which it evolves but also for scientists and planners striving to improve conditions in rural localities. Incorporating indigenous knowledge into climate-change policies can lead to the development of effective adaptation strategies that are cost-effective, participatory and sustainable (Robinson & Herbert 2001). The issue in transformation is that the local often gets peripheralised and ignored in preference for the more visible and dominant narratives of development capturing global processes and development. However, ignoring local contexts is tantamount to charting a path of decontextualised development, which almost always suffers tissue rejection as the implanted changes have little or no relevance to the local conditions and needs. Nevertheless, key arguments of indigenisation can thus be summarised as:

- There is so much local knowledge and value that got displaced from the mainstream when colonisers were establishing their discourses of dominance in Africa.
- Higher education across Africa needs to invest in processes of rediscovery of these knowledges and values, and help to bring them back to the table of post-colonial transformation agendas.
- If universities must establish a 'moral universe' that respects the plurality of voices, then there is no way we can or should continue to ignore the local voices in post-colonial reconstruction of HE.
- In doing this, universities need to be careful not to become trapped by the same snares, which colonisers succumbed to as they believed that theirs was a more superior knowledge base.

- The development of holistic ontologies and epistemologies cannot ignore local contexts, which give meaning to the issues in those specific places.

Whilst the above cannot be considered as an exhaustive bundle of concepts relating to the notion of decolonisation, they provide us with an adequate basis for extracting important lessons for illuminating at the very least high-level principles by which efforts to transform or decolonise HE can be guided. The principles will be preceded by an attempt to draw comparisons between the different narratives, which speak in different ways to the ideals of decolonisation (Table 1.1).

Given the above, and the many convergences associated with the different discourses related to decolonisation, it appears that we can confidently stipulate the following key principles to guide the processes of curriculum decolonisation in HE.

High-level principles to guide the decolonising of higher education curricula

1. It should be borne in mind that the past tends to be associated with romanticism and nostalgia, and that these can cloud judgment about its importance and relevance. When trying to revoke the past, it is more important to consider its significance to the current situation and to envisaged futures.
2. There are no cross-disciplinary hierarchies of knowledge. In other words, bounded disciplines contain knowledge of equal worth. In knowledge selection for the curriculum, it is more important to use the criteria of relevance to current circumstances and to envisaged futures as well.
3. Because we negate the idea of hierarchies of knowledge, decolonisation of HE tends towards collaborative knowledge creation rather than the exclusion of other forms of knowledge.
4. Decolonisation at the objectives and purpose levels of education. Just changing the content without changing the purposes often results in a quick return to the status quo:
    - The purposes of education under decolonisation must be about transformation, correcting previous imbalances, unlearning old models, relearning new models of thinking, creating new models for new understandings and developing new forms of human empowering.
    - A deliberate focus on these markers of transformation is likely to yield more decolonised curricula.
5. Decolonisation at the content level. The principle of balance rather than priority should inform content selection:
    - Whilst priority must be given to indigenous knowledge, this should never be performed to exclude other knowledge systems from different

TABLE 1.1: Towards a framework for decolonising curricula in higher education.

Transformation discourse	Central focus	Major protagonists	Implications for curriculum decolonisation in higher education				
			Purposes	Content	Methods	Evaluation	Caution
Africanisation	Africa identity, culture and values must be deperipheralised	Makgoba (1997) and Letseka (2013)	Elevating African identity and culture	Knowledge on precolonial and post- colonial African cultures, values and beliefsç	Decommissioning colonial material; use of Afro centred approaches that project communalism in learning	Group rather than individual assessments	Africa is not the centre of the world
Decolonisation	Removal of all the vestiges of colonialism, especially those that depict a superiority and inferiority relationship with the formerly colonised	Maldonado-Torres (2007)	Replace colonial artefacts, concepts and knowledge with authentic local knowledge	Local and international content to capture experiences from other similar nations	Raising critical consciousness to address strengths and weaknesses of development narratives	Assessment of critical consciousness and ability to be critical	Intellectual decolonisation is very difficult to achieve
Decoloniality	The act or processes of confronting the tendency of post-colonial societies to revert to the colonial form and state	Maldonado-Torres (2007) and Mignolo (2011)	To address the issues of epistemic change	Dynamics of societal change, establishing learning communities with other in similar situations	Collaborative learning, especially with others, in similar circumstances	Collaborative assessment strategies	Western domination is increasing in all spheres of life
Indigenisation	The rediscovery of key values, practices and beliefs that characterised the local people before colonisation	Ajibade (2003) and Robinson and Herbert (2001)	To highlight and prioritise local knowledge	Topics infused with studies on the local content	Integrational approaches to teaching and learning	Communal learning and assessment	Not always easy to draw convergences and divergences between local and foreign knowledge systems

parts of the world, including from the West. For example, in a course on traditional leadership forms, content must be selected from the local, regional, continental and international contexts to create a non-exclusionary basis of understanding.
    - Critical analysis skills must be embedded in all selected content, so learners or students are not simple purveyors of other people's bright ideas. Critical analysis should be taught to all students in universities, both as content and as a toll for learning.
6. Decolonisation at the methods level. Methodologies which promote a questioning attitude, the development of problem solving skills, critical analysis and innovation must be given priority as in developing appropriate learning skills under decolonisation:
    - Methodological approaches, which promote an education for critical consciousness, should be prioritised.
    - Rather than rote learning of facts and ideas, methodologies which engage learners as problem-solvers should be promoted.
    - At higher levels of learning, learners should be taught entrepreneurial skills which promote innovation should be considered.
    - Debate, interrogation, case studies, peer learning and collaborative working are typical classroom practices, which promote decolonised education.
7. Decolonisation at the assessment level. The restoration of human dignity and identity cannot be pursued through assessment regimes, which promote individualism, personal gain and competition. Rather, assessment should be designed in ways that promote communalism, collaboration, community values, cooperation and group problem-solving:

    - Whilst individual skill and achievement cannot be obliterated, students must be assessed as members of groups working on common problems.
    - The skills of team working, and collaboration need to be prioritised in decolonised assessment regimes.
    - Approaches that promote assessment as learning rather than assessment of learning, such as self-learning assessment, peer assessment and team assessment, need to be given greater prominence in decolonised education.

The Fourth Industrial Revolution and higher education transformation

The contemporary world is littered with conditions of the complexities of the crisis of modernity without providing the conditions to defeat the crisis beyond modernity. Contemporary life is seized with '[...] establishing theories and practices capable of reinventing social and economic emancipation out of the ruined emancipatory promises of modernity' (De Sousa Santos 2002:4).

This assumes that all human challenges can be eradicated permanently through the vehicle of conquering of all impediments hindering the pathways to modernity. Modernity has invented modern problems for which it has not managed explanations, and these have, in turn, aggravated a fresh quest for alternate knowledges, unorthodox methodologies and complementary ingenuities of the world. This is coupled with the '[...] failure of modernity to deliver human development, to eradicate poverty' (Dastile & Ndlovu-Gatsheni 2013:104–105) and to enable human freedom. The industrial revolution is one of the most acclaimed circumscribing moments in human history, which resulted in an economic development that began in the 16th-century Europe. It has generated an enormous assemblage and compendium of reviews and analyses on its landscape, foundations and outcomes.

Traced in the history of human progress, industrialisation involves technology and organisation through the adaptation of new technologies in the manufacturing, as well as the tertiary sector. It originates in the renowned 18th inventions influencing mostly agrarian societies to greater industrialisation, including the spinning jenny and the steam engine in Europe marking the First Industrial Revolution (1IR), whilst the Second Industrial Revolution (2IR), ushered in the generation of electricity and invention of the electric motor. The Third Industrial Revolution (3IR), sometimes referred to as the digital revolution, was accelerated by the invention of a transistor, which ushered the electronic age that introduced computers and Internet. In the series of waves of advances in various domains, the 4IR becomes a new era in the periodisation of industrial revolutions driven by AI and cyber-physical systems (see Marwala 2007).

With all the strides of innovations and development, scientific progress driving the convergence of several embryonic technologies has not been spared from both positive and negative distracting consequences given (see Nabudere 2011):

> [*A*] great deal of uncertainty and acrimony in the way we understand the world, as well as the way human beings understand each other in different environments and cultural contexts and mainstream Euro-American scientific knowledge is unable to explain the crisis. (p. 1)

Taking the movements in industrial revolutions to the global south, as has been questioned elsewhere, 'can Africans create African futures within a modern world system structured' [*as new technologies emerge*] by global coloniality? (Ndlovu-Gatsheni 2014:181; [*authors' added emphasis*]). In the succeeding sections, we enter the topical 4IR discourse starting with the conceptions of the notion in the literature. This is followed by a brief on the promises of the revolution and the associated drawbacks of the revolution will also receive attention in this chapter. This chapter will be incomplete without examining what the new technologies of the revolution will have for the future.

Conceptions of the Fourth Industrial Revolution

Revolutions in the industry released human race from animal power, rendered mass production achievable and effected digital capacities to billions of people. The 4IR is often conceived as a growth out of the 3IR, although it is a new epoch rather than an extension because of the volatility of its progress and the upsetting of its technologies. Understood as the new age, it is distinguished by the pace of technological inventions, the popularity of latitude and the incredible inspiration of novel systems, thereby marking the launching of a novel revolution that basically alters ways of living (see Schwab 2017). The net effect of the new revolution is the overall upsetting of all industries at all levels, given the speed and latitude with which the systems of production and consumption have effect on human life (see Marr 2018).

The 4IR, unlike other earlier versions of it, is different in that it is (Savić 2017):

> [*T*]he fusion of technologies that are blurring the lines between the physical, digital, and biological worlds [...] enhanced by the emerging progress of technology in fields such as quantum computing, machine learning, artificial intelligence, robotics, virtual assistants, the Internet of Things, self-driving cars, drones, 3-D printing, nanotechnology, biotechnology, traffic and security monitoring systems, and renewable energy. (p. 1)

According to Mawasha (2017):

> Just as the Fourth Industrial Revolution, is largely likely to have a disturbing effect on all economies, three aspects need to be taken on in the African context namely that 'Development of digital skills is pre-eminent, [...] public-private partnerships are powerful levers for development and [...] industries are being rattled digitally'. (n.p.)

The Fourth Industrial Revolution: What promises?

The 4IR and its accompanying increased innovations in technological use will heighten and have impact on the development and use of renewable energy, the efficacy of fuel and the storage of energy, which, in turn, will make investments in these fields become progressively cost-effective, whilst enhancing gross domestic product growth, and concomitantly lessening climate change, which is one of today's most critical universal challenges (see Schwab 2017), despite some unsettling overtones. Equally, just like predecessor revolutions, the 4IR has the promise of increasing worldwide revenue levels, thereby enhancing the value of life for the global populace. From the demand side, consumers have benefitted significantly as they are enabled to gain access to the digital sphere with the technology promising new goods and services. In addition, it expands the efficacy and leisure of private lives. Conversely and in terms of HE, '[t]he strongest innovators and leading researchers draw on swiftness, well-pruned processes, and the exploitation of

advanced technology to explore and capture research opportunities' (Xing & Marwala 2017:13). Long-term benefits are likely on the supply side as innovations in technology might increase the efficiency and productivity lowering transportation and communication costs, just as logistics and global supply chains will become more effective, and the cost of trade will diminish, all of which will open new markets and drive economic growth (see Schwab 2017). In the same vein, add that the 4IR is a (Xing & Marwala 2017):

> [*P*]aradigm shift from 'centralized' to 'decentralized' production, whereby machines no longer simple 'process' the product, but they are seamlessly integrated into the information network, the business partners and customers. (n.p.)

The dislodgment of human workers by machine workers through technological innovations results in improved safe and rewarding jobs, although critics have posited that modernisation could produce inordinate inequity, especially with its prospects of disconcerting labour markets through automation (see Brynjolfsson & McAfee 2011). Marr (2018) has added to this by observing that the 4IR technologies might assist people to better plan for natural disasters and have the potential also to reverse some of the harm driven by earlier industrial revolutions.

Some potential hazards of the Fourth Industrial Revolution?

Whilst modernity demands that assimilation of technology is inevitable in contemporary human lives, one can virtually see the depletion of naturally critical human attributes, such as solidarity, harmony and compassionate feeling. The use of cell phones, for example, denies people an inner feeling for the other through direct face-to-face contact and humanly dialogue. Human privacy has also gone out of limits with losses of data tracking and sharing of information via connectivity. Human life has gone into a dehumanisation mode as the 4IR has the potential of making humanity robotic, thereby denying it a heart and soul and reclassify our moral and ethical frontiers. However, Schwab (2017) has made a clarion call for and warned leaders and citizens to:

> [*T*]ogether shape a future that works for all by putting people first, empowering them and constantly reminding ourselves that all these new technologies are first, and foremost tools made by people for people. (p. 105)

Fourth Industrial Revolution in the future

As the 4IR has impacts on industry, business governance and the people directly, it will transform how they act, it equally will change their identity in terms of their view of '[…] privacy, our notions of ownership, our consumption

patterns, the time we devote to work and leisure, and how we develop our careers, cultivate our skills, meet people, and nurture relationships' (Schwab 2017:1). In the same vein, at the governance level, it is hoped that digitisation and introduction of new technologies will expand state rule over populations, given the omnipresent reconnaissance systems and the accompanying capacity to control the digital infrastructure. This also means that the existing approach to public commitment and policymaking will alter, with the central government's shrunken responsibility for conducting policy under new technological changes in terms of rivalry and the reallocation and delegation of control. People will hold governments accountable, express their sentiments, whilst concomitantly and to a large extent organising their efforts, and even circumventing the control of state establishments (see Schwab 2017). Taking the 4IR to Africa, evidence shows that at least (Mawasha 2017):

> [...] 70% of the African continent now has access to mobile technology and by having this digital infrastructure it allows new opportunities for poor Africans situated in rural and informal economies. (n.p.)

However, will governments, especially in the developing economies in the global south, embrace the world of disruptive change, which demands conditions of transparency given their undeviating and perfunctory, 'top down' approach rooted in the 2IR? It is, however, imperative that the current situation cannot do away with the invasion of the 4IR. The revolution has direct ramifications for HE. The starting point in embracing new technologies and the related pedagogical trends is for (Xing & Marwala 2017):

> [*H*]igher education systems to look at how they can accept them and transform the teaching and learning environment to the benefit of both students and academics. (p. 3)

The argument for a 4IR appears to be persuasive. The emerging new technologies coupled with increasingly rapid velocity, breadth and depth have a likelihood of profoundly systematic impressions for policymakers, academics and industry, in general, as they will have impact on how to deal with the irreversible change of our time. Humanity today is faced with the contestations of how to apprehend and model the new technologies revolution and their aggregate impact on the contemporary world. The question for us then is how does the 4IR make a difference so much for the global south and more specifically for Africa? Conversely, and just as Chao (2017) has asked, we examine the question:

> How do we educate for the Fourth Industrial Revolution? Are our education systems and programmes relevant to the Fourth Industrial Revolution? And if not, how do we reconstruct our education systems so that they are compliant with the demands of the new age? (n.p.)

Clash of ideologies: Anticipated opportunities and threats

Ideological clashes create both opportunities and constraints in societies in which they play out. Table 1.2 compares the two ideologies based on a range of dimensions. The 4IR and decolonisation ideologies are set to compete for space and recognition as the controlling ideas in coming years in post-colonial nations, such as South Africa. Each of these ideologies is powered by sets of facilitators and could be limited in influence by sets of inhibitors, which the table tries to capture in some way.

The biggest opportunity we can expect from this inevitable clash of ideologies is the potential this brings for innovation. Each ideology brings several benefits to society, and there is a huge chance both will be embraced by society and by HE institutions. There is bound to be a momentum around the art of co-creation, which seeks to embrace the benefits of both ideologies through increased partnership working. This may lead to the creation of new knowledge driven by desires for efficiency and effectiveness but equally for

TABLE 1.2: Fourth Industrial Revolution and decolonisation: Convergences and divergences.

Dimension	4IR	Decolonisation	Opportunity or challenge
Origin of ideology	Natural progression from postmodernism on the back of increased technological capacity	Reaction to the deleterious impact of coloniality on development	4IR does not question colonialism, whilst decolonisation questions colonisation right from the onset
Ontological assumption	Reality is centred around notions of efficiency and effectiveness of people, systems and organisations	Reality is centred around the notion of social justice	The new focus on things over people may serve to increase and deepen social injustice
Epistemological assumption	Digital and technological knowledge and skills will be a priority	Critical evaluation skills and cultural integration knowledge and skills will be a priority	The battle for whose knowledge is of most worth is likely to intensify
Broad rationale	Building resilient, human proof and agile economies, based on emerging ideas and innovation and to enhance competitiveness	Targeting human identity, culture and dignity	Humanity is likely to be the theatre of contestation
Implication for curriculum and leadership	Techno-digital driven curriculum	Critical post-colonial focus and education for the poor	Can become the seedbed for educational innovation designed to capture the benefits of both worlds
Implications for instruction and assessment	Likely rise of individualised distance and modularised instruction and assessment	Group and team learning driven by critical thinking skills	The rise of blended learning with opportunities for both individualised and group instruction and assessment

4IR, Fourth Industrial Revolution.

increasing social justice in society. Another huge opportunity is the potential the ideology of decolonisation has on developing global south leadership and scholarship. For the first time, there is, right there in front of us, the opportunity to assume global leadership in the scholarship of decolonisation. For the first time, global south scholars should resist the temptation to be taught how to decolonise and to utilise predominantly Western lenses and models to illuminate, dissect and ventilate the concept. The only way true decolonisation will take place is if it is going to be on our terms. The potential brought to society by the 4IR should be carefully assessed for its influence on the decolonisation process. For example, whilst we will need to embrace the potential technology will have on eradicating poverty and disadvantage from amongst our societies, we may need to be sceptical about its potential to create a runaway, faceless society, which only prioritises efficiency and effectiveness. Humanity could easily become a casualty if the full might of the 4IR unleashes without control and moderation.

Being a periphery to centre ideology brings both power and challenge to the decolonisation ideology. Periphery to centre ideologies gain support from the people; they tend to have a popular appeal and can be expected to use this popular support for legitimation. However, there is a sense in which it is unlikely to capture the imagination of the centre in the same way. Being an ideology interested in restorative, reparative and compensatory justice, the potential to illuminate on the folly of history may not be what funders like to be associated with. The question of relying on external funding for its development will provide a formidable challenge to its enactment. When not conceptualised and dealt with carefully, foreign aid can be a new form of subtle colonisation. ‘He who pays the piper, plays the tune’. In the book, ‘Aid, debt and the end of sovereignty in Mozambique’, Plank (1993) showed how Mozambique has essentially mortgaged its sovereignty to the International Monetary Fund (IMF) and the World Bank. Similarly, if the scholarship of decolonisation is going to be developed with foreign money, then the ideology will become tainted.

The 41R is a typical centre to periphery ideology. The biggest beneficiaries will be those who earn money from the www and the Internet, Microsoft, and similar organisations. Effectively it will not be surprising that organisations close to the centres will be key beneficiaries, whilst those existing in the peripheries remain consumers dependent on developments from the centre.

The discourses are both complementary and oppositional. The 4IR is broadly an ideology for economic development through digital and technological advances. Decolonisation is an ideology focused on correcting the past and more precisely aims at recalibrating development in terms of the local indigenous populations primarily through re-establishing peoples’ dignity and self-determination.

Synopsis of the chapters

In Chapter 2, titled *Imperatives of situating teacher and higher education in the context of the 4IR*, Dlamini, Bayaga and Moyo describe the 4IR as a new dispensation characterised by rapid advances in technology, affecting life at home and in the workplace. The persistent developments of 4IR create a need for 4IR-related imperatives, such as critical-thinking skills, innovation, problem-solving skills, lifelong learning and independent thinking skills for students-teachers' HE and education, in general. They further argued that the dispensation comes with opportunities for economic and innovative technological advancement, giving opportunities for entrepreneurship and employment. Consequently, they declare the need for imperatives of situating teacher and HE in the context of the 4IR. These imperatives in the form of technological advances are taking place globally and include areas of AI, the mobile Internet and block chain technology. All these advancements are crucial for economic competitiveness and social development.

In Chapter 3, titled *Foregrounding the complex dance of human relating and interacting in teacher development for Education 4.0*, Kitching, Collett and Damons argue that teachers must guide learners towards participation in a society impacted by the 4IR and COVID-19. They further assert that the impact encompasses significant changes to what humans are doing in interaction with technology, as well as through interaction with one another. For them, teacher education must address both these changes. They further stated that currently, the focus is on the interaction with technology, and consequently, there is limited attention to the complex processes of human relating and interacting. The authors propose critical practices in teacher development, aimed at preparing students to participate in the complex dance of relating and interacting within the uncertainty of the 4IR and COVID-19 educational context.

In Chapter 4, titled *Access in higher education: Reimagining education for the underprivileged students in the Fourth Industrial Revolution,* Chiramba and Ndofirepi explore the assumptions behind the 4IR and conclude that it is not only coercing the industries to assess their strategies but also, to a very large extent, pressurising the education sector to rethink their pedagogical knowledge. The authors paused a critical question: is the education sector doing enough to equip the learners with skills and expertise needed for the 4IR? They argued that despite significant increases in physical access to HE and education in general, the gap in epistemological access between the privileged and the underprivileged in primary, secondary and HE remains apparent. The authors examine two groups of students in HE in South Africa, namely, refugee students and students from marginalised communities. Using evidence from two doctoral theses, the authors argued that underprivileged students in HE face challenges in accessing both physical and epistemological knowledge.

For them, the 4IR requires graduates with extraordinary knowledge and creative minds. It, therefore, further argues that educating the underprivileged students for the 21st century involves equipping them with relevant skills for the 4IR, which, amongst others, involve learning to utilise the Internet sources but surprisingly the groups lack even basic computer literacy skills.

In Chapter 5, titled *Enhancing 21st-century skills through online facilitation,* van Wyk*,* Moodley, Coetzee and Robberts argue that amongst the buzzwords, such as IoT, AI and 4IR, the growth and demand for 21st-century skills to advance the global market and economy are rising. The authors argue that in a low-income country, such as South Africa, an all-inclusive approach to bring about change and eradicate challenges of resistance towards technology integration is needed. They deployed a constructionist approach to investigate the 21st-century skills attained by 29 students in a blended learning course. They highlight student experiences of constructionist facilitation to reveal the 21st-century skills they obtained during the course.

In Chapter 6, titled *The myth of the Fourth Industrial Revolution: Implications for teacher education,* Moll's argument is in the debate between Klaus Schwab and Jeremy Rifkin, which is about whether there is such a thing as a 4IR. He indicates that on one hand, Schwab adopts a technocratic account of education imperatives, emphasising the use of ICTs in teaching as the necessary solution to contemporary, global educational crises. He argues that on this account, teachers must, above all else, be trained to deliver learning using the digital technology. On the other hand, Rifkin is said to have adopted an egalitarian view of education, envisaging a background role for ICTs in classrooms and schools, in a horizontally scaled, Internet-driven, open learning agenda. For the author, both poles of the debate suggest a *technology-driven* conception of teaching and teacher education. He views both poles as posing a reductionist view and as inadequate for contemporary teacher education, because it cannot provide for practices that will foster the deep classroom learning required by the networked information economy.

In Chapter 7, titled *From colonisation to self-colonisation: Efficacy of translanguaging as a socially just decolonising pedagogy*, Charamba points out that throughout the history of mankind, language has been used as a tool of ascendance, and colonisation to consolidate power and create governable subjects. The author, therefore, argues that decolonisation of education should be prioritised and should entail the incorporation of epistemic perspectives, knowledge, thinking and languages from the African continent. He further argues that African countries' curricula are still largely Eurocentric following the monolingual ideology of 'one nation, one language', with foreign languages being the lingua franca for these multilingual societies. The author also pointed out that whilst the recognition of the 12 official languages was hailed as a victory for the constitutional rights of speakers of African languages, this has not

translated into something tangible in the education sector where the Language of learning and teaching (LoLT) is still a barrier to effective education. His main argument is that monolingual pedagogy reduces some students to speechless because of low proficiency in the LoLT and advocates for translanguaging, a term with the potential to end our self-colonisation by decolonising our perception of language and linguistic practices in education.

In Chapter 8, titled *Decolonisation and the aims and purposes of teacher education*, Ajani and Uleanya explore the terrain of teacher education, suggesting that it is the nexus of education system. Their main aim was to add to the discourse on decolonisation of teacher education in the South African context. They understand that teacher education in HE institutions prepares prospective teachers – the pre-service teachers, with necessary training for desired educational goals. Consequently, teachers have an important role in developing learners who can responsively fit and relevantly develop their immediate environments. The authors argue that education should provide learners with knowledge, and skills that are applicable to the realities of their environment. They further contend that teacher education must prepare pre-service teachers with appropriate knowledge and skills that are appropriate for the tasks. The authors stipulate that students' minds need to be decolonised for realities around them by the teacher educators who can be flexible in classroom teaching for desired change in the society.

In Chapter 9, titled *The affordances of open educational resources and student-centred open pedagogy for the decolonisation of teacher education in South Africa*, Olivier argues that in the context of the decolonisation of the curriculum, it is essential to incorporate student voices to situate learning in an appropriate milieu. To this end, he explores the affordances of open educational resources and student-centred open pedagogy as resources that can be used for teacher education. He also suggests that the decolonisation of the curriculum process be focused on students. He critically analyses the pertinent literature on open educational resources and open pedagogy interpreted against the background of the scholarship on the decolonisation of the curriculum. The author views open pedagogy as not only the practice of using open educational resources in teaching and learning but also a means of facilitating greater participation by students.

In Chapter 10, titled *Teacher education in the melting pot: Closing thoughts to the Fourth Industrial Revolution and decolonisation in higher education in South Africa*, Maringe and Chiramba argue that the emergence of the two ideological orientations of decolonisation and the 4IR has the potential to influence needed transformation but the fact that they also diverge in their purposes and assumptions has the potential to exacerbate epistemic violence. The authors also bring together convergences and divergences in the assumptions between the 4IR and decolonisation. By so doing, they identify

sources of tension and contradiction apparent in the chapters of this book, as well as in the literature, which HE institutions need to be aware of dealing with ideologies that are potentially oppositional.

Conclusion

We conclude this chapter with a few critical thoughts. First is that both ideological schemas have much in common, especially as sources of needed transformation in HE. On one hand, the two differ widely in many instances. Epistemologically and axiologically, the two ideologies are based on different knowledge and reality bases. For the 4IR, the knowledge base is steeped in the rapid developments in technologies and digitalisation, whilst decolonisation has its base securely in a belief that the world has become too homogenised, and in the process the risk of further marginalisation of traditional and IKS looms large, especially in post-colonial circumstances. The two view reality differently. For the 4IR, the world is organised around the tenets of mordernisation, which as we know is an extension of previous colonialism, colonisation and imperialism (Mignolo 2011), which resulted in the current hegemonic influence of Western civilisation as the only authentic and acceptable template for development. Decolonisation, however, sees reality in terms of oppression, disadvantage, peripheralisation and subjugation of alternative knowledge systems, which it seeks to bring back to the table of global ideas. Secondly, we think that HE systems cannot and should not dismiss either of the two in preference to the other. We must see the ideas as being in conversation creating a new ecosystem of knowledges. At the very least, HE cannot be left behind by globally significant imperatives. However, that gaze must be tempered with an even stronger focus on creating a socially just HE in South Africa.

Section 1

The Fourth Industrial Revolution and teacher education in South Africa

Chapter 2

Imperatives of situating teacher and higher education in the context of the Fourth Industrial Revolution

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Abstract

The objectives of the current conceptual research study are to examine the context of the imperatives of 4IR, impact of the 4IR and, finally, the transformations in higher education institutions (HEIs) via 4IR. The objectives are anchored upon 4IR rapidly pushing advances in almost all aspects of human endeavours, consequently affecting life at home and at the workplace. The persistent developments of 4IR thus create a need for 4IR-related imperatives, such as critical-thinking skills, innovation, problem-solving skills, lifelong learning, and independent thinking skills for students-teachers' education and HE, in general. Through an integrated systematic review of the literature and informed by the objectives, we examine the (1) alignment of teaching and (2) learning through the emerging innovations, such that the education system will be relevant in the 4IR. We also (3) examine the need to overhaul the education system taking account of the 21st-century skills. Rested upon the objectives, one of the key conclusions was that 4IR technology skills, through a well-defined context, also called the 21st-century skills, can be inculcated in students through the problem-based teaching and learning approach.

Introduction

The 21st century has brought about a new dispensation, called the 4IR, which comes with disruptive technologies affecting our way of life, both at home and at workplace. This revolution is emerging with vast improvements on the previous revolutions. These technologies are 'blurring the lines between the physical, digital and biological spheres, consequently, technologies create a need for special skills in teacher training' (Xu, David & Kim 2018:91). Whilst these skills are also referred to as the 21st-century skills and include critical thinking, innovation, problem-solving and lifelong learning, the skills are inadequately taught under the current education system in South Africa (De Freitas & Spangenberg 2019; Joynes, Rossignoli & Amonoo-Kuofi 2019). Alarmingly, these imperatives are taking place globally in the areas of AI, the mobile Internet and blockchain technology. All these advancements are crucial for economic competitiveness and social development. The assessment is based on De Freitas and Spangenberg's (2019) study, who revealed that South African teachers lack the knowledge of technological content, whilst Joynes et al. (2019) argued that 21st-century skills are associated with information and communication technology (ICT) teaching and learning. Sadly, and in contrast with Joynes et al. (2019), teaching in the South African schools is still highly driven by competence in content with little focus on the application of the material in new situations and development of 21st-century skills.

Drawn from the suggestive skills of De Freitas and Spangenberg (2019) and anchored upon the lamentation of Joynes et al. (2019), arguably, there is, therefore, a need to re-evaluate teaching and learning in South African schools, with the view of aligning education with the current demands of the 4IR. The rationale is because it is through education that the 4IR technology skills can be imparted to the present generation and generations yet to come. As a result, De Freitas and Spangenberg (2019), Joynes et al. (2019), Yusuf, Walters and Sailin (2020) summarised that through education, 4IR technology skills can be imparted to the next generation, and that education provides a platform for further research to fine-tune the 4IR technology for the improvement of human life. Another summary as suggested by research findings is that HE should strengthen science, technology, engineering and mathematics (STEM) education in institutions of higher learning, especially to respond to the challenges of 4IR to produce students who will be competitive in the 4IR era (Yusuf et al. 2020), the need for the debate and thus for the current research.

Methodology for literature review and research objectives

It is essential to evaluate the preparedness of our education system for 4IR so that necessary adjustments are made to align education with the demands of 4IR. Based on the assessment thus far, the current research via an integrated systematic review of literature in 4IR and education starts by re-evaluating the need for positioning teacher and higher education in the context of 4IR. In order to accurately fulfil such examination as directed by Adesina (2019), Schwab (2016), Xu et al. (2018) and Yusuf et al. (2020), it is imperative to position teacher and higher education in a well-defined notion of what we mean by 4IR. The next task as guided by Abdurrahman (2019), Scepanovič (2019), binti Junid et al. (2019), as well as World Economic Forum (2017) is to assess the impact of the 4IR. We also have drawn from the work of Hussin (2018), Kek and Huijser (2015), Ng'ambi et al. (2016) together with Uerz, Volman and Kral (2018) to examine what it means to transform HEIs driven by 4IR technology. Based on the themes of the reviewed works as aforementioned and guided in Table 2.1, we simultaneously discuss the implications and ramifications thereof.

Background and related work

Based on the themes in Table 2.1 and guided by the research objectives, amongst others, the following are three key factors under assessment in related work: contextualising the imperatives of 4IR, impact of the 4IR and, finally, transforming HEIs using the 4IR technology.

TABLE 2.1: Methodology of literature review.

Themes	Sources	Research objectives
Positioning teacher and higher education in a well-defined notion of what we mean by 4IR	Schwab (2016), Xu et al. (2018) and Yusuf et al. (2020)	To examine the need for positioning teacher and higher education in a well-defined context of 4IR
Impact of the 4IR	Abdurrahman (2019), Scepanovič (2019), binti Junid et al. (2019) and World Economic Forum (2017)	To evaluate the impact of the 4IR
Transforming HEIs through the use of technology	Kek and Huijser (2015), Ng'ambi et al. (2016), Lapek (2018), Phang, Nawi and Musa (2017), and Wan Husin et al. (2016)	To analyse transformation of HEIs using the technology

4IR, Fourth Industrial Revolution; HEI, higher education institution.

Contextualising the imperatives of the Fourth Industrial Revolution

Sefotho (2015:123) contended that 'change is inevitable' and reckons that 'survival in this turbulent career environment requires workers to manage change – in themselves and their contexts continually'. What is meant is that industrial revolutions bring change in the way of life of people. What is important also is that an industrial revolution as explained by Schwab (2016) is the emergence of technology that improves the way of life of people, including life in the home and in the workplace. Nevertheless, it is crucial to recognise that the 4IR comes with huge improvements, from the previous revolutions, that are 'blurring the lines between the physical, digital, and biological spheres' (Xu et al. 2018:91).

The 1IR, which started in 1790, came with the invention of the steam engine. This brought relief and ease in doing work, especially in the agricultural sector. It saw the use of coal as fuel to drive the steam engines (Xu et al. 2018), thus improving on the means of transport using steam-engine powered trains. The invention of the internal combustion engine, in 1900, ushered in the 2IR, resulting in the production of electricity and heavy oil-fuelled machines. This led to an increase in industrialisation with mass production powered by oil and electricity machines. The 3IR, in the 1960s, was marked by the invention of electronics and the use of information technology (IT) machines. The 4IR started in the year 2000. This era is characterised by a fast-growing change in technology with an improvement in IT, AI, robotics and three-dimensional (3D) printing. Its outstanding characteristic is the fusion and interaction of techniques from the physical, digital and biological domains.

There are several ramifications for 4IR. For instance, generally, the 4IR is emerging with new technologies that will disrupt the way we live and work (Newman & Gough, 2020; Penprase, 2018; Scepanovič 2019; Schwab 2016; Yusuf et al. 2020). The 4IR affects work in almost all types of industry. The 4IR technology is changing ways of production, communication, transport, trading and management in the workplace. Most present jobs will become redundant,

and new ones that have not existed before shall be created. Specifically, though and in all this transformation, education should take a leading role in preparing the upcoming generation for the new challenges and opportunities brought about by 4IR.

What is meant for teacher and higher education is that the emergence of the 4IR requires this generation and upcoming generations to develop new skills that are compatible with the emerging technologies? What is meant too is that this calls for a change in the education system. As a consequence, change in teaching and learning should be for the development of 21st-century skills required for one to be competitive in the 4IR. These skills are necessary to cope with the context of 4IR. For example, in the past, there has been a need for a workforce that could operate machines. Now, because of 4IR, there is a need for people with skills in computer programming and engineering. The production of teachers who can impart these skills through STEM will ensure the sustainability of 4IR and the development of more technologies (Yusuf et al. 2020).

Impact of the Fourth Industrial Revolution

The World Economic Forum (WEF) (2017) reckons that the 4IR disruptive technologies will cause significant changes in business across the world in the next coming years. These changes will result in some jobs becoming obsolete, whilst there will be a great need for people with 21st-century skills to cope in the 4IR. One of the major ramifications as highlighted by the WEF (2017) is that 'to prevent a worst-case scenario [in which] technological change accompanied by talent shortages, mass unemployment and growing inequality', there is an urgent to empower the present and the upcoming generation through education with the necessary skills for 4IR (WEF 2017:v). Consequently, the emergence of 4IR will not leave the education institution unchanged. The question is how the education system should be transformed to meet these challenges.

In response to the question, the current chapter calls to action in education to respond to the changes taking place because of 4IR technologies. No one may know exactly what skills to develop in our students for 4IR. Still, research findings recommend that the central area of transformation should be STEM education (binti Junid et al. 2019; Schwab & Samans 2016; Sutherland 2020). The implication is that the need to strengthen the area of STEM education is established through a review of research studies on skills for 4IR. For example, a study carried out by Abdurrahman (2019) indicated that STEM learning improves students' 21st-century skills, namely, creative-thinking, problem-solving and critical-thinking skills. Abdurrahman (2019) carried out a quasi-experimental design involving 30 secondary school students in Indonesia. In this study, a STEM maker space was used to develop 21st-century skills in

students. The results revealed that STEM learning could foster students' 21st-century skills for 4IR.

One of the consequences from the previous study is the rising need for telecommuting. Another result is that the employment growth will be in the areas of science, technology, Mathematics and engineering. The implication of this finding is the need for strengthening STEM education to respond to the needs of 4IR. Even though there are a number of conundrums associated with the current paradigm shift (to be discussed), what is key is that the education system must change according to the dictates of 4IR. General conundrum, as cited by Campanella (cited in binti Junid et al. 2019:107), alludes to the fact that jobs that will be relevant shortly are that of 'data scientists, application developers, or cloud computing specialists'. Thus, it is through STEM education that people with these skills will be produced; however, there are other nuances, as discussed below.

Conundrum 1: One conundrum is that the skills needed in 4IR are not only in STEM. The conundrum is based on the assessment of Scepanovič (2019), who cautions that the emerging 4IR technologies are closing the gap between natural sciences, humanities and social sciences. Henceforth, these advances in technology call for an interdisciplinary approach to education, with strengthened emphasis on STEM education. The focus is on transforming STEM education because this is the area that 'houses' technology and science teaching.

Transforming higher education institutions through the use of technology

Based on the aforementioned assessment, our response to the emergence of the 4IR technologies should not be in the sense that we are being 'swept away' by these technologies. Instead, the current research study argues that we should respond in a way that we leverage the affordances provided by these emerging technologies. Therefore, one of the implications is that HEIs should firstly incorporate the 4IR technology in their teaching and take the opportunity to use the affordances provided by technology to improve the deliverance of programmes to students.

Conundrum 2: There has been debate on whether the use of technology enhances teaching and learning (Kek & Huijser 2015). Conundrum 2 arises from Clark (cited in Sickel 2019), who argued that technology does not influence learning, rather, it is only the method of instruction that matters. Clark likened the use of technology with a truck delivering groceries to people. Clark's view is that the truck's function is the delivery of the groceries, but not a change in the people's nutrition. The assertion is that different technologies

only affect the efficiency of the delivery of instruction, but in effect, it is the content and method of instruction that affect learning.

Conundrum 3: However, Kozma (cited in Sickel 2019) argues that technology provides affordances for a selected method of instruction. Hence, educators should draw from affordances offered by technology to teach students. Mishra and Koehler (2006), however, cautioned that educators should carefully select technologies that have specific affordances for their intended instructional objectives and that suit the intended method of instruction. Conundrum 3 means that not all technology can be used in any instance. This careful selection of appropriate technology for any teaching instance implies that there is a need of technological pedagogical content knowledge (TPACK) for educators. The implication, hence, is that to carefully select an appropriate technology to be used in the teaching and learning process, teachers must have a number of competencies to teach 4IR technologies to their students. These include (1) competence in the use of technology, (2) TPACK competency, (3) positive beliefs on the use of technology and (4) skills in innovation and professional development.

In summary, the competency in the use of 4IR technology responds to the educators' ability and ease of using technology for personal purposes. This competency also responds to the teacher educator to understand how technologies work and experience its advantages, first hand. This will then affect educators' beliefs on the use of technologies. However, it cannot be expected for one to have positive beliefs about something they have not experienced themselves. The question then becomes, 'do the teacher educators have experience in using technologies'? In a review of nine studies, Uerz et al. (2018:17) found that 'teacher educators lack the necessary technological experience, especially with emerging or more complicated technologies'. Studies by Murdock (2006), Uleanya and Ke (2019), Georgina and Olson (2008) also found the same results as suggested by Uerz et al. (2018) that there is a lack of competence in HEIs' educators in technology experience, and hence, the need for contextualising the imperatives of the 4IR, impact of the 4IR, finally, transforming HEIs using the technology.

Discussion of related work

Drawn from contextualising the imperatives of the 4IR, impact of the 4IR, and, finally, transforming HEIs using technology and the three conundrums thus far in the related work, innovative competency is key in terms of contextualising the imperatives of the 4IR. The competency for innovation and professional development plays a big role in enabling educators to embrace new innovations and emerging technologies. Silman, Yaratan and Karanfiller (2017) as well as Xing and Marwala (2017) lament the fact that even though technology has the potential of improving students' achievement in education, teachers lack the

necessary expertise to use it in their teaching. The lack of teachers' competence in using technology is because of a lack of training at HEIs. Additionally, Silman et al. (2017) observed that:

> [*T*]he lack of training of trainers is seen as an obstacle to the use of technology while teaching a lot; for this reason, technology is more distracting than a vehicle in the class. (p. 4806)

This speaks to the need for the transformation of HE context to incorporate 4IR technology in training teachers with several implications. Thus, it is TPACK that enables any educator to select an appropriate technology to facilitate learning for his or her students. Technological pedagogical content knowledge also encompasses the teacher's knowledge of how to effectively use technology in teaching. Having TPACK is important as using technology in teaching may impede instead of facilitating learning if the technology is not properly selected (Sickel 2019; Silman et al. 2017). In addition, Ng'ambi et al. (2016:843) conducted a review of use of technology in South African HE to enhance teaching and learning, and found that despite the emergence of new technology, 'teaching and learning practice in South African HE remains largely unchanged'. The challenges in South African HE are because of various reasons emanating from inherent past educational policies. Because of the past differences in HEIs in South Africa in terms of their educational backgrounds, they have different views on how technology can be used to enhance teaching and learning. This results in disparity in the integration of technology in the education system of HEIs. In a study involving 93 Mathematics teachers in South Africa, De Freitas and Spangenberg (2019) found that the teachers had high levels of content and pedagogical content knowledge. However, these teachers had low levels of technological content knowledge. The reasons put forward for not integrating technology in teaching by these teachers included restricted time to finish the syllabi, non-availability of technology hardware in schools, lack of adequate training on technology and negative teachers' pedagogical beliefs in technology. The importance of teachers' pedagogical beliefs for change of behaviour has been established in a number of studies through the impact of 4IR.

Impact of the 4IR

For instance, various researchers point out how pedagogical beliefs of teachers play a significant role in their decision of whether to use technology in teaching (De Freitas & Spangenberg 2019; Ding et al. 2019; Ertmer et al. 2012; Hsu 2016; Lim & Chai 2008; Petko 2012; Tondeur et al. 2017). Many studies found that there is a positive relationship between teachers' pedagogical beliefs and their use of technology in teaching practices (Ertmer et al. 2012; Hsu 2016; Petko 2012; Prestridge 2017; Tan, Choo, Kang & Liem 2017; Tondeur et al. 2017). This is because of the fact that teachers, guided by

their pedagogical beliefs, use methods and materials in teaching that they regard as effective for student achievement. Hence, HEIs should positively impact the prospective teachers' expectations in the use of 4IR technologies in education. Teachers view the importance of technology in education according to their belief in its relevance to education and society at large. Results of systematic reviews of the literature in 4IR and education point to the fact that teachers' pedagogical beliefs can be impacted upon by allowing prospective teachers experience technology use during their training. Hence, HEIs should inculcate technology in the curriculum of teacher training. Tondeur et al. (2017:9) emphasised that 'technology-rich learning experiences have the potential to change teachers' beliefs towards more student-centred, constructivist beliefs [...]'. Globally, the failure of HEIs to incorporate the emerging technologies in their teaching and learning (as a use case) is because of the (Ng'ambi et al. 2016):

> [L]ack of adequate training of higher education practitioners in the appropriate use of technology to improve learning outcomes; institutional barriers are limiting broader update of such technologies, [...] the need for a 'culture shift' among academics to accept challenges to traditional approaches to teaching and learning and scholarly publication. (p. 845)

☐ Use case 1 (Impact 1)

The era of traditional teaching with teacher and chalkboard has passed. Technology must be incorporated into the teaching system. Classrooms must be well equipped with computers, connected to the Internet for research and simulation of problems and solutions. Teachers should use interactive boards, instead of chalk and blackboards, in their teaching. The use of robotics in the classroom should be maximised in order to provide a safe learning environment, for example, the handling of equipment and carrying out procedures that are dangerous to humans.

The use of AI can bring considerable improvements in the education sector. It could be used in education as teaching assistants by informing teachers on best teaching strategies for their students. It could also be used to facilitate individualised and personalised learning in order to meet students' individual learning needs, as this is the recommended approach to education in developed countries (Yusuf et al. 2020). A study conducted by Silman et al. (2017) revealed that the use of technology is beneficial in the education of students with disabilities, which could be intellectual, visual, speech, hearing impairment or physical disabilities. Students with these disabilities need specialised and personalised instruction, which could be provided through technology. Artificial Intelligence can also help in HE administration by reducing unnecessary paperwork that characterises the traditional approach of teaching. Through AI, teachers can administer tests and examinations, mark

students' work and keep records without the use of paper. However, teachers need to be trained to be able to engage and understand the use of AI in the teaching and learning process. Training in the use of technology will position teachers in a place to embrace the use of 4IR technologies in their subjects and understand their (teachers) role in the teaching or learning process.

Use case 2 (Impact 2)

The WEF (2017:1) realises a need 'for adult skilling, reskilling and upskilling throughout a person's career' because of constant changes in skills required in the job markets. Higher education institutions can take advantage of the ubiquity of the Internet and the world wide web to meet this need by providing online teaching and learning, which will facilitate the upskilling of the present workforce to meet the skills demand of the 4IR. In South Africa, where 'access to higher education and the prospect of obtaining a higher education qualification through full-time contact institutions seems a remote reality for the majority of black South Africans', it is imperative that HEIs transform to offer online teaching and learning (Letseka 2015:vii).

The ramifications from the two use cases and further discussions (in transforming HEIs using the technology) are that online teaching and learning can be a means for access to higher education for the majority of South Africans. It can provide many South Africans who did not get the opportunity to obtain HE qualifications with a chance to 'upskill' in order to be competent in handling 4IR technologies, according to their job requirements.

Transforming HEIs using technology

The WEF (2017) notes that because of the rapidly changing technologies in 4IR, future jobs will require workers with multi-dimensional skills. In order to meet the demands of 4IR and its technologies, the education system should be transformed. Hence, the present education system that focuses only on the acquisition of knowledge with little emphasis on its application must change. Students must be taught such that they develop 21st-century skills, including lifelong learning skills. Therefore, changes in education should be in pedagogy and skills development. Yusuf et al. (2020) listed skills needed in the 4IR, which include creativity, critical thinking and problem-solving, to be acquired by students. Developing these skills in students requires teachers to use learner-centred approaches to teaching and learning (Egetenmeyer, Ng & Tuckett 2017; Lapek 2018).

According to Phang et al. (2017), one of the recommended teaching and learning approaches to achieve transformation in student's 21st-century skills is the problem-based learning (PBL) approach. For instance, its effectiveness and usefulness in STEM education are because of its interdisciplinary approach

to teaching and learning. Wan Husin et al. (2016) carried out a quasi-experimental design study involving 125 secondary school students to determine the effect of a PBL programme on the students' 21st-century skills. The students' 21st-century skills were measured before and after participating in the PBL programme. The 21st-century skills that were under study include digital literacy, inventive thinking, effective communication, high productivity and spiritual values. The findings revealed a significant increase in the students' 21st-century skills, which establish the fact that the use of PBL in STEM education has the potential to enhance students' 21st-century skills.

Uerz et al. (2018) noted that teachers do not only pass content knowledge to students but also act as role models to their students. Courses in STEM should respond to the technological advances taking place in 4IR. These courses should be developed such that they provide students with problem-solving skills. The courses should also provide students with practical skills in 4IR technology rather than being theoretical in nature.

It could thus be concluded that teachers have the responsibility to update their students with the existing technological developments in order to make them competent to work with the 4IR technologies. This means that HEIs must have the capacity to equip the teachers for this responsibility. Higher education institutions can achieve this by being 'role models for their students in teaching with technology as well as in fostering students' technological literacy' (Uerz et al. 2018:13). Hence, the use of technology in HEIs goes beyond facilitating the teaching and learning process, and it also models technology usage to the students.

There is a need for competent teachers to support the implementation of 4IR technologies in the schools in order to achieve a shift towards a 4IR relevant workforce. This is because the type of education provided in a country determines its future development. Hence, HEIs must play a key role in cultivating an understanding of 4IR and its accompanying technologies in teachers they train so that they can be agents of change in the schools in which they will be teaching (binti Junid et al. 2019).

Future direction

Three future directions evolve from both the related work and the discussions.

Firstly, based on the arguments within these conundrums, it is unavoidable to pull together the conundrums and consequently provide a sense of caution needed for 4IR in teacher education. Thus, following the conundrums, whilst for instance STEM is key, it is equally evident that 4IR technologies are closing the gap between natural sciences, humanities and social sciences. For that reason, 4IR advances calls for an interdisciplinary model to education, whilst emphasising on STEM education. However, it is important to recognise from

conundrum 2 that different technologies only affect the efficiency of the delivery of instruction and hence teacher education. That is, in education systems, it is the content and method of instruction that affect learning via 4IR-driven technology. In line with conundrum 3, the implication is a prudent selection of an appropriate 4IR-driven technology to be used in the teaching and learning process. In a broader perspective though, teaching and higher education in the era of 4IR require the upcoming generations to develop new skills that are compatible with the emerging technologies and the context.

Secondly, given that some foreground has been established for the adoption of the imperatives of the 4IR in teacher education and HEIs, it is equally paramount to recognise challenges. For instance, even though there will be a 'strong employment growth across the architecture and engineering and computer and mathematical job families, a moderate decline in manufacturing and production roles and a significant decline in office and administrative roles' will be initiated with the advent of 4IR-driven technology. The implication is the need to strengthen STEM education to respond to the needs of 4IR technology skills. Thus, the education system must change according to the dictates of 4IR.

Thirdly, the 4IR is a new dispensation with emerging disruptive technologies that are changing the way we live and do work. Studies in 4IR show that the disruptive technologies of 4IR will not leave the education sector unchanged. It is imperative that the education sector leverages on these emerging technologies to harness their opportunities in teaching and learning for a positive and productive future. A research study on 4IR and technology application in education shows that even though 4IR technologies can improve teaching and learning, the education sector is not proactive enough in incorporating these technologies in the teaching and learning process. Education using learner-centred teaching and learning approaches can inculcate the necessary 21st-century skills in students to make them competent in the 4IR era. The WEF (2017) predicts that with the emergence of 4IR, the demand for jobs that require physical and manual skills will decrease in favour of those that require 21st-century skills. This has implications for teaching and learning to transform from teaching for competence in content knowledge to teaching for competence in the application of knowledge in problem-solving. For future direction, 4IR technologies can help to facilitate the transformation of HEIs to offer online programmes to increase access for many students to higher education.

Conclusion

Drawn from the aforementioned assessments, including the conundrums as well as the use cases, and given that 4IR is coming with new technologies, new skills will be required to work with these technologies. It is only through

education that the upcoming generation can attain these new skills. The first conclusion is that these skills, through a well-defined context, also called the 21st-century skills, can be inculcated in students through the problem-based teaching and learning approach using technology. However, this research study reveals that teachers do not have the necessary skills to teach such a programme. As a second conclusion and a response to the second objective, it is therefore imperative that in-service and pre-service teachers are capacitated on developing 21st-century skills in students in their teaching. The upcoming generation needs critical-thinking skills, creativity, digital age literacy, etc. so that they can contribute to the emerging technologies through innovations and inventions.

In response to the third objective, the conclusion is that HEIs should also be transformed to proving online learning programmes, leveraging on the vast availability of technology in 4IR. The provision of online learning has numerous benefits, for example, providing access to HE for the majority of South Africans and providing the present workforce with opportunities to upscale their education to attain the 4IR technology skills demanded by the emerging technologies.

Chapter 3

Foregrounding the complex dance of human relating and interacting in teacher development for Education 4.0

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Abstract

Teachers have to guide learners towards participation in a society impacted by the Fourth Industrial Revolution and the COVID-19 pandemic. The impact encompasses significant challenges to what humans are doing in interaction with technology, as well as through interaction with one another. Teacher education has to address both these challenges. In training for Education 4.0, the attention has mainly been on the interaction with technology. Attention to the complex processes of human relating and interacting associated with these challenges has been limited. This chapter proposes attention to relationality as a basis for preparing pre-service teachers to participate in what a complexity perspective on human behaviour, refers to as the complex dance of relating and interacting. In order to develop our proposition, we conducted a document analysis to interrogate the representation of relationality in current policies on teacher education. We also applied a critical reflective methodology (Fook 2011). In this context, it encompassed engagement in a series of reflexive conversations, informed by theoretical perspectives on relationality, models applied in practice to enhance relationality in teacher education and critical incidents from our own experience in teacher educators and educational psychologists. Our co-constructed proposition could serve as a guideline for the development of pre-service teachers' capacity to engage with the aforementioned challenges. Our proposition encompasses an integrative process envisioned as three key movements: an invitation to the dance, enhancing a deepened understanding of the dance and attentively engaging in the complex dance to centrally locate the complex dance of relationality in teacher development programmes for Education 4.0.

Introduction

The human race has been exposed to rapid advancements in ICT since the beginning of the 21st century. These rapid advancements combined with the serious challenges associated with the COVID-19 pandemic elicit a sense of uncertainty and unpredictability that may be terrifying at times. Considering the role that teachers can play in guiding the future generation through these challenges, it is important that they should be prepared to be flexible, critical thinkers who are capable of collaborating across various levels of interconnectedness in the Education 4.0 context. Lea et al. (2002) and Hussin (2018) concurred that the complexity of these challenges will require tolerance, emotional intelligence (EI), self-understanding, self-control, empathy and motivation, as well as the social skills to influence, guide and support others.

Currently, the focus on training pre-service teachers to be successful in Education 4.0 has mainly been at the enhancement of skills associated with the implementation of technology. Puncreobutr (2018:92) emphasised that

Education 4.0 should not only focus on technology but has to equip people with an array of competencies required for sustaining human and social capability for this century and beyond. The Delor's report (United Nations Educational, Scientific and Cultural Organization [UNESCO] 1996) best summarise these competencies as focusing on knowing, doing, learning and living together as human beings.

As teacher educators, who share a common interest in and passion for transforming educational contexts into nurturing environments, we asked ourselves how we could possibly contribute to the preparedness of pre-service teachers for these challenges that await them. Whilst we have to acknowledge that some of the competencies have been developed in our training processes, we are concerned that the training do not develop an in-depth understanding of relationality. Yet, relationality is the core of our human existence as foregrounded by the African philosophy of Ubuntu, which views an individual's humanity as being expressed in relationship with others (Metz & Gaie 2010; Ukpokudu 2016). We, therefore, agree with scholars (Aspelin 2014; Gergen 2009; Ljungblad 2019; Roffey 2008) who argue that we need to nurture the notion of ourselves as relational beings if we hope to protect and sustain our humanity in the 21st century and beyond.

The problem we observed in our respective contexts is that we deliberate relationality in the context of the current decolonisation debate and recognise the significance of training pre-service teachers to be competent in the development of relationships across all levels of interconnectedness. Yet, we still seem to struggle to move beyond the historically imposed focus on the individualist approach associated with a traditional Western perspective. In an effort to initiate a shift towards the integration of relationality into the teacher training programmes, this chapter presents a proposition for training pre-service teachers to master 'the complex dance of human relating and interacting'. A dance described by Stacey (2007) as an ongoing dynamic process that is part of our everyday existence as human beings, in which we influence and are influenced by one another across the various levels of interconnectedness.

As a prelude to the presentation of the proposition, we interrogate the representation of relationality in the South African HE policies on teacher education and explain how we co-constructed the proposition with specific reference to the theoretical approaches and the methodology we applied.

Relationality in teacher development in the South African Higher Education context

At the onset of our journey towards the co-construction of our proposition, we explore how relationality is currently represented in teacher development from the South African HE context. We conducted a document analysis of

Minimum Requirements for Teacher Education Qualifications (MRTEC), the policy that guides teacher education in South Africa (DHET 2015), the National Qualifications Framework, the requirements of South African Council of Educators (SACE 2018) and the Integrated Quality Management System (IQMS 2003).

Our analysis of these documents revealed that relationality is acknowledged as underpinning teachers' performance at various levels. The IQMS strongly emphasises the construction of supportive and empowering environments, in which learners could flourish based on enabling relationships with their teachers. Teachers are expected to be responsive to the educational as well as the socio-emotional needs of learners and fellow-educators, whilst mediating learning in ways that are sensitive to diverse leaner needs. Moreover, teachers have to engage in a way that promotes an ethical attitude characterised by respect and responsibility towards others and the democratic values and practices upheld by the Constitution.

The minimum requirements for teacher education qualification emphasises the need for developing the capacity of new teachers to function in Education 4.0 through the development of '21st Century skills of creativity, media and technology literacy, flexibility and disciplinary depth; [...] think critically, show leadership, innovate, collaborate, communicate and take part in lifelong learning' (DHET 2015:12).

The Requirements of South African Council of Educators (SACE 2018), presented in the draft Professional Standards for Teachers (November 2018), emphasise reflexive competencies in relation to designing and conducting learning experiences; engaging learners to stimulate their curiosity about a subject and to motivate them to learn; relating to and communicating with parents, learners and the broader school community; providing learners with constructive feedback and participating in professional learning communities (from SACE PPT 2018).

Considering the emphasis placed on relational competencies in the policy documents, we reflected on the current stance on the development of students' competencies to adhere to the requirements set out in the policies, as implemented at our respective institutions in relation to the policies. We noted a strong emphasis on theoretical conceptualisation of relationality from philosophical and sociological perspectives. However, in practice, we observe fragmented inputs on the development of relational competencies that will enable our students to deal with the uncertainty and unpredictability of the era, in which the pre-service teachers live and work. The relational aspects of the teachers' roles and responsibilities are, for example, emphasised in the practice teaching modules; however, limited reference to relationality is evident when students are assessed during lessons. Essential 'soft skills' as noted in the research on human interaction in the 21st century are identified

and incorporated by some lecturers. At one institution, a first-year module has been introduced. The module exposes the pre-service teachers to various opportunities to rehearse the processes and practices that develop their personal and professional identities as educators and guide them to understand the intrinsic and extrinsic variables that may influence their personal and professional identity over time. The engagements with students are underpinned by a strong social justice ethos that encourages them to adopt responsible citizenship as they grow along their career trajectory. At the other institution, there is an indication of a shift towards a more integrative process that involves lecturers across disciplines in conversations about the significance of relationality. This led to invitations to work collaboratively to enhance students' understanding of relationality but because of the fact that no specific time slots were allocated practical inputs were limited. Limited consultation within and across programmes on strategies to enhance relationality was evident.

Based on our shared experiences, we concluded that there is a definitive consciousness about the significance of relationality and efforts to incorporate it in training. However, viewed from an educational psychology perspective, these efforts are not yet sufficient and sustainable enough to ensure that students are equipped with the competencies to deal with the complexity associated with human relating and interacting amidst the uncertainty that has now become the norm. In concurrence with Sanford, Hopper and Starr (2015:45) who argued that we will alienate pre-service teachers from understanding the 'centrality of relationships in the process of becoming a teacher', we agreed to develop a proposition that could serve as a guideline for the training of students in the complex dance of relating and interacting.

Co-constructing our proposition through critical reflexive conversations

Based on our analysis of the policies and our interrogation of the programmes at our respective institutions, it was evident that the mere incorporation of knowledge and skills on relationality into the curriculum will not suffice in preparing students to deal with the complexity of the dance. The question then arises: what could a process encompass in which pre-service teachers could learn to dance 'the complex dance of human relating and interacting' rather than knowing about the dance?

In order to answer this question, we applied critical reflection, developed by Fook (2011) as a research methodology aimed at challenging the status quo and unearthing new ways of knowing. The application of critical reflection aligned well with our aim to deepen our understanding of what is needed to

prepare pre-services teachers for their journey into the unknown territory that awaits them. We meet once a week on an online platform for a period of three months. Our journey towards the conceptualisations of our proposition modelled the emergent and nonlinear nature of human relating and interacting for which there is no blueprint (Cilliers 2016). Whilst journeying together we had to consistently adapt our own steps and learn to dance to one another's rhythm whilst engaging with one another as dancers in the collective dance of sharing the motion of our thoughts towards our presented proposition.

Our critical reflexive conversations on the development of our proposition were informed by a relational ontology that emphasises the importance of valuing relationships as fundamental and primary to human existence (Slife 2004; Slife & Richardson 2008). According to this theoretical approach, our identities as human beings are constituted by the unique nexus of past, present and future relationships (Slife & Wiggins 2008). These positions are aligned with the indigenous African philosophy Ubuntu, which emphasises a relational view of the human, natural and spirit worlds and foregrounded teachers' responsibility to value relationships as a basis for empowering future generations (Hofmann & Metz 2017; Ngubane & Gumede 2018; Ukpokodo 2016).

Relational pedagogy, an approach developed by Crownover and Jones (2018), serves as an example of an approach ontologically based in relationality. The focus of the approach is to make teachers aware and capable of explicitly focusing on the quality of their interactions with students to develop classroom communities that promote academic, social and emotional growth (Reeves & Le Mare 2017). The approach advocates for an emphasis on the social aspects of teacher training as a way to develop empathy and understanding in future educators. It also allows them to perceive relationships with their learners as a basis for academic learning. Reflecting on our own position, relational pedagogy strengthened our commitment to facilitate a shift away from a singular focus on technology at a time when being humans is crucial.

In an effort to understand the complexity of relationality, we turned to the work of Ralph Stacey (Shaw 2002; Stacey 2003, 2007), who developed the 'complex responsive process of relating and interacting' theory. Contrary to the traditional linear, causal explanations of human interaction, this theory explains 'human relating and interacting' as a dynamic nonlinear and emergent cyclic process *in which we* have a reciprocal influence on one another through our everyday interactions – hence, our reference to 'the complex responsive dance of human relating and interacting'.

The insight we gained from this theory was that the everyday interactions between people on various levels of interconnectedness play a significant role in the way in which they are together in a space. These interactions are unpredictable and teachers should be able to navigate through unpredictability

rather than attempting to control behaviour (Suchman, Sluyter & Williamson 2002; Stacey 2007). The implication for teacher training is that the focus can not only be on the abstract understanding of relationality. Pre-service teachers should be actively engaged in a relational dance to enable them to experience the unpredictability and vulnerability involved in consistently adapting their own steps and learn to dance to one another's rhythm.

The 'Political Ethic of Care' (Fisher & Tronto 1990; Tronto 1993, 2013) enhanced our understanding of the interdependent and dynamic connection between care and relationality. Care, according to this perspective, requires relationality and is premised on the need to create the time and space for democratic relational practices (Zembylas, Bozalek & Shefer 2014). The five dimensions of care identified by Tronto (2010, 2013) also alerted us to the importance of recognising caring needs and taking responsibility to address those needs as part of the process aimed at deepening students' understanding of relationality.

In an effort to identify some key elements of our proposition, we also engaged with the relational development model of Julian Kitchen (2009). The model informed by Carl Rogers' client-centred therapeutic approach is particularly sensitive to the roles that teachers and learners play in their relationships. The model recognises the contexts in which we each live and work, and emphasises the need for presenting one's authentic self in relationships that are open, non-judgemental and trusting. For our purpose, this model emphasises the value that psychological perspectives can add to teacher training and encouraged us to incorporate the knowledge and insight obtained from EI theory (Salovey & Mayor 1990) and trait emotional intelligence (Trait EI) theory (Petrides 2010). Both theories enhance an understanding of our own emotional dispositions and the emotional dispositions of others by sharpening our ability to perceiving, understanding, managing, and utilising our own and other people's emotions (Rivers & Brackett 2020).

As we progress on our critical reflexive journey, we identified critical incidents in our own experiences as teacher educators. Sharing these experiences alerted us to the struggle that we had over the years to voice our concern about the dualistic view of academic learning, curriculum and assessment, and social-emotional learning as exclusive opposites. This view leaves little space for the development of spontaneity, creativity and joyfulness that is much needed to sustain our humanness. Our experiences also reiterated that incorporating knowledge and skills about the dance in the curriculum will not suffice in preparing students to deal with the complexity of the dance. Students need to be mentored to dance proficiently if we want to prepare them to be able to dance spontaneously in the moment as would be expected of them in the Education 4.0 context.

Proposing a relational dance in three movements

Our critical reflexive journey culminated in a proposition. Propositions are applied in posthumanist and feminist new materialist pedagogies to present a possibility that may work best in a particular situation and do not prescribe by presenting *sets of instructions, or prescriptive rules to follow, but present* (Bozalek 2019:184).

Well aware of the complex dynamic nature of the dance, the unpredictability and uncertainty that the future holds, we propose a flexible process that could guide the preparation of pre-service teachers to become more proficient as dancers. Our process unfolds in three interconnected movements:

- an invitation to dance consciously
- deepening an understanding of the *dance*
- attentively engaging in the complex *dance*.

Movement 1: An invitation to dance consciously

All of us are dancing the complex dance of *relating and interacting* (Stacey 2003) every day. Yet, many of us engage in this dance, without even being aware that we are dancing, let alone understanding the impact of our dance on others. In order to ensure that pre-services teachers dance consciously, they need to be invited to join a 'dance studio', that is, a space in which they can become aware of the complexity of human relating and interacting and their own process of relating and interacting.

In this space, they should be introduced to the impact of their dancing on the quality of their own lives, the lives of all their learners, as well as the other role players they will encounter in the Education 4.0 context. This aim cannot be achieved if they are given the option to be observers who sit on the sidelines, they have to actively participate in the process as is expected in the 'becoming a teacher' module presented at one of the institutions. This may be disruptive for some students, in particular for those students who might not consider relationships as significant for their practice as educators in the Education 4.0 context. There may even be resistance from colleagues who have not yet challenged their own dualistic view of academic learning and social–emotional learning as described by Allodi (2010).

The discomfort that emerges presents opportunities for productive learning on conditions that students have the necessary support to make sense of experiences associated with dissonance (Taylor & Baker 2019). In view of the above, it will be important to have 'dance instructors' who understand the complexity of the dance and who can skilfully guide the students to become '*comfortable with being uncomfortable*', whilst respecting the pace with which they move from discomfort to comfort. We also propose that the caring needs

of the students are taken into account, and that guidelines are set to ensure that the students feel emotionally protected when they step onto the studio floor to '*dance*' with their peers.

Our suggestion, in view of possible discomfort, is that the first movement should be playful and spontaneous in nature and not resemble the rigidity of academic work or include deep personal work. In order to enhance this playfulness and spontaneity, students could, for example, select scenarios that may play out in a 21st-century classroom and discuss those scenarios in breakaway rooms online or play it out when meeting face-to-face. They may also be invited to apply arts-based work, such as drawings, collages and photo-voice, to envision scenarios of engagements that could be expected in the Education 4.0 classroom, with consideration of the additional challenges posed by COVID-19. Another very interesting option for engaging with future scenarios is the use of improvisational actors to role-play such scenarios with emphasis on the complexity of relating and interacting. Bell et al. (2014) found that the involvement of actors in an educational programme taught them to recognise the relational complexities of communicating effectively. The idea is to become more conscious of the complex layers of influence in any interaction between humans by being mindfully present in the moments that they observe whilst trying to make sense of the dynamics involved.

Following the exposure to various possible scenarios aimed at awakening a more conscious engagement with what the complex dance of relating and interacting holds, students can be requested to position themselves with reference to relationality in the Education 4.0 context by placing themselves on a continuum between the two extreme positions of relationality as completely insignificant and relationality. Once they revealed their positions, they can be invited to engage in a conversation with someone who took another position. Following these paired conversations, they could come together as a group to reflect on their experiences with specific reference to the impact of dancing consciously.

Exiting the first movement students should be convinced of the value of relationality as an essential part of their professionalisation as teachers in Education 4.0. They should be ready to accept that the complexity of the relational dance makes us all vulnerable; however, it is exactly this vulnerability that enables us to connect on a deeper level with ourselves and others.

☐ Movement 2: Enhancing a deepened understanding of the dimensions of the dance

In this movement, the intention should be to shift from their comfort zones into the zone of possibility by placing them in front or the full-length mirrors on the studio walls. The pre-service teachers need to engage with the

nuanced and layered dimensions of the relational dance to prepare them to recognise and respond to personal and contextual factors that will influence their experience as teachers in the Education 4.0 context (McKay & Barton 2018). We concur with Krasue and Armitage (2014) that this cannot be left to chance or facilitated through fragmented interventions presented across programmes. It is imperative that specific times are allocated so that students can return to the '*dance studio*' in order to gain more experience of what the dance entails. The process will take courage and should be guided by skilled lecturers who guide students to be open to new experiences that will enable them to their own lived theory (Whitehead 2018) as they grow towards embracing relationality as an essential part of their personal and professional journey.

Eliciting a deep understanding of the dance necessitates an understanding of the relationship with the self, the relationship with the other, as well as the reciprocal influence of relating with one another (Stacey 2007). The development of EI as a key competency for enhancing students' responsiveness to their own emotions and the emotions of others is essential in this movement. In order to enhance EI, students need to be engaged in reflexive processes that move beyond what Brownlee, Ferguson and Ryan (2017) refer to as *epistemic reflexivity*, which normally occurs in small and large group discussions and practice teaching throughout the teacher development programme.

In this movement, students should rather be engaged in activities that enhance the acquisition of self-knowledge and self-understanding through self-reflexivity (Pagis 2009). This encompasses a process in which the students' relationships with the self should unfold on various levels through their involvement in creative practices that facilitate talking to oneself or others about the self. Students also need to deepen their understanding of their engagement with other humans. Here, we suggest the application of interrelational reflexivity, a construct developed by Gilbert and Sliep (2009:471) to enhance a 'move beyond a reflexivity of self as an internal process to reflexivity within the relationships between people in a performative space'. Interrelational reflexivity according to the developers should also be underpinned by a strong social justice ethos to ensure that students can build relationships of trust, in which accountability, responsibility and moral agency are acknowledged. The intention is to enhance pre-service teachers' ability to engage more efficiently with feelings of vulnerability, insecurity and resistance that may be elicited by the unpredictability and uncertainty of an era marked by so many changes. In this way, their deepened understanding of the dance may be revolutionary if it could free them from the systemically imposed understanding of themselves as individual beings

to being fully present as relational beings (Gergen 2009) in the Education 4.0 context.

We suggest the use of narratives to practise reflexivity in this movement. From a narrative perspective, the self is but an unfolding story that simultaneously reveals and creates the self (Rossiter 1999). Our individual narratives represent our lived experiences through which we discover and give meaning to the ways in which we relate and interact with ourselves and others (Leitch 2006; Uhl-Bien, Marion & McKelvey 2007). Students can be invited to construct narratives of their own schooling experiences in creative ways and engage with the narratives to explore the relational dynamics involved in those narratives. The stories of our broader context influence how we understand our own lives and gender, class, race and culture all contribute to the meanings we give to our life events (Morgan 2000). In order to enhance a deepened understanding of students' interrelationality, they can be respectfully requested to share their narratives with fellow students and eventually collate all these narratives into a collective narrative for the whole group.

The intention of this movement should – as already alluded to – be to disrupt set ways of thinking about and doing relationality. We, therefore, suggest that interconnectedness is enhanced across the artificial boundaries of year groups, gender and subjects. This can be performed by interspersing moments of shared joy, excitement and celebration about the artefacts created to demonstrate how the individual stories can come together to generate shared knowledge relationally informed by collective experiences. Perhaps, organising an event to share experiences of their interconnectedness with others as core competencies of being a professional educator in the 21st-century African context could be considered.

☐ Movement 3: Attentively engaging in the complex dance of human relating and interacting

The dancers cannot stay in the safety of the dance studio. They have to be exposed to the challenge of dancing consciously in face-to-face or in virtual spaces and apply their competencies to navigate the complex dance in order to develop strong personal and professional relational voices. It seems logical that the practice teaching component in teacher development programmes provides these opportunities. However, we are of the view that before they access practice teaching, they should be afforded an opportunity to rehearse the dance with guidance from empathetic lecturers who can model to actively engaging in the dance in tandem with teaching the subject content.

We propose the use of role play – a strategy widely recognised as an efficient pedagogical tool that better responds to the needs of today's world than the more traditional forms of teaching (Doorn & Kroesen 2013; Jackson & Back 2011). Through role play, the participants will be allowed to act out roles in a variety of situations that simulate the challenges that they might encounter in their practice as teachers. These role plays should take place within safe boundaries, set to ensure that the students get insight into the possible ethical dilemmas that might arise in the relational dance that will involve '*dancers*' from all the various levels of interconnectedness. Kettula and Berghäll (2013) found that role plays enhance sense-making and the construction of meaning for participants. We, therefore, envision that engaging students in role plays will enable them to engage with fellow dancers in caring, kind and respectful ways, mindful of the power positions that they hold.

Another possibility is the use of simulated role plays. Simulations are simplifications of reality, which maintain the essential functions of the simulated environment (McLaughlan & Kirkpatrick 2004:478). Participants in the role play deliberately adopt roles for a specific purpose to learn about 'the setting of the simulation and the issues that cause interdependence among the roles as a consequence of their interactions within the roleplay-simulation'. One of the examples of online simulated role play is the use of avatars defined as *the embodiment of a person or idea or in the computer world, a character that represents an online user.* Wasmuth (2016) invited pre-service teachers to create avatars and found that taking the role of an avatar enabled them to understand how the various stakeholders in a context may feel, think and act. Students found the sense of anonymity beneficial when they received feedback or criticism.

This movement should also continue into practice teaching because it is in this phase that feedback on their '*dancing*' will be pivotal. It is, therefore, essential to develop an instrument for presenting such feedback to students. Based on the work of Carless and Boud (2018:2), we propose the development of an instrument that will enable students to reflexively engage with the way they dance amidst the uncertainties and unpredictabilities of this era, with specific reference to the socio-emotional and ethical-moral dimensions of their engagements with lecturers, learners, school staff and parents.

As students exit this movement, they should be aware that the complex dance of human relating and interacting is a lifelong learning process that requires ongoing reflexivity about ways to improve their dance (Whitehead 2018). Over time, they will discover new variations of the dance, and this will require the mastering of new steps in attempts to attentively synchronise their steps with those of fellow dancers (Figure 3.1).

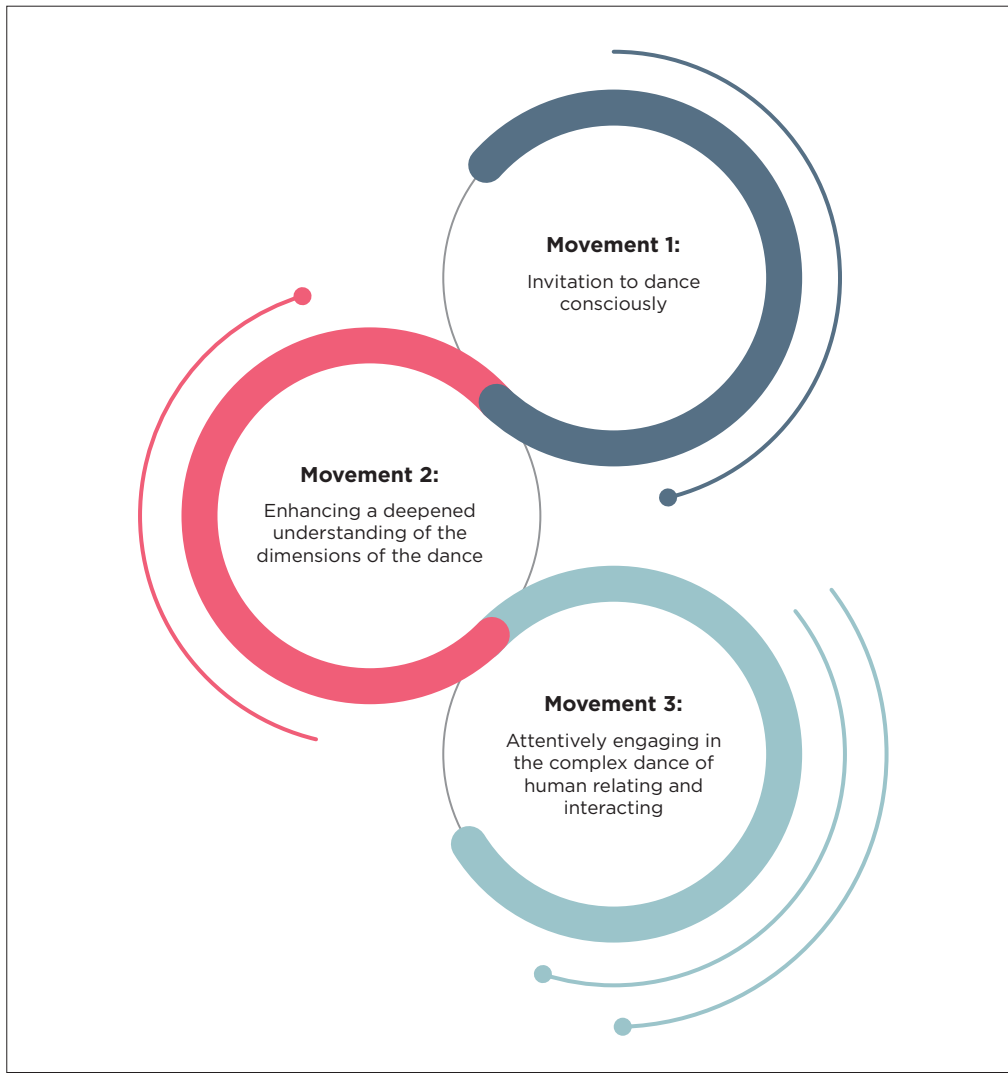

FIGURE 3.1: The movements illustrated as integrated into an overarching process.

Conclusion

In this chapter, we foreground relationality and presented a proposition for facilitating the integration of a process that comprises three distinctive movements that could be implemented in teacher training programmes with consideration of contextual diversity. We envision that our proposition will contribute to the preparation of pre-service teachers to become proficient in the complex dance of relating and interacting amidst the challenges that

prevail in the context of Education 4.0 and the pandemic. We hope that it will contribute to the preservation of our humanity and a more just society.

With reference to the implementation of this process in practice, we anticipate that our proposition will challenge overt and covert power dynamics within current pre-service teacher training depending on the broader philosophical and pedagogical underpinnings that might not align with our approach. We therefore recommend that the implementation of the proposed integrative process should be coupled with dialogue between all role players (lecturers, programme coordinators, teacher and learning specialists, tutors, teaching practice supervisors and student representatives) across teacher development programmes and departments of the faculty. Representatives from schools (mentor teachers) should also consider themselves as active participants (dance instructors) in the relational dance. A specific imperative will be to find time and identify safe, conducive spaces in which we can offer this developmental process to students in order to ensure that they become proficient dancers. We also need to engage in research studies that include the voices of dancers across all the levels of interrelatedness to enable us to realise the impact of understanding and practising relationality amidst the challenges faced.

Gergen (2009:23) warned that if we neglect relationality, we will run the risk of preparing teachers to be 'rational calculators' instead of dancers who can understand the uncertain and unpredictable rhythm of the 21st-century dance and are capable of keeping to the rhythm.

Chapter 4

Access in Higher Education: Reimagining education for the underprivileged groups in the Fourth Industrial Revolution

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Abstract

The 4IR represents a new era of innovation in technology. The era is not only coercing the industries to assess their strategies but also largely pressurising the education sector to rethink their pedagogical and content knowledge. Drawing from the qualitative research study, this chapter examines two specific groups of students in HE in South Africa, namely, refugees and

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those from formerly marginalised communities. Despite significant increases in physical access to HE and education, in general, the gap in epistemological access between the privileged and the underprivileged in primary, secondary and higher education remains apparent. For this study, access theory is topical and essential to promote a more complex understanding of HE landscape. This chapter argues that the 4IR requires graduates with extraordinary knowledge and creative minds. It again further contends that educating underprivileged students for the 4IR involves equipping them with relevant skills, which, amongst others, involve learning to utilise the Internet sources. What comes out in this chapter is that, to a lesser extent, HEIs provide access to acquiring the 4IR technology skills for the underprivileged groups. Higher education in the era of the 4IR, therefore, calls for more interactive forms of pedagogy. Thus, we argue for universities to rethink ways in which they can support refugees and formerly disadvantaged students with requisite knowledge and expertise of how to access and utilise Internet resources for their learning and preparing for the world of work. We are advocating a fundamental shift on how universities reimagine mediation strategies that enhance and work towards acquisition of 4IR technology skills amongst underprivileged students to promote epistemological access.

Introduction

The 4IR represents a new age of transformation in technology. The era is not only coercing the industries to assess their strategies but also largely pressurising the education sector to rethink their pedagogical and content knowledge. Whilst some are excited about the idea, others are hesitant that it has the potential to widen the inequality gap, especially in HE (Schwab 2017). As a result, the question remains, is the education sector doing enough to equip all the students with skills and expertise needed for the 4IR? Despite significant increases in physical access to HE and education, in general, the gap in epistemological access between the privileged and the underprivileged in primary, secondary and higher education remains apparent.

This chapter examines two certain groups of students in HE in South Africa, namely, refugee students and students from formerly marginalised communities. Evidence from two doctoral theses indicates that these groups of students face challenges in accessing both physical and epistemological knowledge (Chiramba 2020; Ndofirepi 2015). The chapter argues that the 4IR requires graduates with extraordinary knowledge and creative minds. It again further argues that educating underprivileged students for the 4IR involves equipping them with relevant skills, which, amongst others, involve learning to utilise the Internet sources. The chapter has been necessitated by a dearth of studies in HE, especially on the underprivileged students in the 4IR era in Africa. We are disturbed by a

serious lack of attention to these groups in existent research. Although the two doctoral theses did not directly address teaching and learning in HE in the 4IR era, the participants showed, however, the kind of experiences involving technology and usage within their institution – hence the choice of this evidence emerging from this chapter.

In this chapter, we therefore draw on empirical evidence from the two doctoral theses to gather information on the extent to which universities in South Africa are providing both physical and epistemological access to the underprivileged groups like refugee students, as well as students from formerly marginalised South African communities. We also utilise conceptual and theoretical evidence in the global and local literature. We use the term underprivileged students to refer to both groups of refugee students and those from formerly marginalised communities in South Africa. We aim to answer the following three broad questions:

1. How do the underprivileged students experience teaching and learning in the era of the 4IR?
2. To what extent do the HEIs provide access to acquiring the 4IR skills for the underprivileged groups?
3. How might the universities provide enough access to the underprivileged students in the 4IR era?

We begin by a conceptualisation of the 4IR, in general, and move on to understand how it is conceptualised in HE.

Conceptualising the Fourth Industrial Revolution

Penprase (2018) argued that the 4IR has its roots in early analysis of the evolution of technology. The earliest evolution, which is the 1IR, arose from harnessing water and steam power towards more systematic and efficient forms of manufacturing (Penprase 2018; Suganya 2017). Schwab (2017) argued that the original term dates back to 1884 in several lectures by Arnold Toynbee on industrial revolution. In his lectures, he has argued that industrial revolution, which is the expansion of power and mechanical production, only becomes a revolution from its coupling with a 'political culture which is receptive to change' (Schwab 2017:31). Furthermore, 'industrial revolution is not merely an acceleration of economic growth but an acceleration of growth because of and through economic, educational and social transformation' (Mapudzi, Chikandiwa & Peel n.d.:50). Whilst the definition of the 4IR may vary, the principles remain the same. Some scholars have attempted to define 4IR as the use of devices to warrant digital data capture from traditionally analogue processes and analysed possibly using machine learning and AI to improve efficiency (Penprase 2018; Schwab

2017). Ruminar (2018) argued that 4IR involves the amalgamation of technological advances in 5G, AI, robotics, advanced materials, 3D printing, quantum computing, block chain and several other technologies. The extant literature points out that 4IR skills are a wide spectrum and fluid. Using a systematic review method in their study, Kamaruzaman et al. (2019) established that 4IR skills go beyond technological advances. Kamaruzaman et al. (2019) asserted that by the year 2022, the preferred 4IR skills would be broadly seven, viz:

> [*A*]nalytical thinking and innovation; active learning and learning strategies; creativity, originality and initiative; critical thinking and analysis; complex problem-solving; emotional intelligence; and system analysis and evaluation will be the preferred skills, as well as technology design and programming; leadership and social influence; and problem-solving. (p. 56)

Fourth Industrial Revolution and education

The 4IR has shaped and is still shaping the future of education and work (Penprase 2018). As a result, many scholars have argued for the acceleration of workforce reskilling (Ruminar 2018). Some ideas have included a drastic reconsideration of curriculum in order to enable students to both comprehend the individual technology in detail and be able to 'thoughtfully analyse and predict the evolution of networked systems of technology, the environment and socio-political systems' (Penprase 2018:798). In other words, the curriculum will have to focus on emerging technologies, for example, robotics, AI, IoT, nanomaterials, genomics and biotech (Ruminar 2018). It is important to note the argument made by Selamat et al. (2017) that teaching students only to acquire technical skills is not enough. In addition, both students and teachers need a shift in mindset of cultivating, using and applying critical thinking, creative thinking and problem-solving skills. Ruminar (2018) also emphasised on 4Cs of communication, creativity, critical thinking and collaboration, as the basic skills needed to nurture students' readiness for the 4IR. Without the mindset shift, acquiring technical skills only keeps students in a 'sit back and expect answers and solutions' consumer mindset we are currently struggling with (Yang & Cheng 2018:38).

Looking specifically in HE, 4IR might imply the rapid adjustment of campus curriculum by expanding its capacity to accommodate the acquisition of new knowledge by different groups of students within faculties with new modalities of instruction that leverage the digital advances from the 'Third Industrial Revolution' (Penprase 2018:207–229). This drastic reconsideration of the curriculum is necessary to go beyond acquiring skills in order to enable students to comprehend, interpret and apply. The workforce needed in this era is the one that is capable of developing new applications and products, as well as capable of interpreting the effects of these technologies on society (Gleason 2018).

According to Ashwin (2019), the kind of curriculum we advocate should also help students to ethically reason for the awareness of societal and human impacts and be able to comprehend the impacts of 4IR technology on people (see Penprase 2018:207–229). We are moving towards embracing a curriculum, which allows creative insights, collaborating in diverse teams and navigating through global cultural differences (Yang & Cheng 2018). Higher education in the era of the 4IR, therefore, calls for more interactive forms of pedagogy. The imperative question remains: to what extent do universities provide this kind of curriculum to students, especially the underprivileged groups like refugees and students from formerly disadvantaged communities? Quality HE is regarded as the emancipatory tool, especially for those students who are underprivileged. However, Yang and Cheng (2018:40) argued that current debates on the impact of 4IR on HE are concerned with 'technocratic and technophilic discourses' overlooking the 'on the ground experiences of the disadvantaged and marginalized'. As a result, for this study, access theory is topical and essential to promote a more complex understanding of the HE landscape.

Debates on access

At the dawn of democracy in South Africa, the ruling government mandated all South African universities to open doors to students from previously disadvantaged communities (Ndofirepi, Farinloye & Mogaji 2020). This gave rise to the ongoing debates about access issues. The concept of access became a buzzword and is increasingly being utilised in scholarly publications on HE and South Africa, and elsewhere (Muller 2014). In understanding access, two concepts, namely, physical and epistemological access are central to the debate. Whilst formal or physical access involves just being accepted and register with a HEI, epistemological access refers to 'learning how to become a successful participant in the academic practice' within the institution (Morrow 2009:78). Many scholars have argued that gaining physical access does not guarantee epistemological access. Ndofirepi (2015:21) argued that gaining epistemological access involves an active role of students in 'developing an understanding of how the institution operates and use their own initiative to gain entry to the practice of searching for knowledge'. We agree this might be true with the students who are rich, have a history of navigating powerful knowledge and are still active in the culture of teaching and learning. However, it is very difficult to assume that the underprivileged and marginalised learners who have no history of HE or those who were forcibly displaced may use their initiative to acquire knowledge.

Grounding on the theory of cultural reproduction by Bourdieu (1977), underprivileged students like refugees and those who were formerly disadvantaged lack cultural, linguistic, economic, social and symbolic capitals that are highly valued in the milieu. Bourdieu (1977) further argued that their

culture is incompatible with the schooling culture. In such circumstances, we propose a framework that prioritises the efforts made by universities to mediate and help them gain entrance in the culture of the institution. Whilst it is ideal for all students to make effort to use the available resource within the institutions, such as libraries, computer labs hardware and software, they might be lacking the know-how to do that. Contrary, Yosso (2005) provided a critique of Bourdieu's theory of cultural capital using the Critical Race Theory (CRT) to focus on the cultural wealth of Communities of Colour: CRT shifts the research lens away from 'a deficit view of Communities of Colour as places full of cultural poverty disadvantages, and instead, focuses on and learns from the array of cultural knowledge, skills, abilities and contacts possessed by socially marginalized groups that often go unrecognized and unacknowledged' (Yosso 2005:69). Thus, in both the cultural reproduction and the CRT theories, we argue for universities to rethink ways in which they can support underprivileged students.

Higher education access in the Fourth Industrial Revolution era

The literature indicates that universities worldwide have embraced the idea of educating students for the 4IR. In their study on the conceptual framework for the development of 4IR skills for engineering graduates, Kamaruzaman et al. (2019:54) identified that the 4IR has come with so much force that 'current skills are no longer able to prepare graduates for this era'. The implication is that the 4IR skills are not static but evolve with time. Kamaruzaman et al. (2019:54) asserted that 'engineering graduates should be given early exposure to, and be prepared for, the skills of 4IR'. However, the discourse of 4IR is understood at artificial level, which gives rise to its misconceptions. It seems the discourse of 4IR has been oversimplified within universities only to refer to gaining basic skills to use technology to accomplish the syllabi, especially in the COVID-19 pandemic era; yet, it remains detached to the disciplines (Ruminar 2018), a reality in universities. This is erratic because they are concentrating on the short-term benefits involved; yet, students especially those who are underprivileged require such skills long after completion of their degrees as the corporate world has become more technologised and digitalised. The underprivileged lack access to such spaces. This impact upon 'their being of a student and their opportunity to realise valued functionings' (Ndofirepi 2020:404). The literature shows that most of such students depend on HE as a liberating tool to get out of their poverty (Kromydas 2017; Rhoads 2016). However, it seems that HE is not particularly effective in producing graduates who can survive in a technologised out-of-school environment (Davies, Mullan & Feldman 2017). The literature argues that the increasing power of AI is threatening to take nearly all the jobs on the market (Kamaruzaman et al. 2019; Xiong 2019).

We often hear about the ever-increasing unemployment rate in South Africa and beyond. This simply means that many universities lack the relevant skills to navigate their world. Penprase (2018) argued that the true and long-term meaning of epistemological access follows the three stages, which begin with the stage of understanding the basic and immediate aspects of technology. Secondly, students should move on to creating personal meaning with technology, and thirdly, they should move beyond personal meaning to understand technology within the wider context. All this should be performed in the context of their disciplines. Ruminar (2018) argued that as English teachers in HE, they have moved beyond teaching the language itself, and have integrated it into technology and thrive to teach students soft skills. This simply means that knowledge in the 4IR should go beyond mere usage of technological skills for pedagogical knowledge; however, there is a need to ensure how that knowledge can be utilised and applied to improve things not only in the short term in universities but also in the long term.

Underprivileged students in higher education in the Fourth Industrial Revolution era

This chapter mainly focused on students in HE with particular attention to two groups who are marginalised and underprivileged carrying out their studies at a particular university in South Africa. These are the refugee students and 'non-traditional' students, as they are commonly known in the South African context. The latter comprises of black African students from poorly resourced rural or township schools and communities. This group has a history of suffering marginalisation prior to and post-apartheid era.

Ndofirepi's (2015) doctoral thesis explored how undergraduate students experience their lives on campus and the meanings they make of such experiences to position themselves for success in their early years of study. Although Ndofirepi's (2015) research study was not mainly focused on the 4IR, the sample mostly consisted of black students who came from low social communities formerly affected by the apartheid regime. Thus, we categorise this group of students as underprivileged because they had no previous family history of participating in HE nor any history of participating in the commodification of HE (Ndlovu-Gatsheni 2017). Because of such unequal distribution of resources during that era, some people suffered and still continue to suffer even after the eradication of apartheid post-1994. They also continue to witness inequality despite the redress policies, for example, policies that support massification of HE, which were put in place.

Chiramba (2020) in a doctoral thesis has explored the experiences of a group, namely, refugee students. Again, the thesis was not focused entirely on the understanding of their experiences with the 4IR but their overall

experiences in HE; however, their biographical narratives showed that they had a lot to talk about the 4IR and their learning. This group of students constituted people who fled to South Africa because of political instability in their countries of origin. In other words, the group became marginalised and underprivileged because this migration was not to their own volition but they had to involuntarily escape because of fear of persecution and death.

It is quite significant to note that a very few studies available on refugee students indicate that the group is invisible in HE spaces. The refugee students are often lumped together with a privileged group of international students, and this is apparent in both the national and international literature (Chiramba & Maringe 2020; Dryden-Peterson 2015; Kavuro 2013). We again learn from the literature that up to now in many national and international universities, there are no legal frameworks drawn to cater for the welfare of refugee students. However, for countries that are signatories to the United Nations High Commissioner for Refugees (UNHCR 1951), we only get to know the availability of such legal frameworks at government level and we do not realise their impact on the ground. What is needed is true transformation involving recognition of such groups and true implementation of the policies to cater for their needs.

Chiramba (2020), therefore, argued that failure to recognise, understand and document the experiences of this group of underprivileged students lands us with challenges of failing to provide enough support for them to realise their full potential in HE spaces. This includes supporting them to transverse in an ever-transforming content of the HE curricula to reflect the intensified skills of technology and digitalisation. Experiences of navigating a more technologically driven mode of acquiring HE came out strongly in their narratives in the thesis (Chiramba 2020). According to Peters et al. (2020:2), during the COVID-19 pandemic, 'digital pedagogies are not neutral with regard to the kind of sociality they encourage'. Students are impacted differently depending on their socio-economic status.

In this chapter, understanding how students from underprivileged backgrounds experience teaching and learning in the era of the 4IR in HE is therefore absolutely necessary. Most importantly, we want to understand and capture the extent to which universities can offer support, if at all they do and, finally, rethink strategies for meaningful intervention by the universities.

Methodology

In this chapter, we rely on data for and empirical evidence from two qualitative research projects carried out at the same university: Refugee Students [RS] (Chiramba 2020) and Rethinking Campus Spaces [RCS] (Ndofirepi 2015), to understand how the two groups of students from underprivileged backgrounds

experience teaching and learning in HE in the 4IR era. Subsequently, for reporting purposes, the two projects are referred to as RS and RCS, respectively, in this chapter to point out the source of the participants' direct quotes interspersed in the Results section.

In the first project, the RS (Chiramba 2020) study was framed within the interpretive paradigm. A qualitative methodology was used, which utilised small-scale research with thick description, aiming for depth rather than breadth, to understand the experiences of refugee students at a selected university in South Africa (Thomas 2010). Within the interpretive qualitative paradigm, the study draws on a narrative tradition with a focus on biographical stories. In this case, a narrative approach helped to reconceptualise participants as narrators and their products as texts, in which we can gain knowledge about a phenomenon (Elliot 2005). This type provides a full voice to the voiceless (McAlpine 2016), and with this, Chiramba (2020) managed to gain a comprehensive picture of their experiences within the host nation, as well as the institution.

Using four refugee students, found through snowballing sampling, the RS (Chiramba 2020) study deployed two types of interviews: the unstructured and semi-structured interviews. The former helped to understand the lived experiences of refugees as individuals. One broad question was asked at the beginning, and the participants would narrate their stories uninterruptedly. With this open-ended question, I managed to gain knowledge of their various experiences, including those to do with technology and digitalisation. The latter was a follow-up probing session to fill in the gaps and probe further into certain issues raised in the initial unstructured interview, in order to understand deeper issues that affect them.

In the second project, RCSs (Ndofirepi 2015), the study was a qualitative interpretive case study design with some elements of a phenomenological approach. This methodological stance 'is based on the proposition that undergraduate students' experience of campus life is best understood through the students' voices; their narrations' (Ndofirepi 2015:59). The phenomenological approach serves as the scientific enquiry that offers a way of studying 'lived experiences' within a social environment as interpreted by the people concerned and involved (Ndofirepi 2015). Phenomenological research investigates 'what was experienced, how it was experienced, and finally the meanings that the interviewees assign to the experience' students (McMillan & Schumacher 2006:352). Thus, the approach aims to increase the understanding of lived experiences of students (Ndofirepi 2015) on campus.

The RCS (Ndofirepi 2015) study is a case of three faculties that have the lowest throughput rates, namely, Engineering and Built Environment, Science, and Humanities at a particular university in South Africa. The social unit includes the first- and third-year undergraduate students (Ndofirepi 2015).

Through a purposive sampling strategy of maximal variation and snowballing (Creswell 2012), a target sample of 47 undergraduate students differentiated by gender, race, nationality and whether they are resident on campus or non-resident was drawn from the three faculties. In the South African context, race refers to African, mixed race, Indian and white (Ndofirepi 2015). The term 'black' refers to African, Indian and mixed race combined (Council on Higher Education 2010). This study deployed in-depth semi-structured interviews to gain an understanding of the students' campus experiences. The questions explored the meaning of students' experiences of campus and asked them to describe their everyday experience on campus in other spaces they occupy (Ndofirepi 2015) other than the classroom.

Results

We deploy some concepts from the analytical model, which was developed in one of the projects, RS (Chiramba 2020). The emerging themes from the original project showed that all the experiences of refugee students, including those of technology and use, can be conceptualised in a model involving the three recurrent experiences of fear, dreams and resilience. As a result, the concepts in the model were representative of what has been persistent in refugee students' three-phase journey of pre-migration, post-migration and future progression intentions. We therefore deployed the three concepts within the model to understand both the refugees and students from formerly marginalised communities. However, in this chapter, we concentrate much on the experiences within the campus future progression intentions to understand how the two groups of students experience epistemological access to HE in the 4IR era and how they contemplate their future. As reiterated earlier in this chapter, we use the term underprivileged students to refer to both the groups of refugee students and students from formerly marginalised communities in South Africa.

What constitutes their fear, dreams and resilience?

From the analysis, four main themes, namely, computer skills, relevant courses, language proficiency and academic writing skills were the most prominent skills in relation to the 4IR and 21st-century skills.

Computer skills

It is apparent from both groups that they had not experienced the use of computers before. The RCSs indicated that some students, especially from the rural background, were seeing the computer for the first time when they came to the university. Refugee Students studies also indicated that students

bemoaned that upon getting accepted at the chosen university in South Africa, technology was the main source of communication; yet, back home they did not use computers for academic purposes. The refugee students had difficulties in using the Internet for basic tasks, such as creating and checking their emails. For both underprivileged groups, the students could not properly utilise the computers to type documents and for carrying out their research, and yet, it was the only effective way to gain good knowledge for academic purposes. What comes out is an example of 'loss of opportunity and abilities to access and utilise resources available at the university' (Ndofirepi 2020:405).

The underprivileged students, however, acknowledge and appreciate the free university Internet access, which, is 'networking on the go to connect and reduce geographical boundaries and loneliness' (Ndofirepi 2015:169). On the contrary, students from affluent backgrounds who by the way are techno-savvy utilise the free Internet resource to access e-library on their laptops. The underprivileged students reported that they took long to master how to use the computers; as a result, their major fear was they would take long time in the university.

Worse, for RS study, some participants also feared that they had no guarantee they would continue to get tuition fees within the host nation. Penprase (2018) argued that the currently HE does not necessarily equip refugee students with technological skills; yet, such skills are at the centre of 4IR. It is even pointless to talk about the advanced technological skills in the 4IR when universities are not even teaching basic computer literacy skills, save for the one-off lecture done during orientation to gather data on the new cohort's computer literacy level. Instead, the marginalised students are exposed to a swim or sink situation where quite a number of them are bound to sink.

Both groups of students kept on dreaming about completing HE, although they were delayed not only because of lack of computer literacy skills but also because of several challenges that include lack of finances for them and their families' upkeep and worse still to seek private tutoring. As a result, for some, these challenges led to the delay in accomplishing their dreams.

Whilst we embrace transformation within HE, 4IR is likely to increase the inequality gap between the poor and the rich (Kayembe & Nel 2019). It is acknowledged that the university does not offer any basic computer literacy courses, and therefore, it becomes very hard with the underprivileged students who seem not even to own smart phones that can offer them some basic training. Success favours historical patterns of privilege. Those from the privileged backgrounds would always excel because they can afford and they already have laptops and several devices that help them build their confidence. It is, therefore, very disturbing that the underprivileged students are struggling with basic computer literacy; yet, in order to be relevant in the 4IR era, they

need to acquire advanced technological skills, such as AI, IoT and cyber networking (Ruminar 2018). What they seem to experience is 'deprivation' (Ndofirepi 2020:404).

Relevant courses

The university has failed to offer refugee students courses relevant to their needs, as well as the native country's needs. This is also the case with some participants for the RCs project. Whilst they qualified for university studies, they did not have the required points to enrol for engineering or science courses they had dreamt for. The participants reported that the poor resourced schools they attended did not prepare them enough to earn good grades regardless of some of them being the best students in those schools.

After gaining physical access to HE in the universities, the participants were not accepted to study courses of their choice that they thought would be suitable, especially for the students of refugee background who want to return home and rebuild their countries. One of the participants wanted to pursue a course in banking but only got funded for an education degree. Another participant wanted to pursue a course in psychology but was denied the opportunity. Teaching underprivileged students for the 4IR involves offering them courses that are relevant in assisting them rebuilding their communities and their countries (Hudzik 2017). Staying relevant to the contexts is significant.

The participant who wanted to pursue a degree in banking had the hope of going back home and working in the bank to stop corruption in banks popular in his country; however, his hope was shattered, and he began to build new hopes on the education degree he was offered. Although the participant had no hope in the degree, education is rated to be amongst the jobs that require innate human features, such as creativity and empathy, skills that are difficult to replace with machines (Knox 2019). It is, therefore, essential that course training should involve imparting such skills to students.

Although he had no hopes in getting the job after completion, he had hopes to complete the degree and work as a researcher in any country. The other participant who was denied a psychology degree had the hope of starting his small business, thereby creating employment in South Africa. Membrillo-Hernández et al. (2019) argued that entrepreneurship in the 4IR provided the chance of opening up new opportunities. As a result, it is important that education that the students receive should prepare them with the necessary skills.

Despite the fact that they did not get their first preferences of study, they did not give up; instead, they thought of new opportunities in the courses.

Language proficiency

For the RS project, some of the participants had a French background, and upon arrival at the university, it was a challenge for them to integrate into the system. The university had no English courses to offer to the underprivileged students who came from rural areas or countries that did not use English for communication or as a language for instruction. Most students for the RCS project who have a rural background concurred that they were taught in their vernacular language in high school, and they failed assignments not because they did not know the content but because they failed to express their ideas in the language of instruction at university. The issue of epistemological access is at play in this instance.

In order to master English even for basic communication, they did not give up; instead, refugee students learned from neighbours and friends in their networks. The 4IR requires English to be taught as a global language and for individuals to be communicating fluently in the language; however, it seems it is not happening to these groups of students (Ruminar 2018).

Academic writing

With lack of English proficiency, it was even worse for refugees to gain skills for understanding and argue in essays. If students fail to write effectively in the language of a discipline, this implies failing to participate successfully in their academic work, and thus, lacking epistemological access. Constructing arguments needs critical skills in complex problem-solving, critical thinking and creativity. Ruminar (2018) recommended four critical skills needed in the 4IR, which include communication, creativity, critical thinking and collaboration. Knox (2019) argued that people's appreciation for such skills will probably increase and is very unlikely to decrease even in the 4IR era, and computers, as already argued, are not yet able to replace these skills. Lack of those skills breeds fear in refugee students in that, they are quite aware that in order to survive in this era, they need to be broad-minded and have analytical thinking. However, they feel not much is done at the institution to equip them with both the technological skills and other several skills needed in order to harness the potential for efficiency and being relevant within the 4IR. As a result, they persevere with the hope that they will at least devise methods of mastering the skills through self-teaching. Some students resort to discussions with the peers and visiting a writing centre at the university, as well as attending all the workshops available to them.

Banerjee (2018) argued that AI and automation would not necessarily take away jobs from people, but would rather require people to adapt and learn how to make use of technology in order to enhance efficiency in existing

processes (Knox 2019). Thus, many participants bemoan their long-term exposure to rote learning in their home countries and rural school, arguing that they will continue fighting for an education system that can transform and provide them tools for critical thinking, EI, cognitive flexibility, only to mention a few. Banerjee (2018) further argued that these diverse and analytical tools are compatible with the 4IR technological advancement. Although things prove to be difficult, their persistence showed that they are resilient, they persevere against the odds. They are not actually focusing on the challenges they face today but actually living in anticipation of a better future. They not only adapt to the circumstances but also believe that they have the power to transform their lives even against the odds.

Discussion and implications

What comes out of the two studies is that underprivileged students experience a digital divide at universities. They face challenges in four key spaces, namely, basic computer skills, course choices, language proficiency and academic skills. These skills enable students to learn effectively, thus enhancing epistemological access. On this note, Maniram and Maistry (2018) argued that 'acquiring disciplinary access means being recognised within a discourse community successfully using its language'. Although these skills may sound trivial, they are key areas towards acquisition of the 4IR skills. Students from affluent communities do not experience all this. Peter et al. (2020:2) contend that already in this current era of COVID-19 pandemic, 'issues of inequalities of access and outcomes in the new pedagogic spaces' are pronounced – history has it that the elite 'tended to survive even if they had to adapt to the new conditions' (Peter et al. 2020:3*)*. They are at an advanced stage in the 4IR era.

Underprivileged students do not usually enrol for courses they dreamt about – relevant course for the 4IR era. They come into university with poor language proficiency and academic writing skills – very basic requisite skills for a university student. A lack of these skills compromises epistemological access. Maniram and Maistry (2018:310) contended that epistemological access –'EA requires that students grasp disciplinary language which is closely aligned to the acquisition of disciplinary knowledge'. Another challenge is that the university cyber space is an alien to this group of students. As much as the universities have digitalised libraries, well-equipped computer laboratories and other laboratories, thus providing physical access, they fall short in providing the true and long-term implication of epistemological access (Penprase 2018). The students lack the very basic skills; yet, epistemological access is about understanding the basic technology, creating personal meaning with it and understanding it within the broader setting (Penprase 2018). This chapter identifies how underprivileged students feel

when in such spaces starting with fear. This zooms from fear of knowing that they do not know and fear of what lies beyond the current state –the unknown and fear of what the future holds for them in terms of not being techno-savvy for the world of work.

The impact of 4IR on jobs is determined by skill level. When the skills of an individual no longer meet the skills required by jobs, unemployment amongst graduates may occur. The situation becomes worse when the existing skills are no longer in line with the technological developments in 4IR (Kamaruzaman et al. 2019).

To allow nature to take its course on these issues is socially unjust. A 4IR setting is meant for people with creative minds and problem-solving skills, who can work with technology to address societal challenges. The element of fear negates and contravenes the development of 4IR skills. What comes out in this chapter is that to a lesser extent, HEIs should provide access to acquiring the 4IR skills for the underprivileged groups. Ndofirepi (2020) argued that:

> [*A*] socially just university campus is one where students have opportunities and freedom to engage and have a sense of belonging, through equal opportunities and the promotion of capabilities for all students. (p. 405)

The literature contends that 'in an effort to ensure that every individual can work in a 4IR setting, they have to develop a set of skills that will make them able to satisfy the future jobs market' (Kamaruzaman et al. 2019:54). We, firstly, propose that universities should boost or build resilience in students, especially those who are underprivileged. Secondly, universities should also be resilient on their own so that they can be in a position to mould a student who can survive in the 21st-century era. One way of doing it is when universities could take an integrated holistic approach in providing enough access for underprivileged students in the 4IR era. There is a need for an overall skill set embedded into the curriculum – integration of the technological skills, innate skills and other several skills to transform the curriculum (Yang & Cheng 2018). Students have the desire to learn, and as such, they can grab the opportunity to upskill into the 4IR.

Conclusion

What comes out from this chapter is that HEIs are not doing much for undergraduate students to provide access to developing and acquiring the 4IR skills. Underprivileged students have challenges with basic computer skills, course choices, language proficiency and academic skills, which compromises epistemological access. It is imperative to consider the socio-economic status especially that of underprivileged students and support them within the university rather than considering all as normal upon students' arrival on campus. We are advocating a fundamental shift on how universities

reimagine mediation strategies that enhance epistemological access and work towards acquisition of 4IR skills amongst underprivileged students. Thus, we argue for universities to rethink ways in which they can support refugees and formerly disadvantaged students with requisite knowledge and expertise of how to access and utilise Internet resources for their learning and preparing for work if universities are serious in realising epistemological access for the students. Transformative pedagogies could be the route to take. With reference to preparing students for work, Kamaruzaman et al. (2019:57) asserted that usually, 'learning institutions are responsible for replicating and developing their graduates'. The cases used in this study are too small to generalise the findings but they serve to add to the current debates on 4IR issues in HE.

Chapter 5

Enhancing 21st-century skills through online facilitation

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Abstract

Amongst the buzzwords, such as the IoT, AI and 4IR, there is a steady growth and demand for 21st-century skills to advance our global market and economy. In a low-income country, such as South Africa, an all-inclusive approach to bring about change and eradicate challenges of resistance towards technology integration is needed. The study follows a qualitative, case study design, with weekly reflections and a survey (n = 29) that highlights student experiences

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of online facilitation. This course was designed according to constructionist principles to reveal the 21st-century skills obtained during the course. The benefits of student reflection have been studied widely and the advantages to content revision and awareness of students' outcomes are well documented. The results revealed that students experience a certain amount of discomfort when they are expected to take responsibility for their learning. However, transformation during the course proved that when working through the discomfort, the students experienced the course as valuable and fulfilling. The findings of this study demonstrate that a constructionist approach to course design enhanced the student experience, and that the skills obtained contributed to a mindset shift and demonstrated an impact on their delivery in their workplace.

Introduction

As we continue into the 21st century, graduates are entering a volatile work environment (Tran 2018) for which students need a specific skill set to survive in the workplace. What those specific skills are that ensure employability is still uncertain (Suleman 2016). Researchers have found that graduates' ICT skills are good; however, their teamwork ability is poor (Suleman 2016), thus, indicating that certain soft skills, such as communication, interpersonal skills, integrity and ethics, are deemed to be important (Singh, Thambusamy & Ramly 2014). What researchers do know is that graduates need skills that allow them to quickly transfer from HE to the workplace, and therefore, promote work-based learning (Herbert et al. 2020; Jackson, Fleming & Rowe 2019). In today's changing world, HEIs need to transfer the knowledge and understanding of a broad set of competencies to students contributing to economic growth (Barak 2018).

In today's fast-changing global environment, ICT skills are vital (Barak 2018; Geisinger 2016; Lee & Hannafin 2016; Van Laar et al. 2017). In order to meet these new challenges, future employees (students) need to develop new skills. With ICT's rapid development, technology's popularity has increased, which has created changes in the demands of the job market that HE needs to deal with (Lee & Hannafin 2016; Siddiq, Gochyyev & Wilson 2017).

Higher education institutions were consequently pushed towards the use of technology in teaching and e-learning (Al-araibi et al. 2019). This resulted in blended and online modules being developed (Moser 2021) where lecturers need to facilitate online. Lecturers are expected to change the way they teach, and adapt to the use of technology as well as changing learning environments (Kangas et al. 2017). However, it is critical to understand that technology alone does not improve teaching and learning (Simelane & Mji 2014). The quest for students and employees to be 21st-century attuned urges lecturers to explore

pedagogies that would further the development of the much needed 21st-century skills. Researchers suggest that students need learning opportunities that address the five dimensions of 21st-century learning, such as the 4Cs for education, knowledge building, the use of ICT for learning, self-regulation and real-world problem-solving and innovation (Bray & Tangney 2016; C21 Canadians for 21st-Century Learning & Innovation 2012; Stauffer 2020). This does not entail 'adding' content to the curriculum, but rather changing how we deliver the content, that is, sculpting the process of content delivery (Reaves 2019).

In constructionism, as introduced by Papert (1980), learning is a process of discovering, acquiring knowledge and creating objects based on what has already been learned (Papert 1980). Furthermore, learning is enhanced when a learner is constructing an artefact (virtually or real) or a mental model that can be shared and discussed with others (Harel & Papert 1991). As learning is seen as a social process, the produced models or systems or artefacts ought to be socially shared to optimise the learning process (Papert 1980).

A constructionist approach towards course design offers opportunities to incorporate strategies that further the attainment of skills needed to be successful in the workplace (Li, Cheng & Liu 2013). Apart from incorporating 'learning by doing' in the design of the assignments that students needed to complete, students interacted with their artefacts and with those of their team mates boosting their self-directed learning abilities (Ackermann 2001). In addition to new learning opportunities, students engaged in teamwork with group discussions and peer evaluation, echoing Papert's notion of learning in social contexts (Papert & Harel 1991). Students had to reflect weekly on their learning process. Reflection is personal and can take a variety of forms, for example, students assess their assignments, or they can describe their feelings and experiences. Whilst reflecting, they take time to think about what they have learned (Back 2019) in this way internalising the knowledge obtained.

Purpose

In order to promote the development of 21st-century skills to survive or transfer easily from university to work, four university lecturers redesigned a course following a constructionist approach. They created an environment where students could develop skills, construct meaning, build artefacts, conduct peer review, provide feedback to lecturers and reflect on learning all within an e-learning course on educational technology (Papert 1980). This chapter focuses on how course design and online facilitation enhanced 21st-century skills needed for the current workplace demands relevant for the 4IR.

Literature

The 4IR is characterised by an exponential growth in the use of technology, and as a result, the challenges faced by facilitators and lecturers to employ teaching and learning strategies to adapt to this phenomenon are scrutinised. Throughout all the industrial revolutions, education addressed the needs of society, and this is also true for the 4IR (Penprase 2018). The 4IR comes with radical developments of innovation and transformation in industry models and online education itself. New delivery technologies, such as augmented reality (AR), virtual reality, AI, IoT, 3D printing, robotics, exponential increase in computing power, to name a few, are at the forefront of how we teach as the debate of what we teach rises (Penprase 2018). As much as corporate leaders have to adjust to the 4IR, education delivery needs to adapt. Life, social interactions, technology and lifelong learning are some of the fields in which change is experienced (Marr 2019). Academics need to guide students to facilitate their own learning. Because of the interconnected world, students need to have a global mindset (Marr 2019). In addition, institutions need to provide more flexible learning opportunities so that individuals can continue to learn throughout their working life (Marr 2019).

The growing popularity of online courses continues to reshape education (Davis 2019), whilst online platforms are becoming the new norm. When studying online, students have more control over how and what they learn (Davis 2019), and the constant connectivity will allow them to form part of a global community (Davis 2019). In the changing job market where a variety of new technologies such as the IoT (Rose 2018), virtual and AR are gaining momentum (Davis 2019), graduates will need skills that make them employable coupled with experiential training (Davis 2019; Kang 2018). During the 4IR, learning outcomes also need to change, promoting online learning, shared learning, lifelong learning, as well as developing 21st-century skills (Kang 2018). Other skills that are crucial to survive during the 4IR includes judgement and decision-making, leadership (Picksley 2021), embracing change, technological skills (Marr 2019), EI, people management skills and cognitive flexibility (Payle 2020).

According to the World Bank (2019), the world is facing a learning crisis. Therefore, a change in HE is inevitable (Kangas et al. 2017). In the past, education institutions were criticised for their lack of change throughout the industrial revolutions (Burner 2018), and this stagnation resulted in students lacking important skills that are required in the 21st-century workplace (Ross 2017).

Knowledge involves both content and skills. At universities, the emphasis is largely on the content, whilst skills development does not always match the needs of graduates (Bates 2015). Examples of the skills classified as 21st-century skills include information, media and technology skills (information literacy, media literacy and ICT literacy), learning and innovation skills

(4Cs and problem-solving), and life and career skills (flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility) (Bates 2015; P21 Partnership for 21st-Century Learning 2007).

Although skills can be learned by trial and error, skills development can be enhanced through teaching activities or interventions. By giving regular feedback, students learn these skills faster. However, small steps are needed whilst students continue practicing the skills (Bates 2015). In order to instigate the development of these 21st-century skills, there are a variety of new learning theories to teach and prepare students for life. Theories, such as PBL (Wood 2003), connectivism (Siemens 2005), constructivism (Richardson 1997), social learning theory (Bandura 1971) and networked learning theory (Ryberg, Buus & Georgsen 2012), are proposed for 21st-century teaching. Another learning theory suitable for 21st-century students is constructionism (Papert 1980).

As mentioned earlier, constructionist learning environments are designed to guide active enquiry, and therefore, online facilitation in these environments entails more than just delivering the subject content. Our students need to be prepared for a workplace that is still evolving to do tasks not yet developed (Malik 2018). Malik (2018) continues by saying that we are not being paid for what we know, but for how we can creatively use our knowledge and apply it in different circumstances. Therefore, our students need to be prepared to, apart from being well conversed in the 4Cs, also be lifelong learners that can adapt to the changing needs of this century.

A new approach to education is needed in the 21st century. A holistic transformation of education in terms of curricula, assessment and facilitation is needed (Malik 2018). Students need to function in a student-centred environment to be able to analyse, make connections, evaluate and draw conclusions from the information they collected, and then communicate their results as constructed feedback to their peers (Warner & Jumani 2016). Lecturers, therefore, need to ensure that students are critical thinkers and problem-solvers, and can communicate and collaborate effectively whilst making use of technology (Bray & Tangney 2016).

Fryer et al. (2016) suggested that combining technology with face-to-face teaching could potentially improve students' motivation, engagement and participation. Student engagement is characterised by the time and effort students invest in their studies (Buskist, Busler & Kirby 2018) and by their active involvement in learning activities (Barnacle & Dall'Alba 2017). The use of technology also enables educators to measure student engagement in an e-learning environment (Gray & DiLoreto 2016). Research studies have shown that the success of students' engagement with e-learning is dependent on the constant support and active involvement of the educators (Fryer & Bovee 2018; Gray & DiLoreto 2016).

Feedback is one of the most powerful teaching and learning strategies creating opportunities for students to improve engagement and performance (Hattie, Fisher & Frey 2016). A student-centred approach creates the opportunity for students' feedback to be used to adjust the content of courses (Zou & Lambert 2017). However, for students to provide meaningful feedback, they are expected to first reflect on their learning (Gray & DiLoreto 2016).

When providing feedback, students make their voice heard, and therefore, the student's voice is widely used in education to encourage students to provide feedback and create a sense of belonging. Acknowledging students' inputs (student's voice) is student-centred and provides a learning environment of mutual respect where students' contributions are valued (Baroutsis, McGregor & Mills 2016). Feedback provides a channel of communication to give students a voice and could take on many different formats. In e-learning environments, digital feedback methods, such as online surveys, journals, polling and video feedback, are used. However, challenges were identified, including compulsory collaboration, which required students to change their learning habits, resulting in increased stress and cognitive overload (Blau & Shamir-Inbal 2018).

In order to address possible design challenges, and provide multiple learning opportunities and activities, a proper e-learning framework is needed. This framework should encompass the many facets of e-learning giving mutual attention to design strategies that will reduce online learning challenges for students. It should assist instructional or learning designers to create and design meaningful and authentic learning activities that encourage the development of 21st-century skills.

Theoretical framework

A theoretical framework forms the foundation of a research study and highlights the perspective from which the study was examined (Sekaran & Bougie 2013). In researching the possible e-learning frameworks, factors that contribute to successful e-learning implementation were considered as the students in the study would need to understand, design and develop content.

Sun et al. (2008) carried out an extensive literature review on factors that influence e-learning activities and student satisfaction. They discovered six dimensions coupled with a variety of key factors that influence student e-learning satisfaction. Sun et al. (2008) investigated the key factors affecting the satisfaction of students' e-learning and found that only seven factors had a significant influence on e-learning satisfaction.

In addition to the work of Sun et al. (2008), Haw et al. (2017) adopted the same framework for secondary education. They proposed the LearnCube that consists of six dimensions (design, course, teacher, technology, support and student) where each one relates to a different aspect of the critical success factors for e-learning. These six dimensions provide a holistic outlook on the design and development of e-learning content.

The theoretical framework that guided this study was found in the works of both Sun et al. (2008) and Haw et al. (2017). As this study is in a blended learning environment, in HE, the attributes of some dimensions slightly differ from the original models. In the adaptation of the original framework, the Material quality attribute (Design dimension) has been moved to the Course dimension and the Peer influence attribute (Teacher dimension) has been moved to the Student dimension.

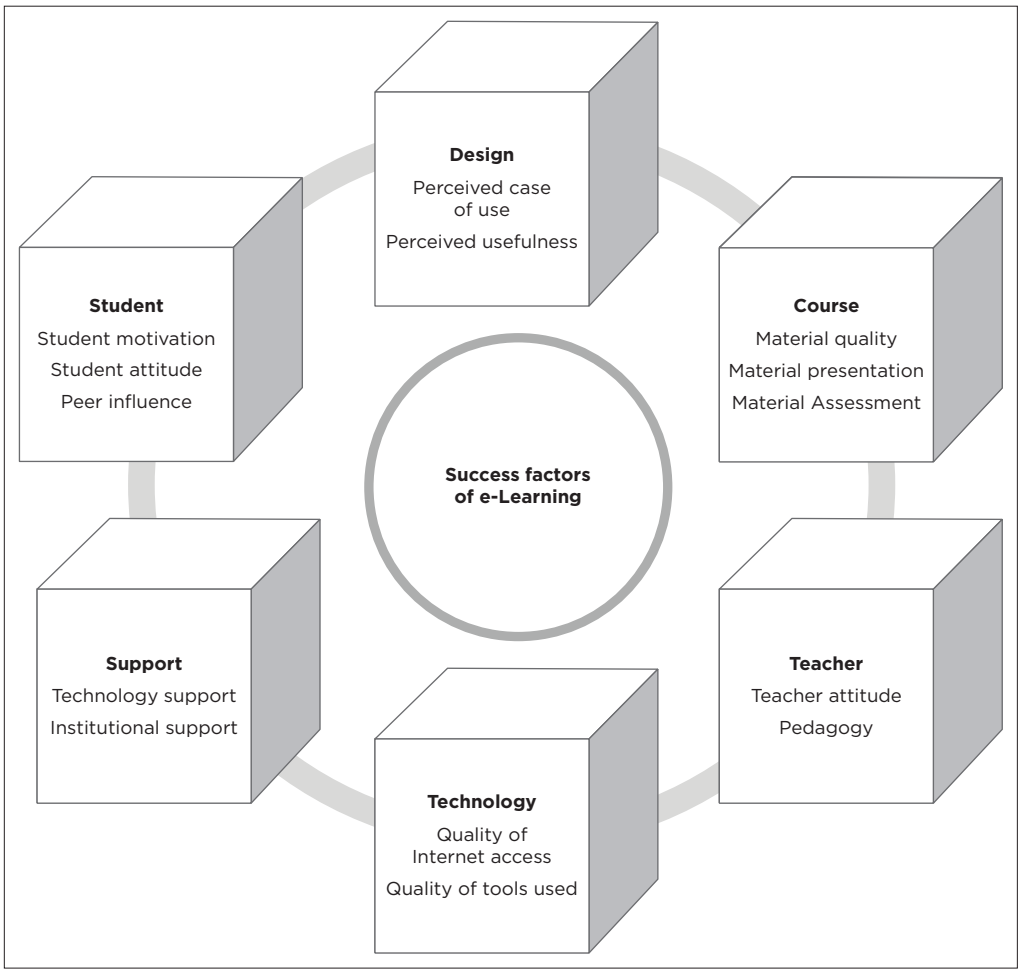
The adapted framework, therefore, formed the conceptual lens for this study. The key factors indicated in Figure 5.1 were used to guide and formulate the questions in the survey. In order to explore the student reflection of 21st-century facilitation, we focused more on the Design, Course, Technology and Student dimensions.

Course design affects the students' experiences in terms of the usefulness and how easily the course can be navigated and accessed (Placencia & Muljana 2019). Whilst the quality of the learning materials and engagement of students are related to the course design (Rajabalee & Santally 2021), a positive student experience typically indicates that the course is of high quality (Sampson et al. 2010).

This study is centred around the student. Their expectations, motivation, engagement, interaction with the content, interaction with their peers and their attitude towards the course all affect their experience (Gopal, Singh & Aggarwal 2021). Therefore, in this study, the researchers did not examine the influence of the teacher or the pedagogy. However, we acknowledge that the way that the teacher engages and interacts with the students contributes to the climate of the class.

According to Suleman (2016), students tend to be computer literate, and the regular use of technology does not affect their experience. As it turned out, students in this study had no difficulties accessing the Internet or computers. Students were, however, exposed to a variety of software applications in this module, which resulted in a certain amount of discomfort, as students had easy access to well-maintained computer labs. The researchers did not investigate support.

Keeping in mind the theoretical lens of this study, the following methodological approach was used.



Source: Adapted LearnCube (Haw et al. 2017; Sun et al. 2008).
FIGURE 5.1: Key factors used to guide and formulate the questions.

Methodology

The course under scrutiny was designed to empower students enrolled for a Postgraduate Certificate in Higher Education in the design and development of e-learning environments. This qualitative case study was approached within an interpretive paradigm (Denzin & Lincoln 2000; Merriam & Tisdell 2016). The aim was to provide a rich description of the experiences of the students during the course, as well as about the attainment of 21st-century skills (Creswell 2013). Twenty-nine students enrolled in the course presented in a blended mode of delivery. They attended five contact sessions over 18 weeks, including online interaction. The students acted as a purposeful, convenient

sample as they were enrolled in the course (Salkind 2010). Apart from the focus of advancing the design and development of learning environments in the students' respective disciplines, focus was placed on the development of 21st-century skills. Therefore, the development of information literacy, media literacy and technology literacy especially featured during the module presentations as the technology was used extensively. We did not specifically build the module around life and career, and learning and innovation skills, as we were interested to see how these 21st-century skills featured in the student's reflections.

Students had to reflect on their experiences and interactions with the different technological tools each week. Although there are a variety of methods used to skilfully reflect, in this course, we used prompts such as 'what were interesting discoveries', 'challenging and powerful moments' and 'how would they prefer to demonstrate their learning achievements'.

The student reflections together with a survey were used to investigate the influence of the course on the attainment of 21st-century skills. The data harnessed from the reflections and the survey were extracted from the Learning Management System.

Data analysis

As the study focused on improving online facilitation and the skills promotion, the researchers focused the data analysis around these themes. The survey questions were designed around the six dimensions of the LearnCube (Haw et al. 2017), and the data were deductively analysed to explore the student reflections of 21st-century facilitation (Patton 2015). In the analysis, the researchers focused on the student experience of the following four dimensions of the LearnCube: Design of the course, the content of the Course, Technology used, and Student motivation and attitudes. In addition to these constructs, the researchers particularly focused on self-reported skills developed during these activities. The themes were grouped, logically organised and quotes were highlighted and presented as the findings of the study. In order to ensure anonymity, pseudonyms were used. The students are referred to as 'P', ranging from P1 to P29. The findings are structured to highlight student experiences and integrate the skills developed for each dimension.

Findings

A mind-shift from the first week's experiences to the last week's experiences manifested in the survey. Participants that initially found the course material to be overwhelming, frustrating and feared their ability and competence to

complete the course, suddenly felt empowered and confident (P2, P6, P25). This mind-shift is portrayed by P21 as follows:

> 'I have transformed my way of facilitating learning, even the communication between me and my students improved since I started using e-learning'. (P21, student, date unspecified)

Once the student experienced 21st-century facilitation for themselves, he or she was able to adapt it for his or her own workplace. The student could immediately see the improvement in communication with his or her own facilitation and the response from their own students once this was implemented. It became evident that there were a multitude of skills that were being learned.

Design

Attention was paid to the design of the course to provide not only an authentic experience but also multiple learning opportunities that would encourage participation and engagement and model 21st-century facilitation. Participants started to understand the value in the design of the course, and suddenly the method of facilitation was recognised as learning through experience or experiential learning (P24). This finding is also confirmed by Kang (2018) who said that graduates need skills and experiential learning to make them employable. This acknowledgement led to participants thinking even further of how they can relate to and apply their knowledge and skills gained in the course in their everyday work environments, therefore finding the design of course useful.

The participants showed excitement and eagerness to implement what they have learned in their existing teaching practice. This is a powerful testimonial of the relevancy of the course, and the preparedness and confidence these participants felt to teach both face-to-face and online. This relates to the skill that Herbert et al. (2020) deemed as important for work readiness. This excitement and eagerness were confirmed by the following quotes:

> 'I have already started implementing the things I have learnt'. (P12, student, date unspecified)

> 'As a result, I have actually implemented some of these tools in my own courses'. (P28, student, date unspecified)

Participants enjoyed the practical way that the course was presented. It allowed them to apply what they learned in their teaching practice. Also, they learned how to adapt their old ways of teaching to 21st-century facilitation methods. This notion is summarised in the following quote:

> 'The course has forced me to rethink the way I do things in and out of the classroom'. (P19, student, date unspecified)

Discovery learning was welcomed by several participants, as P24 mentioned that 'exploration and discovery' are what kept him motivated in the course. P29 explains further how the course encouraged personal and professional development (P1, P10, P12, P19, P24, P28), in that it 'gave you a chance to discover a lot of things as well as discover yourself and your style of eLearning' (P26, student, date unspecified). This is testimony to how constructionism lends itself to that higher level of learning through discovery, creation and design (Kynigos 2015).

The design of the course made provision for experiencing a variety of tools. The students appreciated that the course design included all the links that they needed (P14). As the participants progressed, they found that 'after a lot of practice and commitment it was easy to use' most tools (P11, student, date unspecified). They started to show dedication by trying to perform all the activities rather than master just one (P14), which is also mentioned in P21 Partnership for 21st-Century Learning (2007). They learned to have patience with themselves and the apps they worked with (P3). This developed their problem-solving skills and helped them to reach the desired outcomes (P20, P18) (Bates 2015). They also found the course to be useful and interactive, where they were challenged to focus and use their creative side for constructing the activities (P13).

The 'refreshing design' as mentioned by [P10] created a different approach to how activities were facilitated in class (P19, P28). Activities prepared participants for assessment, and rubrics made the course easy to follow (P4). P23 explains that:

> 'Each week is carefully designed to scaffold the learning of the skills needed for each part or activity'. (P23, student, date unspecified)

One of the main criticisms against the design of the course was the aspect of time. This was a controversial aspect as some students found that the time allocated for the completion of activities was sufficient and fair (P4, P14, P26 and P28), whilst others found the time insufficient and were overwhelmed by what was expected in the given time (P13, P15 and P25). As one of the participants mentioned:

> 'The number of hours indicated for each activity was extremely conservative. It took at least double the amount of time and sometimes more [...] I would have like to have spent more time to focus on the tasks and the different apps'. (P12, student, date unspecified)

This controversy in the amount of time spent simulates a higher workload and allows some students to experience the design of the course as challenging (P19). Therefore, designers need to be sensitive to time on task when designing an online course.

Technology

Participants found the applications and tools to be so engaging that, at times, they felt there was not sufficient time to engage with all the tools as they wished (P12). It kept their attention (P1, P19). They could immediately see the relevance and value of how these tools would create active engagement in their teaching (P2, P19 and P28). Most of the instructional tools were easy to use (P2, P9), and students confirmed that they had sufficient access to the online platform (P3, P4), P12, P18). As P4 stated:

> 'I prefer using my computer to work and learn on so it helped me that everything was so easy to access on my own computer both in class and at home'. (P4, student, date unspecified)

The literature shows that students who are confident in their ability to complete technology-related tasks suffer from little or no technology anxiety (Sun et al. 2008). Technology anxiety is often a limitation towards effective and efficient technology task delivery. In this study, the majority of students did not find technology a challenge. This is in agreement with older studies carried out by Suleman in 2016. Participants reported that they were confident in participating, as well as implementing new ideas in their classroom (P21). They also used words, such as 'not scared to ask', 'comfortable' and 'positive environment', that contribute towards their confidence (P6, P21, P23 and P28).

Course

The application of the content taught received a positive response as participants found it to be 'very interactive and I believe were good at evaluating true understanding and application of the content' (P13, student, date unspecified). They mentioned the value of 'hands-on', 'practical' and 'develop skills needed' (P1, P14, P18 P20, P28). P3 mentioned:

> 'The assignments were good because it put to practice everything I learned while going through the study work'. (P3, student, date unspecified)

P23 emphasises the importance of scaffolding and how students are better prepared to apply their knowledge when building, developing or creating artefacts. These are fundamental characteristics of the constructionist approach and promote 21st-century skills. Through creating artefacts, it was fascinating to see the acknowledgement of the participants that had gained so many 21st-century skills. The spectrum of skills that the participants reported that they either practiced, learned or developed during a few weeks are summarised below. The first category of skills identified is the learning and innovation skills (P21, Partnership for 21st-Century Learning 2007). According to Stauffer (2020), learning skills entail the popular 4Cs, which include critical thinking, creativity, collaboration and communication.

The students confirmed the significance of practising the 4Cs of education. Critical thinking (P2), creativity (P13), collaboration (P10) and communication (P8) were demonstrated through comments, such as 'figure things out', 'think out of the box', 'having to work with my peers [...] have been amazing' and 'communicate [...] a lot more fun'. These responses are an indication that participants apply their minds, and are challenged to use higher order cognitive processes to complete tasks, collaborate, cooperate and learn through sharing whilst enjoying face-to-face and online communication.

The students measured the quality of the course against how much knowledge they have gained. In the survey, they indicated that they benefit a lot (P1, P5 and P11), and the way that they facilitated previously will dramatically change (P1, P3, P19). They experienced excitement and shared their newfound knowledge with their colleagues at work (P1).

Although some students complained that they lacked guidance, and had to do all the work on their own, or needed more teaching, they self-proclaimed that whilst struggling they did learn new skills. This is highlighted in the following quote:

> 'What seemed confusing and difficult at the outset was not so difficult in the end. I have learnt a lot and that technology is not so confusing and there are many new things I can do. I am very excited about learning. I wish there was more time to work with the things we had to do'. (P12, student, date unspecified)

This additional need for teaching can be seen as their accustomed nature to 'spoon feeding' (P5, P6, P17). This also emphasises the importance of giving students opportunities to develop the ability to learn independently (Bates 2015) as it does not come naturally to all students. Emphasis is again placed on resistance to change in behaviour and open-mindedness towards different facilitation techniques.

Student

The survey responses did not directly question 21st-century facilitation but several themes emerged. Apart from the digital literacy skills (P16, P11) that were anticipated, a variety of 21st-century skills were obtained. Participants recognised these skills on their own even though this was not consciously averted. It was heart-warming to view the value and appreciation they had for the development of the additional underlying skills. They could apply what they learned from one activity to the next, emphasising the transferability of their skills (P11). They self-reported that they learned many skills, which stimulates a learning culture as Kang (2018) also found. As one of the students mentioned:

> 'I will definitely go back to the ones not used to explore how I can make use of them'. (P14, student, date unspecified)

The willingness to implement the skills learned and use the tools in their teaching practice was welcomed very strongly. Students revealed in several of the survey items how they would use what they have learned and how their students would benefit from such an approach. They added value to the study, in that participants came to this realisation on their own and found the content to be applicable, flexible and relevant (P2, P8, P9, P24, P26, P29) (Bates 2015). Participants self-reported that they changed how they 'teach', 'facilitate' and 'communicate with students', and even added that they created new lessons for their students (P1, P7, P21, P28).

Peer interaction allowed them to view different perspectives that they otherwise would not have realised (P19, P21) and proved to add value to the learning experience (P8, P28). This finding is in agreement with working in a constructionist environment as propagated by Kafai and Resnick (1996).

Although students were interested in teaching with technology tools and were looking forward to each week's class (P1), various other aspects motivated them to continue with the course. Except for completing the qualification, the biggest factor was to learn more (P3, P13, P24), indicating the interest this constructionist course has sparked. As P1 said:

> 'I was motivated by the sense of mystery that the course had'. (P1, student, date unspecified)

This suspense was the result of a carefully designed course, with quality content, variety of tools and motivated students. However, students did acknowledge that their peers played a huge role in keeping them motivated (P6, P9, P25).

Not all students embraced the collaborative nature of this course. However, this opens up opportunities for students to develop their self-regulating skills, which include academic skills, such as goal setting, applying their own strategies and self-monitoring their effectiveness rather than reacting to external forces. This finding was also confirmed in the study carried out by Zimmerman (2008) on self-regulation and motivation.

They mostly worked on their own, trusted their instincts and were responsible for their learning: 'It was a very self-directed learning experience for me. As most of the learning, I did myself' (P29, student, date unspecified). This reveals that students acknowledge that they actually learned the content with just guidance and scaffolding rather than the traditional teacher-centred approach to learning.

Finally, students indicated that their attitude towards technology has changed during the duration of the course. From being reluctant to use technology and e-learning in their teaching practices, they were now positive and convinced that this is the best way to teach the 21st-century students (P7, P9, P13, P16, P27).

Conclusion

Considering the findings of this study, it is important to note that we are now 20 years into the 21st century. As illustrated in the literature, one can clearly view the development of technology and education across the different revolutions. The 4IR does not differ in introducing new concepts for e-learning, blended learning and online learning. Course design and the importance of new innovative methods to transform learning using constructionist approaches continue to grow. Evidently, the feedback and reflections of student experience inform the revision and improvement of courses. The 21st-century skills being at the forefront of education change and workplace development demand a panoramic view of course design and development.

The study delivers on this view using the LearnCube as a lens to dig deeper into the dimensions that influence the development of 21st-century skills and contribute to the prerequisite skills required for the 4IR. The *Design* dimension alluded to the students' acknowledgement of whether the course material was easy to use and useful. The responses regarding the activities and the collaboration with their peers whilst learning demonstrated that they found the course material and navigation easy to use and useful as they could immediately relate it to their own work context. The value of the course design was mirrored in the practical application students experience whilst doing this course. The eagerness in which they implemented what they have learned is an indication of the relevance participants felt. This of course worked hand in hand with the *Technology* dimension, which revealed that if students have the correct infrastructure in place, then technology is not a barrier to their learning. Most students had quality Internet access, and this contributed to their success in the activities as it eliminated the technology anxiety. The tools provided were carefully sought and taught them different skills creating variety, and they were able to compare and make informed decisions on what would be most suitable for their context. Together with the quality of tools, the *Course* dimension catered for high-quality material, presentation and assessment. This interlinking nature created a holistic, well-developed course that focused deeply on these three aspects of learning. The presentation of content and how it is assessed, in turn, actively influence the student response to learning. Quality content provides scaffolding with multiple opportunities for learning using a variety of methods. By designing assessment opportunities that invoke the demonstration of skills, students became aware of their learning and started to be more aware of the support that they received. The *Student* dimension, which focused on motivation, attitude and peer influence, was acknowledged, and students showed their appreciation and gratitude for the presentation and design of the course. Students draw motivation from themselves and their peers to continue working on their activities. Their motivation and willingness to implement what they have learned instigated a positive attitude towards the use of technology in their teaching practices.

The findings implicate that each student's experience was subjective. The patterns and trends that emerged from this study reveal that students develop 21st-century skills, such as communication, collaboration, creativity, critical thinking, media literacy, information literacy and life skills, that cater to the workplace from courses that follow a constructionist approach to teaching and learning. The notion of self-directed learning encourages active participation and engagement, promotes peer interaction, and develops technology literacy skills that are essential for the workplace. The extent to which students' reflections guide 21st-century online facilitation is evident in the causal relationship between the lecturer and student feedback, which was indicated as valuable and beneficial. This process formed part of the learning experience and encouraged not only an open-mindedness to change and adapt but also a mind-shift and transformation in how students approached content design and development and applied their newly acquired knowledge and skills to their work contexts. Student feedback and reflections can be viewed as a tool for the improvement of user experience and course design to enhance 21st-century skills. It guides 21st-century facilitation, which still remains a fairly new concept in the South African context.

The study does not report any shortcomings; however, it recommends that a constructionist approach be used to design courses in other fields or subject areas and evaluate the extent of student reflection on 21st-century skills. This will provide insight into the applicability of this learning theory in various contexts or fields of expertise, and necessitate the importance and need for wider exposure for 21st-century skills development and facilitation.

Chapter 6

The myth of the Fourth Industrial Revolution: Implications for teacher education

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Abstract

This chapter is located in the debate between Klaus Schwab and Jeremy Rifkin about whether there is such a thing as a 4IR. An analytical framework established by careful analysis of the 1IR suggests that the notion of an *actual* 4IR is a conceptual leap too far. Nonetheless, there is a particular discourse on *teacher education* associated with each pole of this debate. On the one hand, Schwab adopts a technocratic account of education imperatives, emphasising the use of ICTs in teaching as the necessary solution to contemporary, global educational crises. On this account, teachers must, above all else, be trained to deliver learning using digital technology. On the other hand, Rifkin adopts an egalitarian view of education, envisaging a background role for ICTs in

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classrooms and schools, in a horizontally scaled, Internet-driven, open learning agenda. However, both poles of the debate suggest a *technology-driven* conception of teaching and teacher education. The argument here is that this reductionist view is inadequate for contemporary teacher education, because it cannot provide for practices that will foster the deep classroom learning required by the networked information economy.

Introduction

In the academic and teacher education environment in which we currently work, the 4IR seems to be taken for granted. We speak about as if it were like breakfast. It just seems to be way we live in and organise our world, 'without any deliberate pursuit of coherence [...] without any conscious concentration' (Bourdieu 1984:170). In an educational and social environment in which we now habitually use networked digital technologies to carry out our work and communicate, everybody seems to name it the 4IR, and to operate as if that just is the way it is. Our job is to prepare teachers for the 4IR. This gets written into curriculum documents, university policy documents, national 'standards' for teacher education and decrees from our academic heads; however, nobody wants to tell us what it means. We are just expected to know because it is our breakfast for the day: '[e]verybody knows we are living in the Fourth Industrial Revolution'. There is very little by way of critical collegial reflection about why we should call it a 4IR, and what that actually means, historically and culturally. However, the notion of the 4IR is contested (unlike breakfast), and very different conceptions about what counts as teacher education come out of that contestation.

The argument in this chapter is that current discourse on the '4IR' and teacher education is dangerously technology-centred. It would be better to step back from such discourses – it is not given that a 4IR is upon us – and think through implications through the implications of ICTs for teaching and learning more carefully from the stance of classroom pedagogy. There is no doubt that such technologies offer very special affordances to the teacher. However, it also seems clear that to talk about teacher education in the technology-centred language of a '4IR' leads to a misconception about what e-learning should be in our society.

The argument here proceeds as follows: firstly, the chapter gives an account of the dispute between Klaus Schwab (2016) and Jeremy Rifkin (2011, 2016) about whether there is such a thing as a 4IR to provide a context for subsequent arguments. Next, it describes briefly the ideological coup that Schwab pulled off at Davos in 2016, which pushed the notion of the 4IR as a massively converged set of technological marvels to the centre of global economic, political and (not least) educational discourse. The chapter then considers whether the now mainstream notion of a 4IR developed on the basis of

Schwab's ideas will hold up to historical and conceptual scrutiny. It shows how an analytical typology established by careful analysis of the 1IR suggests that the notion of a 4IR is a bridge too far. In that light, the particular conception of teacher education associated with the '4IR' is discussed and contrasted with that associated with the Rifkin pole of the debate. The implication is that we should be looking into deeper analysis of the current and ongoing 3IR to understand contemporary education. The final part of this chapter develops this analysis in relation to the imperatives of teacher education in the 21st century.

Rifkin and Schwab

Schwab famously intervened (he would say 'disrupted') by introducing the notion of the 4IR into the WEF in January 2016. This annual pilgrimage is often styled as the gathering of the world's economic elites: corporate heavyweights, heads of state, global intellectuals and their entourages gather in the Swiss Alps to discuss and prepare themselves for the 'the next big thing'. Schwab's (2016) intervention shifted the hegemonic understanding of the socioeconomic character of the globalised, networked information society that came about in the latter half of the previous century:

> We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another. In its scale, scope and complexity, *what I consider to be the Fourth Industrial Revolution,* is unlike anything humankind has experienced before. We have yet to grasp fully the speed and breadth of this new revolution. Consider the unlimited possibilities of having billions of people connected by mobile devices, giving rise to unprecedented processing power, storage capabilities and knowledge access. Or think about the staggering confluence of emerging technology breakthroughs, covering wide-ranging fields such as artificial intelligence (AI), robotics, the Internet of things, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing, to name a few. Many of these innovations are in their infancy, but they are already reaching an inflection point in their development as they build on and amplify each other in a fusion of technologies across the physical, digital and biological worlds. (p. 7; [*author's added emphasis*])

He placed a great deal of emphasis on what he proclaimed to be the unprecedented speed, size and scope of the '4IR', in relation to previous industrial revolutions. The *velocity* of change, he suggested, is exponential rather than linear; the combining of multiple technologies *broader and deeper* than ever before; and the *systems impact* is now total, across the whole of society and the world economy (Schwab 2016:8–9). This is why, he said, 'disruption and innovation feel so acute today [...] innovation in terms of both its development and diffusion is faster than ever' (Schwab 2016:14). With this, Schwab dismissed most of the global expertise we have on these matters: 'I am well aware that some academics and professionals consider the developments that I am looking at as simply a part of the Third Industrial

Revolution' (Schwab 2016:8). Bear in mind that the notion of a '4IR' had not existed before he decided to disrupt things.

Let us turn our attention to some of the expertise that he dismissed. Firstly, he ignored the huge contribution of Manual Castells, the Spanish sociologist acknowledged in the academic world as the primary theorist of the *network society,* that is the 'society whose social structure is made up of networks powered by micro-electronics-based information and communications technologies' (Castells 2004:3). Castells (1996) demonstrated that by the 1990s, the entire world was organised around networked information systems, at the heart of which is the Internet. Drawing together work that he had been carrying out for two decades, in an address to the UN in 1999, Castells (1999) suggested that:

> In the last quarter of this century, a new form of socio-economic organization has emerged [...] for the first time in history the entire planet is capitalist [...] [*while it still*] appeals to relentless competition in the pursuit of profit, and individual satisfaction (deferred or immediate) is its driving engine [...] it is fundamentally new because it is tooled by new information and communication technologies that are at the roots of new productivity sources, of new organizational forms, and of the formation of a global economy. [...] this new world [...] is shared by all countries despite the diversity of their cultures and institutions. (p. 2)

In his writings, Castells is optimistic about the possible use of ICT as a strategic means for governments to achieve more prosperity and equality: 'it is an essential tool for economic development and material well-being in our age; it conditions power, knowledge and creativity'. However, it is not distributed equitably between the richer and poorer countries, and between the rich and poor within countries. Therefore, humanity faces either 'a virtuous circle of development or a downward spiral of underdevelopment' to be determined not by technology but by political and social dynamics (Castells 1999:4). Castells (1999:7) also wrote extensively about what he terms 'the other side of the information age: inequality, poverty, misery and social exclusion', all of which are currently the growing legacy of the globalised, information society.

Now, it is quite clear that Schwab has been heavily influenced by these ideas. Most of his substantive claims about the global information economy are neatly repackaged, albeit sanitised, versions of Castells' arguments (Schwab 1976:86). Yet, he acknowledges this work only once in a peripheral comment (Castells 1999:86) about how overwhelming the '4IR' can be. The problem for Schwab is that Castells does not deal with the currency of 'industrial revolutions', nor does he date the fundamental digital transformation of society in the contemporary era, and nor does he lend support to the 'unprecedented' speed-scope-system change hypothesis. In more practical, political terms, Castells does not help Schwab very much with the latter's ideological project, which is to declare a *bold, new industrial revolution* in the

2020s, rather than to concede that globalisation and the information society is in trouble.

Another prominent, expert contributor to the understanding of a possible contemporary industrial revolution, whom Schwab ignores, is Jeremy Rifkin. Rifkin's background is in an extensive 'end-of-work' literature, which explores the digitalisation and automation of work in both offices and factories, attendant job losses and the consequent 'hollowing out' of the middle classes in society (e.g. Beck 2000; Gorz 1999; Rifkin 1995; Zuboff 1998). He dates the emergence of the 3IR to the post-Second World War period (Rifkin 1995:61); however, he argues that its most significant impact was being felt only in the 1990s, in computers, robots and software taking over strategic thinking and managerial functions, in relation to the production and distribution of goods. These changes increased productivity, output and sales. However, Rifkin (1995) noted how the:

> [*N*]ew generation of sophisticated ICTs being hurried into a wide variety of work situations [...] [*replaces*] human beings in countless tasks, forcing millions of blue and white collar workers into unemployment lines, or worse still, breadlines. (p. 3)

Therefore, well before 2016, Rifkin was operating on the terrain onto which Schwab descended in 2016 but with a notable disagreement. Rifkin does not think that these dramatic changes to business processes, the workplace or society constitute a '4IR'. More recently, Rifkin, like Schwab, has been located in the broad terrain of supra-national states, and has written sceptically about the notion of a 4IR from within the human rights tradition associated with the United Nations Environment Programme.

In 2016, Rifkin argued that the WEF had 'misfired' with its '4IR' intervention. He suggested that Schwab was on shaky ground with his suggestion that the fusion of technologies between the physical, digital and biological world is somehow a qualitatively a new phenomenon (Rifkin 2016):

> The very nature of digitalization [...] is its ability to reduce communications, visual, auditory, physical, and biological systems, to pure information that can then be reorganized into vast interactive networks that operate much like complex ecosystems. In other words, it is the interconnected nature of digitalization technology that allows us to penetrate borders and 'blur the lines between the physical, digital, and biological spheres'. Digitalization's modus operandi is 'interconnectivity and network building'. That's what digitalization has been doing, with increasing sophistication, for several decades. This is what defines the very architecture of the Third Industrial Revolution. (n.p.)

Rifkin goes further, rejecting Schwab's argument that an overall rapid increase in the velocity, scope and systems' impact of new technologies implies a 4IR. He shows that it is the intrinsic interconnectedness of networked information technologies themselves, and the continuous, exponential decrease in digital technology costs, that produces changes in 'velocity, scope, and systems

impact', and that this has been going on now for some 30 years. It is a misconception that Schwab views this as a 'new revolution'.

Rifkin (2011) himself has a vision of a coming industrial revolution, or rather the coming to full fruition of the 3IR, in which society and the global economy are organised in a system of nodes, are laterally scaled and encourage 'distributed capitalism' – collaborative business practices that work most effectively in networks. Rifkin envisages the convergence of green energies with IoTs as the basis of this fundamental socioeconomic transformation. A shared *biosphere* becomes the global context of social, political and economic relations. His perspective is one of the radical restructuring of capitalism, in global human rights networks, into what is coming to be known as biosphere politics. No matter how one responds to this notion of change, the point presented in the current chapter is that Schwab did not need this on the table at Davos in 2016, in his move to shore up the flagging, established global economic order.

The 2016 Davos coup

In the face of the serious possibility that the 4IR is nothing more than a myth, Schwab pulled off a remarkable achievement at the 2016 WEF. Perhaps, the important lesson to be learned from this is that the most effective communication strategy by far, is to draw world leaders together in lavish and convivial surroundings, give them a free book and send them back home with a formula that will convince their subjects, constituents, customers or clients that we are on the brink of a brand new world. From then onwards, the notion that an unprecedented industrial revolution is upon us has become ubiquitous in social, political and economic discourse around the world. In every sphere of life, not least education, the question that is on everyone's lips is, how can we make sure that we are prepared for the 4IR?

The 2016 Davos formula is now well established. For the most part, it operates tacitly, despite its obvious replication by hundreds of enthusiasts to narrate and reiterate the '4IR'. Box 6.1 sets out this metaphorical *frame* – symbolic representations and cognitive heuristics that constitute the 'common sense' of a political and socio-economic system (Lakoff & Johnson 1980:236) – which I have distilled from numerous Web resources and academic texts.

Schwab himself established the standard:

- 'The 4IR is unlike anything humankind has experienced before. […] think about *the staggering confluence of emerging technology* breakthroughs, covering wide-ranging fields such as artificial intelligence (AI), robotics, the IoTs, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing, to name a few. […] they build on and amplify each other in a fusion of technologies across

BOX 6.1: The ideological frame of Klaus Schwab's Fourth Industrial Revolution.

1. List between 7 and 15 technologies, mostly digital, that sound smart, make us feel outdated and leave us in awe of the future. Even if they are not 21st century innovations, declare them so.
2. Declare that there is amazing, unprecedented convergence between these technologies.
3. Suggest that they produce changes that will disrupt and transform every part of our lives.
4. Appeal to each of the previous industrial revolutions as an exemplar of the current one.
5. Together, these moves will establish your authority in the matter of the 4IR. If possible, in relation to point 4, name one or two core technologies or energy sources in the previous industrial revolutions. Proven suggestions are the steam engine for the 1IR; the internal combustion engine, petrol and/or electricity for the 2IR; and computers, smart phones and/or nuclear energy for the 3IR (you would have mentioned the Internet in point 1, so try to avoid that here).

Source: Moll (2021b).

> the physical, digital and biological worlds. […] I am convinced that the 4IR will be as powerful, impactful and historically important as the previous three'. (Schwab 2016:7, 13; [*author's added emphasis*])

Other advocates of the 4IR replicate the message quite closely:

- The 4IR is 'the current that blurs the lines between the physical, digital and biological spheres through AI, automation, biotechnology, nanotechnology and communication technologies […] contrary to the earlier industrial revolutions, 4IR is based not on a single technology, but on the confluence of multiple developments and technologies' (Marwala 2020n.p.).
- According to McGinnis (2020n.p.), it is a 'fusion of advances in artificial intelligence, robotics, the IoT, 3D printing, genetic engineering, quantum computing, and other technologies […] this perfect storm of technologies […] is paving the way for transformative changes in the way we live and radically disrupting almost every business sector. It's all happening at an unprecedented, whirlwind pace. Whilst it is set to change society like never before, it builds on foundations laid by the first three industrial revolutions'.
- 'The 4IR – characterised by the fusion of the digital, biological, and physical worlds, as well as the growing utilisation of new technologies such as AI, cloud computing, robotics, 3D printing, the IoT, and advanced wireless technologies – has ushered in a new era of economic disruption with uncertain socio-economic consequences for Africa. […] However, Africa has been left behind during the past industrial revolutions. Will this time be different?' (Ndung'u & Signé 2020n.p.).
- 'The 4IR is a visionary plan for countries around the world to adopt game-changing technologies like AI and robotics. Most importantly, the 4IR does not consider any of these technologies in isolation. Instead, it encompasses a fusion in which these high-powered tech tools integrate with our physical and biological worlds. Think ubiquitous computers, interconnected digital devices, intelligent robots, autonomous vehicles, gene editing, printing of

> organic matter and even brain enhancements. An effective way of understanding what the 4IR is about is to consider it in the context of the previous three industrial revolutions' (Getsmarter 2019n.p.).

The number of relays in the message chain goes on and on. The idea of the '4IR' is apparently hegemonic.

The myth of the Fourth Industrial Revolution

Gramsci taught us that most hegemonic ideologies turn out to be misleading myths. Despite the echoes of Schwab amongst the faithful, a careful historiographical analysis of the criteria for what counts as an industrial revolution shows us very clearly that there is no such phenomenon as a 4IR in contemporary times. The 1IR is regarded by historians as the archetypal industrial revolution. Historically, conceptually and methodologically, it provides us with the criteria that determine whether any historical epoch or series of events, real or imagined, can properly be considered to be an industrial revolution (Moll 2021a).

The 1IR (*c.* 1760 to 1850) was a fundamental socioeconomic transformation that was centred in British society, but ramified across the whole world. It was a complex ensemble of technological, economic, social and political changes, not just an emerging or merging of technologies. It was certainly not merely about technological innovation nor simply a technological 'revolution'. We call it a revolution because it transformed the whole of society, and therefore, historians give it multiple descriptions. Hobsbawm (1962) suggests that it was both a successful and a tragic transition from an agricultural to an industrial economy – successful at the level of industrial development, and tragic in its human consequences in factories and in cities. This analysis of the tension between the forces of production (technology) and social relations (the quality of life) is pivotal for understanding what an industrial revolution is. Technologically speaking, the core of the 1IR was the emergence of the factory and of large-scale manufacturing driven by machines (Allen 2009; Bythell 1983; Kennedy 1993). This encouraged technological innovation, famously in the transatlantic convergence of the cotton gin, the spinning mule, the mechanical loom and Watt's steam engine to radically increase the output of cotton textiles. The primary raw commodity of the 1IR was cotton, and the production of this commodity was maintained by a continual supply of slave labour from Africa to the Americas (Beckert 2014; Dattel 2009). Economically speaking, the 1IR marked the rise of capitalism, and the emergence of bourgeois society from the demise of feudal society (Bythell 1983; Deane 1965; Heaton 1965; Knox 1974; Reeve 1971). Socially, the formation of the working class was one of its distinctive social features (Hobsbawm 1962; Thompson 1963). Globally, it entrenched the early economic relations of colonialism. The three-faced Janus of the 1IR was the commodification of

Africans, the brutalisation of slaves in the American colonies and the immiseration of the working poor in Britain (Blackburn 1997; Bythell 1983; Williams 1944).

On the strength of this analysis, it is possible to derive an analytical framework relating to any putative industrial revolution. In order to be understood as an industrial revolution, the total ensemble of the economic, social and political changes that we are talking about must have at least all the substantial features in Figure 6.1.

To summarise the 1IR in these terms:

1. It had a technological dimension, in that it combined innovative machines, driven by steam power, to increase production dramatically.
2. It transformed the labour process, in that work was performed in factories by machines and not as handcraft.
3. It was responsible for the emergence of class relations on the factory floor.
4. It spawned large cities, with deep divisions between rich and poor within them.
5. It expanded the transatlantic slave trade dramatically.

In the context of this book, it is important to recognise that 'the first three industrial revolutions stripped Africa bare' (Moll 2020). From a decolonial African perspective, the 1IR was perhaps the most brutal slave economy

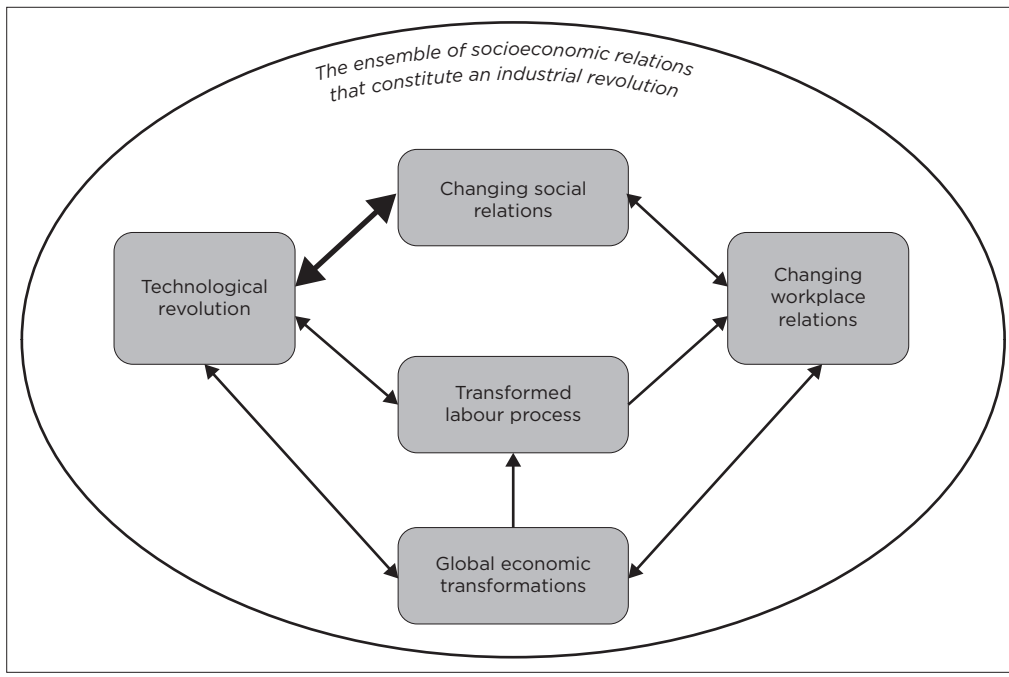

FIGURE 6.1: Analytical criteria for an era to count as an industrial revolution.

in history. The 2IR was about the systematised colonial conquest and domination of the continent in the so-called 'scramble' for Africa. And the worst traditions of slavery and colonialism are now perpetuated in the severe exploitation of the countries of the global south. They either become increasingly marginalised, or they become the labour reservoirs for the offshoring and outsourcing practices of multinational corporations. One of the main reasons for rejecting the notion that there is a 4IR is that the patterns of neocolonial exploitation of the 3IR have deepened in the current era, not least because of the rapid consolidation of the global digital economy (Moll 2020, 2021a). I shall return to this issue in the next section.

There is no Fourth Industrial Revolution

One of the major problems with Klaus Schwab's putative 'Fourth Industrial Revolution' is that it does not even meet the technological revolution criterion (Moll 2021a). Historically speaking, it is a damp squib. Below, I establish this by examining the technologies that seem most frequently to be proclaimed as pivotal technological innovations of the 4IR: AI, machine learning, robotics, the IoTs, big data and 3D printing:

- It is somewhat misleading to think of *AI* as technology. Artificial intelligence is a field of knowledge and research that seeks to conceive and sometimes build artificial animals and humans, to try to answer questions, such as 'can a machine think?' and 'can a machine act like a human being?' However, it is not the technology as such that interests AI researchers, but rather the 'virtual machine' that runs inside it. A 'piece' of AI is the mental model of an information-processing system that a programmer has in mind when writing a program that could run inside a machine (Boden 2016:4). Artificial intelligence is not technology *per se* but some of the knowledge it produces is applied in various technology fields, including computer design and robotics. It is very much of the 3IR, having commenced with the advent of modern high-speed digital computers in the 1950s (McCarthy et al. 1955; Turing 1950). Recognising that AI is a scientific field that has progressed rapidly in the past three decades still does not warrant the claim of a fourth technological 'revolution'.
- *Robotics,* the development of computerised machines that replicate human action, is prominent in science fiction-like images of a 4IR. Mostly, it relates to automation, which is the displacement of human workers by robots in manufacturing, and has technological roots way back in 3IR. The first digitally programmed robot was installed in a factory in 1961 to lift and stack hot metal (Engelberger 1985:7), and robot technology has progressed steadily since then. By 2018, China had an estimated 154 000 industrial robots, Japan 55 000 and the United States of America some 40 000, mostly in the motor and electronics industries (IFR 2019). Robotics merged in a significant way with machine learning during the course of the

last century. This does not mean that machine learning is all about robots, and many robots (like those on motorcar assembly lines) are not learners. Chatbots are the most ubiquitous robot technology today; however, they (their apparently female human voices 'inside' our cell phones notwithstanding) are only the latest phase in the evolution of natural language processing dating back to the 1960s.

- *Machine learning* refers to the ability of computers to learn and act automatically as humans do without explicit programming. Deep learning, an evolution of machine learning, creates an 'artificial neural network' that can learn and make decisions on its own. These developments date back to the 1950s, when Samuel coined the term 'machine learning' to describe his computer programme that could play checkers. By 1997, 'Deep Blue', an IBM computer, defeated the world chess champion. The confluence of robotics and machine learning started to take shape in the 1980s (Apolloni et al. 2005; Kuipers 2008; Van de Velde 1993). Early learning robots that could 'learn for themselves what is best for them, without their designers having to figure if all out beforehand', had been developed by the 1990s (Van de Velde 1993:1).
- An IoT consists of networked mechanical and digital devices with the ability to transfer data amongst themselves without any human intervention. It sounds revolutionary, but the technology is not new. The core technologies of the IoT are the Internet, which originated in 1969, and the analogue or digital converters of the 1960s (Kester 2005), which link mechanical devices via sensors and actuators into the IoT. In the 2020s, it is clear that IoTs can radically beef up businesses and governments by networking things like transportation, security, energy conservation and urban waste management, but their technology is definitively that of the 3IR.
- *Big Data* storage is also based on 3IR technology. As one commentator puts it, 'it would be nice to think that each new innovation in data management is a fresh start and disconnected from the past. However [...] most new stages or waves of data management build on their predecessors. [...] The data management waves over the past five decades have culminated in where we are today: the initiation of the big data era' (Hurwitz et al. 2013:10–11). The history of the emergence of 'data' as storage and analytics makes it quite clear that the ongoing emergence of what we now term 'big data' is a technology of the 3IR.
- *3D Printing* commenced in the 1980s and was well established in its present form by the 1990s. Also known as additive manufacturing, it can be described as the structured fabrication of an object, in that it lays down successive, multiple strata of a polymer material to construct a final product, guided by a computer model. Various iterations of 3D printing – stereolithography and laser sintering in the mid-1980s, and fused deposition modelling in 1989 – brought 'desktop 3D printing' into everyday commercial use in the 1990s.

The conclusion from these preceding discussions of supposed '4IR' technologies is clear. None of them is a radical, ground-breaking invention of contemporary times. All of them were, and are, gradual evolutions of technology rooted back into the defining technological transformations of the 3IR. To be fair, many of the prophets of the '4IR' make the point that it is not so much separate technologies in their own right that constitute a technological revolution, but rather the unprecedented converging of technologies. Therefore, Marwala (2020), for example, said, 'contrary to the earlier industrial revolutions, 4IR is based not on a single technology, but on the confluence of multiple developments and technologies'. This misconception needs to be gotten out of the way: he is simply wrong when he suggests that each of the earlier industrial revolutions was based on a single technology. Firstly, the *transatlantic convergence* of the cotton gin, the spinning mule, the mechanical loom *and* Watt's steam engine constituted the revolutionary technological aspect of the 1IR. Secondly, the *systematically planned convergence of technologies* was essential to the distinctive assembly lines of the 2IR factory (Jevons 1931; Schön 2007). Thirdly, the Internet was, if anything, *the technology of the convergence of technologies* that brought about the fusion of multiple digitised technologies in the 3IR. Now we need to ask, is there a similar grand convergence of technologies in contemporary times, even if the technologies themselves are pretty much of the 3IR?

The answer seems to be no. It is a truism that technologies do converge at many points in time and in any era. In the 3IR, there is no doubt that many of the digital convergences of the time have been, and continue to be, revolutionary when considered against the 'industrial age' of the 2IR. The placing of machine learning technology in robots, or the digitised Internet connection of cell phones to the world wide web and big databases, were not isolated incidents of convergence. They were defining aspects, amongst thousands of others, of a socioeconomically pervasive transformation of society that we have no problem thinking about as a technological revolution. There are, indeed, isolated achievements in contemporary times that give us a glimpse beyond the 3IR, such as the bionic hand, which translates electrical impulses from the human nervous system into digital information that allows a person to control and use her robotic hand (Wits University 2019). However, cases like this are exceptions that prove the rule. There is sparse evidence of a contemporary, widespread, socially pervasive, 'grand' convergence of new technologies that transcends the digital revolution in some way. Most of the proclaimed 'technologies of the 4IR' and significant convergences between them turn out to be phenomena of the 3IR (Moll 2021a).

Furthermore, we have not even got to all the other social transformations that would constitute an industrial revolution. To go back to the pivotal tension between the forces of production (technology) and social relations (the quality of life), it seems clear that '4IR' talk contradicts itself when it comes to

the notion that contemporary society is changing radically. One point to emphasise here is that this is even more plainly true in the immediate context of the global COVID-19 pandemic. There are many who celebrate the arrival of the 4IR because of 'the new normal' of online conferencing, online learning, data-driven health management, Trump-like attacks on 'big tech' amongst COVID denialists, and the like. However, these phenomena have actually confirmed the stark reality that there is nothing like the deep transformations of the labour process, labour relations, social life and international economic relations that we would expect to find if we were living in a '4IR' (Figure 6.1). The social context of the world is still that of the 3IR, and not much change is in sight. These realities are about continuing globalisation, and the tensions between those who drive it and benefit from it, and those who are marginalised by it and often resist it.

The automation of factory and office work in the 3IR started in the 1980s. It led to the 'hollowing out of work' in industrialised countries: at the top are highly skilled, very highly paid jobs that steer the networked digital economy; at the bottom are the unstable, low-wage, low-skills jobs, and in the middle is the systematic demise of midlevel, middle-wage, 'blue collar' jobs. In the Organization for Economic Cooperation and Development (OECD) countries, from about 1985 to 1995, between one-third and half of the labour force comprised temporary staff (Carnoy & Castells 2001). This phenomenon continues, with the growth of wealthy elites and deepening poverty internationally. The proportion of middle-skill jobs has dropped from 42% in 2000 to 32%. Whilst employment in services is likely to increase concomitantly, this will be largely 'lower-quality and precarious jobs' (OECD 2019a:3). The pattern is similar in South Africa, with less than one-third of the workforce in mid-skill jobs (OECD 2019b), with about 30% of these are increasingly automatable (le Roux 2018). The fracturing of occupational identities associated with transient workplaces of the 3IR continues.

Castells' (1999) 'double-edged sword' of the 3IR – economic prosperity on the one hand, rising urban poverty, inequality and environmental degradation on the other – is relentless. In cities, the 'urbanized hierarchies' of the 1970s (Castells 2000:xxxiii; Hall 2014) continue to be entrenched as 'suburbs have been re-sorted into a wide array on the basis of class and race' (Nijman & Wei 2020:2). Widespread disillusionment with this growing inequality threatens the basic legitimacy of political systems. There is a general consensus amongst analysts, for example, that this deep social crisis explains the support for Trump and Brexit witnessed in recent times (Fraser 2016:281). The 3IR's contradictory patterns of social life continue, with various expressions of nationalism, fundamentalism and chauvinism clashing (or sometimes cohering) with various expressions of group identity, internationalism, diversity and global solidarity.

Globally, the 3IR patterns of the marginalisation of the South continue. From the 1970s, the globalised information economy allowed, indeed, compelled 'multinational' corporations to trade outside national borders in order to maximise profit and reduce costs of production by offshoring and outsourcing. So low-skill assembly operations were migrated to Mexico and Asia, whilst garment 'sweatshops' were set up in India, Bangladesh and Honduras. By 1990, not only manufacturing but services, such as software programming, call centres and database administration were regularly being outsourced to underdeveloped countries. All contemporary evidence of offshoring and foreign outsourcing suggest a deepening of the exploitative patterns of the 3IR, which is likely to continue for some time into the future (ILO 2019). Ethiopia, for example, the 30th poorest country in the world (Ventura 2021), is forced to provide the cheapest labour in the world in order to compete in the offshoring market (Barrett & Baumann-Pauly 2019). African countries are increasingly becoming what are euphemistically called offshoring 'destinations of choice' (Moll 2021a:28–29). Whether it be by offshoring or outsourcing to 'low wage' counties, outsourcing to the cloud or onshoring back to fully digitised factories, Africa and other countries of the South bear the brunt of contemporary neocolonial exploitation.

There is nothing like another industrial revolution taking place beyond the third, if you consider the five analytical criteria established earlier. Schwab's brave new world simply does not exist.

The alleged Fourth Industrial Revolution in education

Needless to say, however, the Schwab messaging mythology permeates into education, as mechanically (or electromechanically, if you prefer) as elsewhere. Thus, we are told things like the following equivalent examples, amongst many. Marr (2019) says:

> The 4th Industrial Revolution will dramatically change the way we relate to one another, live, work, and educate our children. These shifts are enabled by smart technologies, including artificial intelligence, big data, augmented reality, blockchain, the Internet of Things, and automation. These technologies are disrupting every industry across the world at unprecedented speed. For our children to be prepared to engage in a world alongside smart machines, they will need to be educated differently than in the past. (n.p.)

According to Khathu (2019):

> The 4IR builds on the third revolution but combines multiple technologies from the digital, physical and biological worlds. The two were preceded by the 1IR, which saw the invention of the steam engine, and by the Second Industrial Revolution, which saw the invention of the internal combustion engine. [...] operating in the current industrial revolution requires higher education levels and cognitive skills.

> If the 4IR is really to deliver [...] South Africa has to rapidly and immediately change its education focus and delivery model to be responsive. (n.p.)

Such claims locate us back in the ideological framing of an alleged 4IR, and we are asked to think about education in those terms. A dramatic new educational revolution has somehow arrived, although from a teacher's point of view, it not clear at all what this means. We sometimes resort to the set of platitudes styled as '21st century skills' (Trilling & Fadel 2009), such as critical thinking, problem-solving, collaboration, creativity, innovation (Trilling & Fadel 2009:50–56), flexibility, productivity, initiative, cross-cultural interaction, accountability (Trilling & Fadel 2009:75–84) and digital literacy (Trilling & Fadel 2009:65–68), which are supposedly connected to the current revolution. We do this despite the fact that these skills (with the exception of the last, for obvious reasons) have been part of injunctions to improve organised education since it first began (Bloom 1956; Brookfield 1987; Bruner 1973; Dewey 1933; Ennis 1962; Owen 1824; Sumner & Keller 1940). Even digital literacy skills were invoked in these terms well inside the previous millennium of the 3IR (Crook 1994; Papert 1980). None of the talk about 21st-century skills particularly help teachers to understand what a distinctive 4IR could possibly be; instead, coupling the two ideas reinforces the mythology of both.

It is instructive in this regard to go back to the dispute between Schwab and Rifkin, and what they themselves have to say about classroom teaching and learning. As one might expect, Schwab puts forward a technocratic account of pedagogic imperatives, including a notion that the use of ICTs in teaching is necessary to the resolution of contemporary, global educational crises. On the other hand, Rifkin adopts an egalitarian view of education, envisaging an important background role for ICTs in classrooms and schools, in enhancing a 'human ecology' agenda. Notably, he looks to teacher training that envisages a future 'green industrial revolution' quite different from the putative 4IR of the present.

Schwab (2018) commenced his discussion of classroom teaching by claiming that education systems have become disconnected from the *competences* that young people in school, as an emerging 'global work force', need to function in today's labour markets. For him, of course, that means 'knowledge work', the high-level skills, expertise and knowledge required to coordinate geographically dispersed networks of economic activities, which cannot be substituted by technology. Therefore, the two critical elements of a transformed curriculum must be, 'the ability to engage with and use technology' and the 'understanding of technological change' (Schwab 2018:xv). Authentic learning for the 4IR can thus be achieved using IT to model and amplify learning. Schwab seems to be suggesting that something like 'blended learning' is non-negotiable in today's schools. Teaching should be conducted through the 'strategic integration of personal coaching and digital

learning [in order to] provide both the technological and human-centred skills necessary to thrive in the 4IR' (Schwab 2018:xvi). Pulling the strands of his argument together, it appears that the use of ICTs *as the primary medium* in teaching is deemed necessary. Not only will this ensure procedural learning of sophisticated ICT competences but also it will allow schools to produce the desperately required, skilled, ICT-savvy operatives required by a global economy in which they are currently in short supply.

Another theme in Schwab (2018) is the notion that a 'flexible mind' should be developed in and around engagement with ICTs in the classroom (akin to the '21st-century skills' notion discussed earlier). Schwab calls for an approach to teaching that develops leadership skills, EI, critical thinking and allows pupils 'from drastically different parts of the world to collaborate on projects' – presumably through PBL in online learning environments. In an interesting perspective, he considers this kind of technology-centred learning to be 'the development of resilience' to thrive in a digital economy. Schwab also makes a very strange assertion in discussing the teaching of these 'profoundly human skills' along with technological know-how: he concludes that 'the future of education content is thus neither wholly digital nor wholly human but a hybrid of both' (Schwab 2018:xvi). It seems that he has taken his belief in the radical convergence of technologies to its extreme, and that Ray Kurzweil's (2005) *singularity* (the time when all intelligent machines will merge with each other, and with human intelligence) is already here.

Turning now to Rifkin's (2013) conception of teaching and learning, it is clear that his view of the role of a teacher differs completely from that of Schwab. He also commences by claiming that the traditional educational model is out of touch with the demands of the industrial revolution that is coming to fruition. In the contemporary, globally connected world, he argues, 'the primary mission of education is to prepare students to think and act as part of a *shared biosphere*'. It is a mission in which (Rifkin 2013):

> [*T*]eachers [*instruct*] students, from the earliest ages [...] that every activity they engage in – the food they eat, the clothes they wear, the car their family drives, the electricity they use – leaves an ecological footprint that affects the well-being of other human beings and other creatures on earth. (p. 119)

Rifkin envisages *lateral learning environments*, in which the connections made in the pursuit of knowledge and understanding follow the horizontally distributed, laterally scaled structure of the Internet. He wants to see teachers facilitating 'virtual global classrooms' and community-based service learning that will 'break through conventional classroom walls, making education a more expansive and inclusive experience'. This is a challenge to a conventional classroom, and Rifkin conceives the new learning environment as a Web-enabled space of 'distributed and collaborative' educational experiences, resting on the idea of the socially shared epistemology of a human ecological

system, the biosphere. Rifkin's notion, which as noted is *also technology-centred but not technocratic*, is that we are seeing the emergence of 'distributed capitalism' in the convergence of IoTs and green energies. He suggests that the distributed and collaborative learning of the Internet will prepare the workforce of the 21st century for the ultimate 3IR economy that operates in similar, laterally connected and scaled, sets of relationships (Rifkin 2013:119).

In summary, Schwab offers an account of the imperatives of classroom pedagogy that is technocratic, in the sense that its entire curricular logic is about learning to work 4IR technologies. Good teaching involves authentic, direct instruction in the use of and understanding of digital information technologies, one might say on a 'just-in-case' basis. It also involves developing the 'soft skills' of communication and people management around and through computers. On this account, teachers must above all else be trained to deliver learning in a flexible way using digital technology. In contrast, Rifkin envisages an important background role for ICTs in classrooms and schools, in that the laterally scaled learning environment is directly enabled by the lateral information structures of the Internet. However, the learning of procedural skills in this environment would be incidental, acquired on a 'just-in-time' basis, as learners collaborate in exploring and constructing a shared biosphere. In learning to facilitate such collaborative enquiry, student teachers themselves acquire the necessary technological skills vicariously. Notably, both perspectives about teaching and teacher education are *technology-centred*.

Now, it takes only a moment to realise that in the sphere of education, notions very similar to those of Schwab hold sway. Parents worry, is my child prepared for the 4IR? Teachers ask, am I teaching the right knowledge and skills required by the 4IR? Education authorities ponder 4IR curriculum changes. Governments declare policies that establish 'paperless' 4IR classrooms or online learning as best practice in teaching and learning. Universities restructure their curricula in response to 4IR labour markets (Kupe 2019). And in teacher education, the notion that we are preparing teachers for the 4IR becomes increasingly hegemonic, mirroring the 4IR talk that permeates the rest of society.

The Afro Global Episteme (AGE) proposed by Maringe and Chiramba in Chapter 10 seems to me to have affinities with Rifkin's notion that green energy sources merged with IoTs can produce some fundamental socioeconomic transformation. In this, it too is opposed to the technicism of Schwab, in both ideological and educational terms. Perhaps AGE can also overcome the technology-centredness of Rifkin, in some form of laterally scaled knowledge production and educational systems that are emergent from this continent and its scholarship?

Conclusion: Where to, teacher education?

As I wrote this chapter, and the argument became more systematised, I found myself thinking, so must I choose between Schwab and Rifkin? Now that I am arguing that the '4IR' is an ill-conceived myth, a hegemonic ideology that arose because the elites in Davos needed to restore optimism that globalisation could be a positive force for change in the face of the 'wave of anti-technological modernisation and anti-globalisation sweeping through the traditional West' (Muller 2017:17), do I need to go for Rifkin's account of education in the 3IR?

My immediate response was that neither option is desirable. The contrasting pedagogies encouraged by Schwab and Rifkin have passed us many times before – they seem to set up a version of the dichotomy between *programmed instruction* and *postmodernist critical pedagogy*. Programmed instruction is objectives-driven, and it requires a teacher to sequence instructional inputs towards clearly defined performance outcomes. Schwab's performance outcomes, which he calls *competences*, are 'the ability to engage with and use technology' and 'understanding of technological change', and to achieve them, 'teachers must work in tandem with technology' (Schwab 2018). For B.F. Skinner, a teaching machine presents carefully programmed material, 'in which one problem can depend upon the answer to the preceding problem and where, therefore, the most efficient progress to an eventually complex repertoire can be made' (Skinner 1968:24). The echo of Skinner in Schwab (2018:xvi) is deafening: 'technology makes it possible to synthesise and analyse data to tailor pedagogy to individual student needs and provide feedback in real time'. Postmodernist critical pedagogy, however, conceives the classroom as an 'ecological and holistic' learning space consisting of a network of relationships of mutual care and respect. It collapses the distinction between a teacher and student, instead viewing them as 'co-equal' participants in a web of learning that stretches locally, regionally and globally (Shrewsbury 1987:6). Rifkin's version is that the learning classroom is an intimate part of the biosphere and is a horizontally distributed, cooperative space of discovery learning enabled by the Internet (Rifkin 2013:119). In e-learning, the correlate is *connectivism*, Siemens' (2005) 'learning theory for the digital age'. His idea is that 'learning is the network' – it is distributed across body, machine and the networked society, and is collaborative. It is 'co-constructed' activity made possible by the Web, in which collaborative interactions with and through computers encourage critical discussions and the negotiation of knowledge (Crook 1994), or in Rifkin's terms, the construction of a socially shared human ecology (Rifkin 2013:119).

These views are two sides of the same coin. In behaviourist-inspired, programmed instruction, the teacher is a manager of reinforcement contingencies. In postmodernist critical pedagogy, the teacher is conceived

as something like a manager of a collaborative learning environment. From neither perspective, is he or she an instructor, facilitator or mediator, as the cognitive theories would have it. There is also no interest in either perspective in the developing mind of the learner. For behaviourism, it is a 'ghost in a machine'. For postmodernism, it is 'a comforting story or "narrative of the self" [...] the fully unified, completed, secure and coherent identity is a fantasy' (Hall 1992:277). It has always been deeply ironical that both behaviourism and postmodernism will not consider learning as internal operations, as developing states of mind.

Schwab and Rifkin provide us a remarkable insight as to why this is the case. Both of their espoused pedagogies are *technology-centred.* In Schwab's case, the imperative is to produce technological competences, assessed and demonstrated procedures and skills. The 4IR project does not seem to need any broader, cognitive conception of learning to achieve its objectives. In Rifkin's case, learning is also technology-centred, in that it is participation in laterally scaled knowledge networks on the Web. However, this means that there is no deliberate instruction by a teacher to ensure that any particular learner will acquire depth in understanding concepts. Horizontally distributed, web-enabled learning entails both the greatest strength and the greatest weakness of e-learning, captured in the maxim, 'the Internet is a mile wide and an inch deep'.

Now, the main issue that arises here is school learning and academic learning consist mainly of the study of subjects, disciplines or knowledge fields characterised primarily by not only vertical discourse structures. They also (at higher levels of abstraction) horizontal, or 'multidisciplinary', connections between them. As long as we set up learning environments that are only about the lateral exploration and discovery of knowledge, as Rifkin wants to do, we will not have the means as teacher educators to develop depth in our students. And as long as we confine ourselves to the achievement of demonstrated, technological competences, as Schwab wants to do, we will never get our emerging teachers to engage with knowledge at the levels of depth and abstraction that will enable them to teach their own pupils more than just procedures or shallow conversations.

It is, therefore, increasingly evident that it is a mistake to think about teacher education from within an 'industrial revolution' framework of any kind. In relation to the overall theme of this book, the bottom-line conclusion here is that Schwab's insistence that the only modalities of teaching that are legitimate in the 4IR are those that employ ICTs as a medium is a dangerous starting point for thinking about teacher education. The idea of the '4IR' imposes a technicist conception of pedagogy on us. By this I mean that it reduces the boundaries of curriculum, teaching and learning to a focus on the use of IT in any context of knowledge or activity, and to an understanding the

nature of IT itself – it does not simply mean the training of technical computer skills. Nonetheless, this narrowing of focus is problematic. Because the discourse of the '4IR' is hegemonic, it often translates into the unquestioned assumption that all teacher education courses *must* be characterised by the primary use of digital technologies in finding and communicating *information.* The expansive notion of 'the pedagogic integration of ICTs' is reduced to the (compulsory) notion of the use in pedagogy of ICTs. The ideology lurks in the corridors of different departments in a school of education, and many teacher educators hope secretly that the use of PowerPoints in their lectures will get them by.

Why do I suggest that the notion of the pedagogic integration of ICT is expansive? Instead of thinking about teacher education as the realisation of the 4IR in the classrooms of the teachers that we teach, we need to think about teacher education as incorporating the *affordances* of ICTs in the teaching strategies that are important for any teacher to adopt in a specific knowledge domain. The starting point should be about how our students learn to teach a body of knowledge; it should not be about how ICTs sit at the centre of any kind of industrial revolution (whether it be the extant 3IR or the mythical 4IR). When we get rid of the ideology of the '4IR', then we can turn all of this on its head and ask the much more productive question, how can the integration of ICTs add pedagogic value to our current practices as teacher educators, and to those of our students when they go out to work in their own classrooms? There is no doubt that it can.

If it is able to transcend *all* industrial revolution discourses in teacher education, focused as they are in the technological rationality of the West, then, as mentioned by Maringe and Chiramba in the last sentence of this book, 'decolonisation can indeed provide the checks and balances required to moderate runaway ideologies such as the 4IR'.

Section 2

Decolonisation and teacher education in South Africa

Chapter 7

From colonisation to self-colonisation: Efficacy of translanguaging as a socially just decolonising pedagogy

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Abstract

Throughout the history of mankind, language has been used as a tool of ascendance and colonisation to consolidate power and create governable subjects. During the colonial era, white minority governments have wielded language policy in education as an instrument of political manoeuvring, which is key to the transformation agenda of Africa, in general, and South Africa, in particular. Upon attaining political independence, African nation states embarked on educational reforms by revising their curricula in the name of 'decolonising education'. Decolonisation of education should entail the incorporation of epistemic perspectives, knowledge, thinking and languages from the African continent. A closer look at the curricula of African countries shows that they are still largely Eurocentric following the monolingual ideology

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of 'one nation, one language', with foreign languages being the lingua franca for these multilingual societies. Whilst the recognition of the 12 official languages was hailed as a victory for the constitutional rights of speakers of African languages, this has not translated into something tangible in the education sector where the instructional language still hinders effective education. This chapter argues that monolingual pedagogy in HE reduces some tertiary students to speechless and underperform academically because of their low proficiency in the instructional language, and thus, advocates for translanguaging, a term with the potential to end our self-colonisation by decolonising our perception of language and linguistic practices in HE.

Introduction

Regarding language, the 'choice and use of language are central to people's definition of themselves concerning the whole world' (wa Thiong'o 1986:1). That explains why it is continuously at the centre of several competing societal forces in post-colonial Africa, particularly in educational advancement (wa Thiong'o 1986). Many post-colonial authorities suggest that the settler practice of imposing their languages onto the colonised to the extent of even prohibiting the use of native languages has serious ramifications on the people's true freedom and constitutionalism (Lovesey 2012). Thus, in *Decolonising the Mind*, Ngũgĩ wa Thiong'o views language as the enabling condition of human consciousness, advancement and freedom, thereby advocating linguistic decolonisation in education (wa Thiong'o 1993).

With regards to post-colonial studies, language has become a 'weapon and a site of intense neocolonial conflict' (Margulis 2014:1; Maringe 2013). Ngũgĩ views monolingual education as a tool of oppression to prevail social order in societies, which promotes colonialism or imperialism, and argues for the break-free from the English-only monolingual approach implemented in education. Ngũgĩ advocates for multilingual education that places students' languages in the centre, as this 'illuminates the spirit of people and promotes their areas for development' (wa Thiong'o 1972:439). Ngũgĩ seeks for this decolonisation from the English-only instructional approach, which he views as an oppressive tool from the West through education and culture being implemented through two processes, namely, socialisation, which allows the youth to partake and become knowledgeable within systems of production and then through imparting two relations or struggles considered man versus man and man versus nature, which are characterised by harmony and conflict (wa Thiong'o 1981:4). These processes result in one of two consciousness situations: slavery consciousness, which denies the former colonies of their mother tongue, making them believe that they have no history or 'liberated consciousness' being fully aware of colonialism at play and seeking liberation (wa Thiong'o 1981:6).

Whilst working with illiterate farm labourers in Brazil, one of the world's greatest philosophers whose work on decolonisation was hugely influenced by existentialism, Paulo Freire held the experiential conviction that people should not be defined by their past. Rather they should draw lessons from it to determine their future and create human values instead of blindly following some pre-established and unquestioned norms of existence (Freire 2014). In his pedagogical model of *Critical Pedagogy*, he suggests that true decolonisation in the classroom can only be realised when both the educator and the student acknowledge each other's different experiences and expertise they bring into the classroom and view them as instructional resources. In this process of *conscientização,* the most important academic resources to be brought into the classroom are linked to one's cultural and linguistic experiences. Anything short of the recognition of a student's language is a perpetuation of colonisation (Freire 2007).

Over the past few years, decolonisation has received great attention by historians, post-colonialists, post-modernists and sociologists. As there is no single definition for decolonisation, in this chapter, it will be taken to refer to the undoing of colonialism and is rarely achieved through a single historical act but rather progresses through one or more stages of emancipation (Martin 2007). Decolonisation of the university curricula is essential for achieving cognitive justice as colonisation resulted in the decimation of the knowledge and languages of the colonised people (Le Grange 2015). Elements of decolonisation include 'deconstruction and reconstruction; self-determination and social justice; internationalisation of indigenous experiences; and language' (Le Grange 2015:3). Whilst many South Africans celebrate decolonisation in the name of freedom, peace and justice (Srhir 2020), others question the extent to which basic human rights have been realised, especially with regards to the medium of instruction in most South African multilingual institutions of education where language use in education has a complicated history, which has affected different demographic groupings distinctively (Maringe 2013; Rothermund 2006).

South African legislatorial guidelines on HE advocate responsive pedagogical strategies to language use that embrace and make use of African languages (Charamba 2020b). These legislative recommendations for multilingualism that advance the use of local South African languages in HE (Department of Higher Education and Training 2015; see also Mkhize & Ndimande-Hlongwa 2014):

> [*A*]re made in the South African Constitution (1996), the Higher Education Act (1997), the Language Policy for Higher Education (2002), the Report on the Development of Indigenous African Languages for Use as Mediums of Instruction at University (2003), the Report of the Ministerial Committee on Transformation and Social Cohesion and the Elimination of Discrimination in Public Higher Education Institutions (2008), the Charter for Humanities and Social Sciences (2011), and the White Paper on Post-Secondary School Education and Training. (p. 8)

Although the country's language legislation, policy frameworks and guidelines cited elsewhere in this chapter affirm the role of indigenous African languages, education in South Africa largely still follows a monolingual trajectory notwithstanding the multilingual nature of most of the country's classrooms (Charamba & Zano 2019).

This monoglossic language ideology, with its roots in the colonial era, does not value cultural and linguistic diversity in the classroom. It views languages as distinct entities spoken and taught at different times to keep them from polluting one another (García & Otheguy 2020). According to Statistics South Africa (2019), English which happens to be the 'home language of 9.6% of the country's population is the medium of instruction in more than 80% of the country's educational institutions' (Charamba 2020a: 1779). English dominance as the medium of instruction is still an important issue in post-apartheid South Africa, and the necessity to identify the undeniable reasons for this occurrence remains imperative as the country seems to be self-colonising in an attempt to decolonise education (Mkhize & Ndimande-Hlongwa 2014).

History of monolingual education in South Africa

South Africa is a multilingual country characterised by linguistic problems rooted in its policy of apartheid. On the one side, there are tensions between its two super-official language groups: Afrikaans and English (home language for about 19.7% of the country's population), whilst, on the other side, there are tensions between the ethnic Europeans and the black majority (Soudien 2011). This is most evident regarding the language of instruction in educational institutions. The battle for supremacy between English and South African languages can be traced back to the heart of the colonial history of the country (Maseko 2014). During the precolonial era, education, given in one's mother tongue, was integrated, embedded in the socialising of the youth with a focus of developing a competent and responsible adult. This form of education was structured in such a way that it introduced the apprentices to a 'wide range of social, cultural, economic, linguistic, medical, and other essential knowledge traditions' (Charamba 2021a:422). In order to facilitate this socialisation process, proficiency in a language was of paramount importance as it was the medium through which erudition was transmitted (Mkhize & Ndimande-Hlongwa 2014).

The original European settlers in South Africa spoke Dutch, which eventually evolved into Afrikaans. When the British gained control of the country 'in 1822 they proclaimed English as the lingua franca' (Cross & Ndofirepi 2017:3; Kaschula 2013; Maseko 2014). English was then considered to be the civilised language and spoken mostly by the upper classes. Because of its status, even the elite Dutch ended up using it in their everyday life, making it the language

of the government, schools, legal system and business (Fang, Caoa & Murray 2020). In 1925, the Afrikaners won the right to be taught in Afrikaans (Soudien 2011). Thirty years later a policy of teaching in both English and Afrikaans on a 50–50 basis was adopted by the colonial government. The introduction of Afrikaans alongside English in black South African schools is considered the immediate cause of the Soweto uprisings of 16 June 1976 that saw students protesting against the Afrikaans language as the medium of instruction (Kaschula 2013).

Even though the South African government has since then given the School Governing Bodies the prerogative to choose the language of instruction for their respective schools, about 80% still use the English language in their multilingual schools (Republic of South Africa 1996; Statistics South Africa 2019), thus solidifying the language's hegemony. This has resulted in most schools discouraging students and teachers from using any other language than English for instructional purposes (Zano & Phatudi 2019). Although this choice (by the School Governing Bodies) might pass the legal test, it has been proven by research to have negative academic effects on South African students (see, for example, Madiba 2014; Maseko 2014; Omidire 2019; Probyn 2019; Wolff 2018). In choosing the language of instruction, the Governing Bodies decide on behalf of the students. But is that the language students want to be taught through? Here, the power to choose lies in the hands of a few individuals, who by the way are not students.

The current practice in the country is that students are educated through their home language alongside English or Afrikaans from grade R till the third-grade. From the fourth-grade upwards, education follows a monolingual trend in which lessons are delivered in either English or Afrikaans language (Omidire 2019). This monolingual practice stretches into higher education where about 72% of the student population is black and only one in 20 completes their qualification in record time (Statistics South Africa 2017). In responding to this low throughput rate, the Council for HE (2015) lists the language of instruction as a major contributing factor calling for a radical overhaul of the HE curricula. According to Neville Alexander, a South African educationist, the use of English and Afrikaans languages disbenefits mostly black African students, resulting in what he refers to as neo-apartheid (Alexander 2005), a situation I call '*self-colonisation'* of a nation state.

Monolingualism and education: A global perspective

'A language for the world? A world of languages! The two concepts are not incompatible so long there is independence, equality, and democracy' (wa Thiong'o 1993:40). Statisticians from United Nations Educational Scientific and Cultural Organisation suggest that more than two-thirds of the world's

population can speak more than one language, and in the Global Education Monitoring (GEM 2016) report, it suggests that over 40% of the world's student population is not taught in a language they understand. The organisation's white paper titled, *'If you don't understand, how can you learn?*' released for the 2016 International Mother Language Day, points out that the pedagogical use of a language different from the student's home language affects their cognitive, literacy, psychological and emotional development (Charamba & Zano 2019).

In line with the GEM report, a body of recent research on the relationship between language and learning also suggests that the use of a single language of instruction (especially if that language is different from the students' home language) is the major contributor to students' academic underachievement (see, for example, García & Otheguy 2020; Olivares-Orellana 2020; Omidire 2019; Vallejo & Dooly 2020). This is because of the double-barrelled challenge the students are faced with (Iversen 2020). These students are expected to acquire academic knowledge through a decontextualised school language and must do this through English, a language they have often not yet fully mastered (Charamba 2019b; Cummins 2008).

When students do not have the required linguistic proficiency in the medium of instruction, this often hinders them from acquiring the desired knowledge, resulting in demotivation. Such students tend to lose interest in the learning area, thwarting and knowledge development (Olivares-Orellana 2020), as the written language found in academic contexts is often punctuated with high lexical density, abstraction and technicality (Cummins 2008; Zano & Phatudi 2019). Another body of recent research in education puts forward the notion that multilingual students who are allowed to use their linguistic repertoire as a learning resource develop a deeper understanding of concepts compared with students who are taught through a monolingual approach (García & Otheguy 2020; Hua, Li & Jankowicz-Pytel 2020; Vallejo & Dooly 2020).

A one-year ethnographic study by Poza (2019) shows better comprehension of concepts amongst fifth-grade students in America who were allowed to use their linguistic repertoire during lessons compared with when only one language was used for teaching and learning. The study puts forward the notion in the education space, multilinguals' language skills (considered an invaluable meaning-making tool) should be capitalised on. As a pedagogical strategy, translanguaging disrupts linguistic power structures and the philosophies of race, and nationhood (Poza 2019). In their study, Infante and Licona (2018) showed how multilingualism can be valuable in framing and supporting epistemological access across the curriculum in Mankato. The study shows better academic performance amongst students who were allowed to use multiple languages during academic activities. The researchers

urge teachers across the curriculum to acknowledge and accept multilingualism in their classrooms, as it also boosts students' self-esteem, confidence and sense of belonging (Iversen 2020).

Makonye (2019) undertook a quasi-experimental research study with two experimental and two control groups chosen from sixth-grade Mathematics students in Zimbabwe. The study shows a significant difference in the academic performance between students who were allowed to use multiple languages during educational activities and those who used the medium of instruction only. He also reports on reduced mathematical errors and misconceptions amongst students in the experimental groups compared with those in the control groups. Makonye posits multilingualism as an invaluable teaching or learning resource in the mathematics classroom. A similar study by Charamba and Zano (2019) compared the performance of 11th-grade Chemistry students in South Africa and also reported better performance amongst the students who used their entire linguistic repertoire than the monolingual (control) groups. The researchers advocate for multilingual pedagogy in education and argue that besides resulting in an improvement in students' academic performance, multilingualism is a humanising, decolonial act codified in national and international statutes.

In exploring the benefits of multilingualism across the curriculum, another study analysed (Torpsten 2018):

> [*C*]lassroom activities, texts, and pictures produced by 11-year-old students in a multilingual Swedish classroom and suggests the simultaneous use of multiple languages in the classroom leads to a broader and deeper knowledge of language and subjects compared to a monolingual approach. (p. 104)

Probyn (2019:216) also documented the successes shared by South African teachers who 'break the post-colonial monolingual ideologies prevalent in classrooms and engage with students' linguistic resources to provide access to both conceptual knowledge and English'. These studies suggest that in classrooms where teachers emphasise monolingual pedagogy, minority students have to try and acquire subject-specific knowledge through a language most have low proficiency in (Olivares-Orellana 2020), and this becomes a barrier to effective learning as subject-specific language and its vocabulary tend to get more complicated and disconnected from their observable contextual experiences (Hua et al. 2020).

This emanates from the findings of several sociolinguistic studies, which suggest that the communication level acquired at school with regards to an exotic language is not enough for the required Cognitive Academic Linguistic Proficiency (CALP; Cummins 2008; Wolff 2018). There is, therefore, an acute necessity to contrive alternate instructional strategies for our multicultural and multilingual institutions of learning that acknowledge and permit the contemporaneous use of languages in the classroom to ensure effective

tutelage (Vallejo & Dooly 2020). In these contexts, García (2017) views such learning situations, in which one strives to advance their knowledge acquisition by making use of all their language resources in the same lesson, as translanguaging practice.

Translanguaging as decolonising pedagogy in higher education

Although multilinguals have been using several languages simultaneously to communicate since time out of mind, as a focus of research, this concept (of simultaneous use of languages) came to the fore in the early 1980s when Cen Williams was investigating effectual approaches for teaching bilingual students by employing two languages in the same educational lesson (Charamba 2021a). He came up with the term '*trawsieithu*' (Li 2018), defining a process in which the bilingual students would read a text in one language and then write or discuss it in another. The term '*trawsieithu*' was later translated into the English language as '*translanguaging*' by Colin Baker (see Lewis, Jones & Baker 2012). This marked a paradigm shift in socio- and applied linguistics, drifting away from traditional linguistic terms, such as 'code-switching, and code-mixing, calling into question the existence of "languages" as identifiable, distinct systems' (Charamba 2021a:422; Makoni 2014).

Originally, translanguaging was viewed as the 'multiple discursive practices in which bilinguals engage to make sense of their bilingual worlds' (García 2009:45). Subsequent definitions of translanguaging rely on 'two key components: the notions of flexibility and repertoires' (Prada & Nikula 2018:2). Some definitions hinge on the philosophy of linguistic repertoire, a basic sociolinguistic idea alluding to the 'the totality of linguistic resources (i.e. including both invariant forms and variables) available to members of particular communities' (Gumperz & Hymes 1972:20) and including 'the totality of distinct language varieties, dialects and styles employed in a community' or by a speaker (Cook-Gumperz 1986:7; Prada & Nikula 2018:2). Considering this viewpoint, language is no longer a circumscribed, detached substance, entrenched in inactive communicational activities (Benson 2015). It becomes a 'portable tool allying with multimedia and multisensory signs' to excogitate meaning (Baoueb 2020:4; Mazzaferro 2018) breaking the imaginary and ideological divides between respective named languages.

In defining translanguaging, another scholar, Grosjean (2019), makes use of a sports analogy of hurdles, where two different athletic skills, high jump and sprinting, are simultaneously involved. Athletes make use of these skills as a unitary whole to succeed in their sport. This can be likened to the same way multilingual people make use of their linguistic skills to communicate effectively (García 2017). Translanguaging surpasses the 'linguistics of systems and speakers to linguistics of participation' (Li 2018:15). In their study,

Lasagabaster and García (2014) conceptualised translanguaging as a process by which multilingual speakers employ all their communicative resources to communicate and to make meaning of the world in which they live.

Translingual practice embraces 'going between and beyond linguistic systems and structures including different modalities such as speaking, writing, and signing' in or outside the classroom, enabling multilinguals to use their idiolect (Charamba 2021a:424; Mazzaferro 2018). Translanguaging is a theory that postulates that:

> [*R*]ather than possessing multiple autonomous language systems, as has been traditionally thought, all users of language, conveniently select and deploy particular features from a unitary linguistic repertoire to make meaning and to negotiate particular communicative contexts. (Iversen 2020; Vogel & García 2017:1)

The practice capitalises on fluid linguistic practices of multilingual students to learn deeply, whilst helping them to choose when and why to use certain linguistic features.

Translanguaging as a didactic approach presents both intellectual and sociological advantages: firstly, it optimises meaning-making and strengthens communication skills in the underdeveloped language by equilibrating the ranking of languages within the classroom (Charamba 2020b; Vogel & García 2017). On the flip side, it supports and promotes the relations and cooperation between home and school by advancing parental intervention in multilingual students' learning (Mazzaferro 2018). Even though different scholars have come up with different definitions of translanguaging, the intersection is that they all acknowledge that a multilingual speaker's communication mechanisms are conjoined associated with the same linguistic repository and facilitating students' learning in one way or the other (García & Otheguy 2020).

Caruso (2018) analysed linguistic practices in a Language and Communication policies course at the University of Algarve in Portugal, the student population of which comprised equal numbers of locals and Erasmus. The course instructor allowed their students to use their linguistic repertoires in asking questions, giving responses, during class and group discussions, and when writing to gain a total understanding of the concepts taught, which in most cases were in English language. The study reports on the benefits of translanguaging, which led to the co-creation of academic knowledge in a collaborative learning sphere (García & Li 2014). At the end of the course, the professor asked the students to take a structured multilingual final examination in three languages. The results show an improvement in the academic performance of the students when spaces for translingual practices are availed in HE (Srhir 2020). The study further suggests that the ever-evolving HE linguistic landscape calls for all universities to embrace translanguaging in social contexts, in which different cultural and linguistic groups coalesce for the betterment of society (Wolff 2018).

Zhang et al. (2020) made lecture observations in five Chinese universities in southern, central and northern China, and then interviewed the 43-course lecturers to gain an insight into their use of translanguaging pedagogy. The findings of their study revealed that translanguaging pedagogy was generally employed by all lecturers as they had noted great improvement in their students' acquisition of the English language and course-specific knowledge (Zhang et al. 2020). Literacy in the language of instruction is a key element of HE as learning and teaching are supported through a range of texts and genres for reference works, lecture handouts and research articles (Vogel & García 2017).

As HE becomes more widely available and more internationalised (Maringe 2013), the acceptance of translanguaging in HE opens up windows of opportunity for multilingual students to understand the universe by employing all linguistic resources at their disposal (Mendoza & Parba 2018; Ocampo 2018), and this is associated with transformation, social justice (Hurst & Mona 2017) and decolonisation essential for an efficient and productive HE (Palfreyman & Walt 2017). This is exemplified in Madiba's (2014) study of the simultaneous use of isiXhosa, Tshivenda and English by the science students of the University of Cape Town. The study illustrates how conceptual knowledge and English language acquisition are strengthened when multilingual students discuss concepts through the simultaneous use of languages. Madiba also suggests that translanguaging in HE can be used as an efficient teaching strategy to support discussion and a deeper understanding of concepts. He also points out that translanguaging puts all languages on the same pedestal by disregarding artificial language boundaries, promotes creativity and helps sustain heritage languages, which, if not used, are on the verge of extinction (Gilham & Fürstenau 2020).

Whilst HE has historically been seen as a monolingual space, the studies cited herein show that universities in the world are increasingly becoming translingual spaces that reflect the multilingual environments in which they exist (Carroll & Mazak 2016), and they can capitalise on this multilingualism. The studies highlight that translanguaging enables students to engage classmates through translanguaging and heteroglossia (Li & Lin 2019), endorses the 'simultaneous use of literacies and languages' to keep the academic tasks moving (Charamba 2019b:112; Probyn 2019) and improves the academic performance of students (Torpsten 2018).

Universities in South Africa, like else in the world, are enrolling large numbers of linguistically and culturally diverse students (Maringe 2013), necessitating the need for ending the English monolingualism by adopting multilingual pedagogy for effective learning, transformation and decolonisation (Hurst & Mona 2017). According to Statistics South Africa (2019), about 70% of the South African HE populace are black African students (who are either

bi- or multilingual), and the language of instruction for over 80% of these HEIs is English. This mismatch between the student demographics and the language of instruction presents ample justification to constructively align the two by recognising students' linguistic repertoire. Multilingualism is a policy orientation towards the formal recognition of multiple languages and includes all the non-standard varieties under postmodern notions of heteroglossia, which gives equal standing to all languages and dialects being spoken within a formalised system (García 2017; Palfreyman & Walt 2017; Poza 2019).

The perpetual use of a single language of instruction decades after democracy signifies an element of self-colonisation on the part of the country. The language policy for HE adopted by the government of South Africa in 2002 recommends multilingual pedagogy as a vehicle to enhance equity of access and progress in tertiary education. This contradicts apartheid HE legislations that left a heritage of disparity amongst races (Madiba 2014), preclusion and a trail of continual failure (Krulatz & Iversen 2019). Because of the linguistic landscape and the proficiency of some students in the English language, the academic value of translanguaging in HE teaching and learning contexts cannot be over-emphasised. Through translanguaging in education, South Africa can draw from what many other developing and developed countries do very successfully (Burgess & Rowsell 2020).

In some countries, translanguaging has been accepted as a legitimate, socially just pedagogical approach that facilitates the scaffolding of one communication mode by another and for meaning-making across the curricula (Burgess & Rowsell 2020). For example, in Asia, Europe and North America, students are taught in their home language (Wolff 2018). In these countries, students learn global languages, such as French and English, to prepare them for global communication later in life. Whilst in schools or universities, these global languages are used alongside students' linguistic repertoire in the classroom as a scaffold, thus enabling them to fully understand the complexness and usage of their linguistic repertoire and an exotic language (Cummins 2008; Wolff 2018). Through translanguaging, university students make use of a unitary meaning-making system, in which multiple discursive practices are employed to understand the multilingual world and to develop spaces conducive to the use of their entire semasiological and semiotic repertoire in the HE space (García & Otheguy 2020).

Using their entire linguistic repertoire, teachers and students, 'co-intent on reality, are both subjects, not only in the task of unveiling that reality and thereby coming to know it extensively but in the duty of re-invigorating that knowledge' (Charamba 2020a:24; Freire n.d.). As they 'attain this knowledge of reality through common reflection and action, they discover themselves as its permanent re-creators' (Freire 2007:23). Decolonisation of education has been a heated debate in South Africa since 1994 and was further fuelled by

the student protests #RhodesMustFall and #FeesMustFall of 2015, which saw university students demanding, amongst other things, a transformation of the sector from the colonised curriculum to an Africanised one that acknowledges relevance of their languages and culture in all institutions of higher learning (Le Grange 2016).

These university students' unrests in 2015 'precipitated a renewed interest in the decolonization' of South African HE, and by association, the decolonisation of the university curriculum (Le Grange 2016). The issue of decolonisation of the country's university curricula is a (Le Grange 2016):

> [*L*]ong overdue and crucial debate given that the Western model of academic organisation on which the South African university is based especially with regards to the language of instruction, remains grossly avoided or unchallenged. (p. 1)

Through translanguaging, languages historically segregated based on racial, cultural and linguistic disparity can conglomerate through fluid academic interactions and deepen multilingual students' comprehension of knowledge in different university courses (Charamba 2019b; Wedin 2020), as they are not seen as rigid or stabilised entities.

Rather, they are regularly moulded and (re)constructed depending on the context, purpose and audience. Translanguaging regards languaging not as an abstract system of rigid, pre-determined rules or regulations but rather as communicative practices and actions practised by multilinguals in spontaneous, affinitive and conversational ways (Gasca-Jiménez 2018). A research study on South African HE suggests that the sector is 'racial and class-based, the effect pointing that only 15% of the 60% of black students who survive first year eventually complete their university studies' (Le Grange 2016:1). These studies suggest that the university students who do not complete their studies come from an oppressive, ineffective public school system, and such students are disadvantaged in various ways: 'they are academically underprepared, financially hampered and for some the language and culture of the university is foreign' (Le Grange 2016:1). Several reasons have been raised to shoot down the introduction of translanguaging in HE.

I will address the most common two. At the top of the list are costs involved in material production and curriculum change. Currently, financial implications for such a programme in South Africa stands at less than 2% of the country's education budget and, if implemented, this amount is likely to be recovered in less than 5 years from the date of implementation (Seekings 2011). Another sect of the education fraternity feels African languages are simply not fit for use at South African HE level; however, this is debatable. For example, Wolff (2018) reported that at Rhodes University, isiXhosa is used alongside the English language in Journalism and Media Studies, Pharmacy, Politics, Sociology and Economics courses. Doctor of Philosophy theses written in African languages have been produced by students at the University

of Limpopo, University of South Africa, and Rhodes University. Universities, such as Stellenbosch, University of the Cape Town and the Cape Peninsula University of Technology, have successfully developed several multilingual glossaries in English, isiXhosa and Afrikaans languages for use in several academic faculties (Wolff 2018).

Conclusion

The thesis I sought to defend in this chapter is that perceived from research, sociolinguists and lived experiences of linguistically excluded multilinguals in South African institutions of education and the world over. Post-1994 (South Africa attained its political independence in 1994), language practices in most South African HEIs do not represent a fundamental difference from the inherited policies that treated languages as separate entities, with specific languages assigned to respective social contexts (Li 2018). The continuous exclusion of students' linguistic repertoire from the education sphere symbolises a continuation of the socially unjust and unconstitutional existence of a multifaceted societal structure (Gordon 2016; Osborne 2020), which in most cases results in *epistemicide, linguicide and academic genocide* (Charamba 2019b, 2020b). In order to alleviate the prevailing dropout and failure rates, HEIs should start viewing students' linguistic repertoire for what it is: an asset, not an obstacle.

Most students in the country can converse in more than one language even before they start with formal education (Charamba 2019b; Wolff 2018), why then should institutions insist on using monolingual pedagogy rather than translanguaging for instructional purposes? Translanguaging facilitates teaching and learning through the use of one's linguistic repertoire, a strategy both students and lecturers use outside the lecture halls. It is also a way to contribute sustainably to the sustenance of marginalised languages (Shepard-Carey 2020), societal decolonisation and economic progress by fully exploiting the cognitive and creative potential of our multilingual students that comes through the use of their full language repertoire. True decolonisation of HE lies not in mere random transferrals of international theories and information but in the acts of cognition brought about through linguistic decolonisation (Charamba 2021a; Freire 2007). The approach also offers multilingual students who are taught through a language different from their home language, the much needed support that is absent in current monolingual university lecture rooms.

Regardless of the various approaches that we might consider in decolonising South African HE curricula, fundamental to any didactical approach must be rethinking of the content to be delivered, as well as the medium through which the respective content is disseminated. This chapter entrenched in the notion that both multilingual students and educators bring into the education space

divergent linguistic knowledge that can efficaciously be used as a pedagogical tool (Hedman & Magnusson 2020), vouches for the recognition and use of multilingual pedagogy in HE. Sociolinguists are intrigued by how black South African students' language mostly in the urban areas, in what sounds like communicating through more than one language simultaneously (Charamba 2019a; Wolff 2018). The scholarly nomenclature for this way of languaging is translanguaging (Charamba 2019b; Li 2018).

Research globally suggests that for students to have a deep understanding of concepts, good creativity and sharp critical-thinking skills, the use of their linguistic repertoire in the same lesson is inescapable (Hedman & Magnusson 2020). The findings from the recent research by scholars in the field of education further propound that translanguaging pedagogy facilitates cultural cohesion, sharpens one's creativity, instils confidence in multilingual students, boosts their self-esteem, enhances students' academic performance across the curriculum, and promotes oneness amongst students, parents and teachers (Burgess & Rowsell 2020; Charamba 2021a; Gilham & Fürstenau 2020; Hedman & Magnusson 2020; Olivares-Orellana 2020; Osborne 2020). In our bid to decolonise South African HE, departments of languages, linguistics and literacies at our institutions of HE are the hub.

Teacher and lecturer training should be revamped to include academic courses that introduce and equip these prospective educators with multilingual pedagogy and how to view and effectively use multilingualism as a humanising teaching and learning resource. Professional development programmes can be rolled out to already practicing educators who need to know the language with which their students skilfully defend themselves from the aggressiveness of their world and when and how they use that language in the classroom (Freire 2007:204).

Universities can also consider developing multilingual teaching resources and assessments, in which students will be allowed to use their full linguistic repertoire when taking the assessment activities as no single language exists in isolation, thus typifying the 'ubuntuness' of languages, a notion from the African epistemological orientation of complex continuity found in the injunction: 'I am because you are; you are because we are' (Charamba 2019b; Madiba 2014). The implementation of translanguaging pedagogy, however, requires institutions of HE to craft language policies that explicitly detail how the use of more than one language will be advanced in their respective academic environments (Carroll & Mazak 2016). Only then can we envision the true decolonisation of HE.

Chapter 8

Decolonisation and the aims and purposes of teacher education

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> Decolonisation of education, knowledge and thought does not ask us to rewrite history but should allow us Africans the academic freedom to finally write ours, as equal intellectual members of the human race. (Adebisi 2016:451)

Abstract

Teacher education is the nexus of the education system. In this chapter, we aim to add to the discourse on the decolonisation of teacher education in the South African context. Teacher education in HEIs prepares prospective teachers, the pre-service teachers, with the necessary training for desired educational goals. Hence, teachers have an important role to develop learners

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who can responsively fit and relevantly develop their immediate environments. Learners are to be provided with knowledge and skills that apply to the realities of their environment. This implies that teacher education must also prepare pre-service teachers with knowledge and skills that are appropriate for the tasks; therefore, the need to decolonise teacher education becomes necessary. The minds of students need to be decolonised for realities around them by the teacher educators who can be flexible in classroom teaching for the desired change in the society. The call for decolonisation of education in HEIs of South Africa has become prominent amongst scholars to dismantle the present Eurocentric-dominated knowledge and to engage students with a decolonised curriculum that will embrace and promote Africanisation and Indigenous Knowledge.

Introduction

The emerging Fourth Industrial Revolution is shaping education system globally. The sector has positively been impacted by various learning technologies, as well as online educational platforms. Attainment of educational goals and objectives makes it critical for teacher education to empower pre-service teachers with needed skills, abilities and knowledge that are relevant to their learners' realities. How prepared are teachers to impart knowledge and skills for the industrial revolution in their learners to compete globally amongst their contemporary learners using their local contexts to drive learning experiences? Learning continues to be challenging to learners in developing African countries where various impediments for quality education system exist. Various studies have been undertaken to explore the reasons for the challenges. Consequently, different factors have been identified, which include indigenisation (Horsthemke 2017), Africanisation and decolonisation of the curriculum (Uleanya, Rugbeer & Olaniran 2019a). The initial clamour for decolonisation arose from the #FeesMustFall students' protests of 2015. The need for decolonisation is a rethink of the curriculum for tomorrow, a shift from Western and Eurocentric learning experiences for the learners. This implies the significance of teacher education in achieving decolonisation in the South African education system as a whole in teacher education, language policies and curriculum.

Education is the bedrock of any nation's development (Ajani 2019a). It provides knowledge, skills, values and attitudes that can make citizenry responsive. Thus, there has been increased quest for decolonisation regardless of the consequences. Teacher education is critically important as the bedrock that anchors the whole education system; for instance, the way and manner in which the teacher education system is designed and implemented contribute to the way learners will be taught. It significantly produces teachers whose responsibilities are to impart in learners, knowledge,

skills, values and attitudes, needed for the growth and development of the society. The students from some South African universities engaged in a series of protests that rocked the higher institutions between 2015 and 2016 to demand, amongst other things, decolonisation of HE curriculum to reflect the realities of their environments, and these protests have prompted and intensified scholars' agitations for decolonised teacher education (Heleta 2016; Kamsteeg 2016; Le Grange 2016; Mamdani 1998; Pillay 2015). The violent protests led to a loss of lives and wanton destruction of properties by the students. Conversely, the attention of stakeholders was drawn to their demands, from which decolonisation remains a tropical subject, which remains continuously relevant to the education system in South Africa. Various discussions have been raised and conferences organised with regards to the subject. However, it remains a major issue in recent times. Thus, this chapter further opens up on the discussions and possibilities around decolonisation of teacher education, purpose and aims as focal points for the larger decolonisation of education from Westernisation and Eurocentrism of the curriculum to attain the realities that can transform South African colonial education.

This chapter explains the concepts of decolonisation, indigenisation and Africanisation, as well as the aims and purpose of teacher education in decolonisation. The chapter reflects on the challenges of teacher education in the decolonisation of HE and how to enhance decolonisation in the South African teacher education context.

Conceptual understanding of decolonisation

Decolonisation is a complicated term, and it does not refer to political freedom exclusively in South Africa. Decolonisation has been expressed in several concepts; however, decolonising education in South Africa remains prominent. Decolonisation in education encompasses the process of decolonising knowledge production in the African context. According to Fanon (2008), decolonising the mind of an average black student from all arsenal of colonial complexes is what is known as decolonisation. Fanon (1967), one of the proponents of decolonisation theory, views decolonisation as a set of beliefs that favour community, indigenous life and epistemology. Meanwhile, decolonisation has been described in various ways by different scholars. For instance, according to Uleanya et al. (2019a:97), decolonisation is 'a new praxis for sustainable development in the African continent'. This implies that some scholars opine that the calls to decolonise education in the South African context are to promote sustainable development through education system. The purpose of education is to equip learners with necessary and appropriate knowledge and skills that can make learners to understand and impact their immediate environment for responsive living.

Meanwhile, Sium, Desai and Ritskes (2012) aver that decolonisation is a practice, which is always in conflict with colonial ways of reasoning and acting. The colonial ways of reasoning enforce and make some system to be rigid or stereotyped. Seemingly, Alfred (2009) opined that 'decolonisation can only be experienced when indigenous people hold their indigenous practices in esteem and put them into action through formal and informal settings'. Corntassel (2012) stated that indigenous people must restructure 'colonial policies, institutions, structures, beliefs, among others, to ensure the continued existence of indigenous cultures and communities' (Corntassel 2012:94).

The indigenous people have their diverse knowledge and skills, which serve the purpose of knowledge production. Uleanya et al. (2019a) view decolonisation as a phenomenon that aids in proffering solutions to the challenges of the host community. This is because decolonisation policies are considered to add more value to the lives and knowledge of students. The policies recognise the indigenous perspectives of the locals and integrate these for knowledge construction.

Prominent voices on decolonisation from South African scholars contextualise decolonisation in different perspectives. According to Mbembe (2015), decolonising South African HE is a shift from Westernised knowledge that portrays colonialism and apartheid (Decolonisation of knowledge). Ndlovu-Gatsheni (2015) opined that decolonisation is a process of learning to unlearn in order to re-learn. He further affirms that Africa is a legitimate epistemic base from which Africans can view and understand the world around them. However, Le Grange posits that decolonising the curriculum is to reflect the emergent indigenous paradigm in HE in the South African context.

In some regards, decolonisation has been considered as being synonymous to 'Africanisation', which according to Uleanya and Yu (2019) means including African cultures, beliefs, practices and norms in the form of formal education provided for the citizens. These scholars affirm that Africa has diverse concepts that should be integrated into HE to present Western knowledge where Africa is the centre. Conversely, scholars, such as Bok-rae (2007), Ndlovu-Gatsheni (2015), Grigorescu and Zaif (2017), Uleanya and Yu (2019), as well as Uleanya et al. (2019a), advocate for decoloniality and glocalisation rather than decolonisation alone. Decoloniality, according to Ndlovu-Gatsheni (2015), implies unveiling colonial means of power disguised as globalisation, modernity, apartheid, amongst others. Meanwhile, glocalisation, according to Bok-rae (2007), Grigorescu and Zaif (2017), Uleanya and Yu (2019) and Uleanya et al. (2019a), means using the global standard to proffer solution to local needs. A further review of the work of Uleanya (2020) suggests that for glocalisation to be achieved, the designed and implemented curriculum guiding the education provided in a nation tends to have great roles to play. Suffice to state that subjects such as 'Africanisation, decoloniality,

decolonization as well as glocalization' are unattainable without a well-designed and implemented relevant curriculum for teacher education.

Additionally, to decolonise education, there is a need to deconstruct knowledge from Eurocentric structures, as well as pedagogical strategies of delivering this knowledge and skills to reflect the South African context (Ryan & Tilbury 2013). The decolonised curriculum for teacher education should be an ideal one that provides knowledge to the students based on the realities around them, which will make them responsive to diverse situations, the curriculum that will empower them to adopt balance between the contextual content and global sensitive contexts in realties. Teacher education is presently dominated with Eurocentric knowledge in traditionally single-based perspective worldviews and courses or subjects are disciplinary based. The present structure of teacher education could not provide the students with necessary knowledge and skills needed in this dynamic 21st century, where students need multifaceted knowledge as mutually independent students that can relate contextually and be relevant in diverse situations.

Africanisation and indigenisation in the decolonisation of teacher education

A shift from Eurocentric-dominated knowledge in teacher education requires a decolonised curriculum that is rooted in Africanisation and indigenous knowledge. Decolonisation and Africanisation are two different contexts, and they mean differently (Mamdani 1990; Mbembe 2016). To some scholars, Africanisation is the absolute rejection of Western-dominated knowledge, cultural and political doctrines, whilst some describe it as the manifestation of knowledge, skills and ideas that reflect African contexts in post-colonial situations (Heleta 2016; Horsthemke 2004). Africanisation has been extended to a wider philosophical worldview that reflects socio-cultural and knowledge that is indigenous based and free from colonial not Eurocentric in nature (Jansen 1998). Thus, restructuring the curriculum to reflect indigenisation is an avenue to decolonise the African scholars, as well as to decolonise HE from Eurocentric-dominated knowledge.

The focus of Africanisation and indigenisation in teacher education should be the integration of African philosophy into teaching and learning, with the aims of familiarising the students with the realities that promote integrity, justice, truthfulness and courage in these students. Decolonisation of teacher education allows African philosophy to be used as a basis of what can transform and develop students for the discourse in African education (Waghid 2004). Hence, adoption of Africanisation and indigenisation in decolonising teacher education is to integrate core values that can make the students conscious of how and what is needed from them to develop

their societies. These core values include values of communism, Ubuntu and humanism in the real African context. South African society is diverse and encourages the interrelationships and interdependence of community members. Conversely, teamwork amongst the students is critical to the decolonised curriculum where students are encouraged to work as a team rather than working as individuals to attain common goals. Thus, Africanisation and indigenisation recognise and emphasis service to mankind; knowledge that promotes learning experiences in cultural, social, economic and intellectual education in the South African context for all citizens.

Both Africanisation and indigenisation are of the views that education should be liberated from dominated knowledge of Eurocentric epistemologies and should be the education that makes students relevant to the realities of their diverse situations as South Africans in ecological relationships. It is believed that the present teacher education is Eurocentric, and there is a need to move away from this to the more transformative education system. The shift from Eurocentric knowledge becomes a necessity in teacher education, as it tends to promote or indoctrinate the students with Western knowledge that promotes individualism, separation and self-centeredness amongst the community members. A form of knowledge where each strives to be greater than the community or sees the need to focus on individual interests rather than that of the community interests or teamwork in the African context. The knowledge that is African embedded or African in its approach is contrary to Western knowledge, which tends to dominate and manipulate students' minds (Mbembe 2016). This implies that the creation and spread of African indigenous knowledge are to be promoted. In this regard, decolonisation can be said to thrive.

Decolonising teacher education, therefore, implies reconstructing the curriculum to provide the students with indigenous knowledge that can make them think and act as Africans towards their community development in real contexts of their diverse realities. The role of indigenous knowledge in decolonised teacher education is to engage students with knowledge and tasks that promote critical and logical thinking, thus, making the students respect and articulate their diverse realities for their development. Furthermore, the students can think meaningfully to discover the diversity that exists in their South African environments. Decolonised knowledge is critical to pre-service teachers who will be change agents in the South African education system, and will eventually empower their learners to be change agents as well. The implication of decolonisation in teacher education is to expose pre-service teachers to the knowledge that is lifelong and relevant to situations in their local environments (Adebisi 2016):

> Decolonisation of education, knowledge and thought does not ask us to rewrite history but should allow us Africans the academic freedom to finally write ours, as equal intellectual members of the human race. (p. 451)

According to Adebisi (2016), decolonisation of teacher education is not to shift away from Western knowledge in totality, it is an attempt to strike a balance between local contextual knowledge and globalised Western knowledge that tends to dominate South African teacher education. In order to decolonise curriculum in teacher education, Africanisation, indigenisation, Western, Eurocentric, imperial, globalisation and internalisation are to be integrated to produce the desired decolonised curriculum for an African philosophy of education (Horsthemke 2017). Moreover, Soudien (2010) had earlier stated that knowledge from the integration of the above components must be indigenously contextualised for the production of knowledge in South African HE. Neither of these components alone can advance nor transmit knowledge that is African focused in diverse contexts of South Africa (Horsthemke 2017). In other words, decolonisation is not condemnation or rejection of Western knowledge or structure but a call to accommodate African philosophy into the system. According to Horsthemke (2017), there is a need to incorporate conventionalism, nationalism and cultural values of the Africans into what is learnt in schools for political, socio-cultural and economic integrations for global discourse.

Furthermore, Africanisation is the African philosophy of education that rationally integrates, acknowledges and coopts Eurocentric knowledge with indigenous knowledge education for the development of local education and local communities (Horsthemke & Enslin 2009; Waghid 2004). In this manner, Africanisation rejects absolute external influences and places more emphasis on knowledge that provide students' identities with their African cultural values (Horsthemke & Enslin 2009). Though, reservation on seclusions of Africans from internalisation is inevitable in the global philosophy of education if Africanisation dominates the African curriculum (Horsthemke & Enslin 2009).

Conversely, Africanisation is a perspective for Africans to view themselves clearly as Africans in the African context but in relationships with the outside world. Therefore, Africanisation is a project for re-centering, placing Africa in the centre. Thus, decolonisation is not an endpoint rather the beginning of a new struggle, and it is not the rejection of Western streams.

Aims and purpose of teacher education

Teacher education is a significant component of the education system, and it is the system that trains or produces the whole human resources for national development. The significant components of teacher education include the teacher educator, student-teacher, the content and teaching strategies. Uleanya et al. (2019b) opined that the success of students in many instances is predicated on the type of education received by their teachers. Thus, teacher education is paramount towards the pursuit of success in students.

Teacher education is measured by the quality of teacher educators through the quality of pedagogical content knowledge imparted into the student teachers. Teacher education aims at producing quality teacher educators who have abilities, skills and knowledge to prepare student teachers. Thus, teacher education is to ensure the production of pre-service teachers who will possess the appropriate knowledge, information, skills and pedagogy needed to impact learning. These pre-service teachers are engaged in different multi-tasks that can empower them for professional tasks as potential classroom teachers. The pre-service teachers are exposed to both theoretical and practical aspects of teacher education, which can make them cope with classroom rigours of teaching and learning, management of diverse learners, and abilities to handle all challenges in the education system. The purpose of teacher education, therefore, is for the student teachers to acquire right attitudes, competent skills, relevant and specialised knowledge that are professionally needed for their effective and efficient classroom practices, as well as other relevant tasks within the education system. The post-apartheid reformed South Africa education system focuses on the provision of quality education to all South Africans. Conversely, teacher education should ensure adequate preparation of student teachers through the relevant and appropriate curriculum for diverse learners throughout South Africa. Thus, teacher education is critical to the development of any nation.

Decolonising teacher education in South Africa

The issue of decolonisation of the education system remains a debate with divergent opinions. Nevertheless, there is a significant need for the decolonisation of curricula in South Africa, considering the changing profile of students and their relevance in their host communities (Maistry 2011; Uleanya, Rugbeer & Duma 2018). Meanwhile, according to Gamede and Uleanya (2019), the decolonisation of the curricula gives rise to more relevance in the education system of the nation, as well as the students. Conversely, teacher education is a major factor that contributes to the learning abilities of students at various levels (Uleanya et al. 2019b).

Similarly, in South Africa, teacher education is one of the determining factors, which has the impetus to promote or mar learning. Reviews of the works of Sathorar and Geduld (2018), as well as Uleanya et al. (2019a), indicate that the current HE system in South Africa is colonised. Meanwhile, teacher education remains the training ground for producing teachers who specialise in different subjects or teach at different classes or phases of the education system. According to Sathorar and Geduld (2018), the quest for quality and decolonised education, which at the same time is expected to be free, serves as a motivation for improved and transformed concerns regarding the issue of decolonising teacher education in South Africa. Suffice to state

that teacher education is capable of determining the extent to which learning takes place.

Hence, attempts to decolonise the education system of South Africa has the potential to thrive if the process begins with the decolonisation of teachers' education in South Africa. Uleanya et al. (2018) stated that the curriculum is a major component that must be explored for the decolonisation of any education system inclusive of South African and teacher education. Hyland et al. (2008), Welikala (2011), Ryan and Tilbury (2013), Uleanya, Rugbeer and Duma (2018) and Uleanya et al. (2019a) state different ways by which decolonisation of the curriculum, especially that of teacher education, can take place. These include taking cognizance of local contexts during the selection of teaching and learning materials, thus ensuring that local contexts are considered when lessons are taught, considering the adopted language of communication during teaching and learning, amongst others. However, Sathorar and Geduld (2018) opined that for the decolonisation of teacher education and other curricula to be relevant, there is a need to proffer answers to the following questions:

> What does decolonising a curriculum entail? How does decolonisation impact the presentation of modules? [*and*] How can the theory of decolonisation being transferred into the practice of our student teachers be ensured? (p. 8)

Sathorar and Geduld (2018), however, further stated that there is no specific way of decolonising the curricula. Suffice to state that as important as the subject of decolonisation of teacher curricula may be, regardless of questions raised and answered by researchers on the subject of the decolonisation of teacher education curricula, there remains no definite and precise way of undertaking such process. Hence, different societies continue to explore the most suitable way. Hence, the reason and importance of this study.

Furthermore, decolonising the curricula is important; however, in the words of Steve Biko (2004), the decolonisation of the mind of black people is more important. According to Biko (2004), the decolonisation of the minds of black people propels them to be independent of the whites and dependent on themselves. In other words, it makes black people believe more in themselves and act accordingly. Conversely, Uleanya et al. (2018) argued that glocalisation should be promoted in African societies. Thus, black people should be provided with knowledge and skills that can make them explore ways of adopting relevant and adaptable practices from foreign societies, mix such with the practices peculiar to the African context to proffer solutions to their challenges or meet their needs in realities of their environments.

Decolonising teacher education in South Africa is an attempt to place values on diverse people's experiences to acknowledge what is 'silent' in the African context. Many indigenous scholars have moved for indigenous people, and their diverse indigenous knowledge to be recognised and integrated into learning experiences. Thus, the call for decolonising teacher education

continues to be strengthened. According to Shizha (2013), decolonising teacher education will enhance learning experiences to be meaningful and related to students' immediate environments. Hence, to achieve this, decolonising the teacher education with a pragmatic approach to promote transformative intervention, which allows inclusiveness for knowledge construction. This implies diverse classrooms that accommodate students' experiences with Western knowledge in the African context.

Decolonising the minds for realities transformation

Processing the decolonisation of the mind, according to Kgatla (2018), attempts to propel black people to actualise self-emancipation and self-empowerment from the control of their colonisers and enslavement be it internal or external. Meanwhile, Oelofsen (2015) stated that decolonisation transcends political spectrum, and it revolves around other sectors of the society and human endeavours. Ngũgĩ (1986), following the belief of the Fanon's (1967) post-colonial psychoanalysis, proposes that art is a means of healing the trauma of colonialism. Thus, for the decolonisation of the black minds to be possible in a society inclusive of South Africa, art is important. This includes various practices, such as painting, drawing, singing, literature and other forms of creativity. Ngũgĩ (1986) further opined that the decolonisation of the mind for realities transformation can be performed by upholding native African languages. This he proposes to be able to ensure renaissance in African cultures, and eventually, liberate African nations from their neocolonial conditions of oppression.

According to Ngũgĩ's work (1986), which is also supported by Uleanya et al. (2019a), language is a major tool for the decolonisation of the minds of the blacks. Additionally, Ngũgĩ (1986) upholding the idea of Fanon opines that a rejection of the colonizers' linguistic and cultural forms is a precondition for achieving true freedom. Thus, by extension, the freedom for blacks remains dependent on their ability to decolonise their minds through their languages and other means. Ngũgĩ (1986) also avers that it is expedient for material circumstances to change. This is also described by Marxist tradition as focusing on material history. According to D'Errico (2011), education is a means by which the minds of blacks can be decolonised. Thus, there is a need for the growth of education in the African society. However, this education is expedient to be channelled towards proffering solutions to the challenges of Africans and meeting their needs in the real South African contexts.

Challenges of teacher education in decolonisation

In the South African context, decolonisation of teacher education is to prepare pre-service teachers on how to acquire knowledge and skills that embrace

and adopt the use of local contents for teaching and learning in learners' immediate contexts for meaningful understanding and application (Sathorar & Geduld 2018). Teaching as a career is a demanding and challenging profession in a diverse country like South Africa. Teachers in diverse and multicultural classrooms are meant to engage learners in teaching and learning, as well as the moral development of these learners to conform to societal values and norms. Hence, teacher education provides a training platform for students to be prepared with what is needed to attend to problems and challenges of their diverse learners. Decolonisation of teacher education is a process that requires certain conditions for its successful passage in HEIs. These conditions include professional development (Ajani 2019b) of academic staff on pedagogical skills for decolonised curriculum, classroom management, management of diverse students, the collaborative interpersonal relationship amongst academic colleagues and other staff members, relationships with students and other members of the HEIs, provision of adequate teaching and learning facilities, and many more educational institutions.

For teaching and learning to reflect decolonisation, it is not the only curriculum that needs to be decolonised, teaching strategies and methods have to be decolonised to ensure students get decolonised knowledge in teacher education. Therefore, academic staff needs appropriate abilities, skills and knowledge to engage students in critical thinking through appropriate communication strategies. Hence, responsibilities are huge on the academics to empower the students with skills and knowledge that can also be transmitted into the student teachers' eventual learners. The professionalism of academics in HEIs is critical to the professional delivery of decolonised curriculum in teacher education (Ajani 2019a). Students in teacher education need to be well prepared to impart learners as change agents to appreciate and respect diversities in South African communities, as well as acknowledge their social identities in realities.

☐ Teaching approaches in teacher education

Decolonisation of teacher education includes decolonising the teaching approaches employed by the lecturers who facilitate teaching and learning in a HEIs. Mamdani (2007) argued that training of teachers, as well as curriculum design for the education system, takes place in the HEIs. Mamdani (2007) opined that:

> Without research in higher education to develop curricula for the entire system of education, all curricula will be as an off-the-shelf imported facility, with little relevance to the lived circumstances of both student and society. If our object is to transform general education, we need to begin with higher education. Higher education is the strategic heart – indeed head – of education. (p. 213)

Thus, this implies that teacher education may be confronted with the critical challenge of being decolonised if the process of preparing pre-teachers in teacher education remains Eurocentric in its approaches to teaching and learning. According to Sayed, Motala and Hoffman (2017), the educational backgrounds of the majority of the lecturers in teacher education are Eurocentric in nature, which informs their teaching approaches in teacher education and limits the students' abilities to expand their conceptual knowledge beyond the Eurocentric learning experiences. Seemingly, it narrows down students' thinking to influence the bodies of knowledge in South African imaginaries (Sayed & Novelli 2016).

Sayed et al. (2017) opined that:

> [*L*]ecturers' education histories, their different conceptualisations of what it means to decolonise the curriculum and their understandings of the expectations of students, relative to the demands of the university affect decolonisation of teacher education. (p. 73)

The lecturers decide what to teach and how to teach learning experiences in the curriculum based on their understanding and educational backgrounds, which influence how they train and teach their students based on what they are familiar with. Thus, this is a challenge that needs to be decolonised.

Most of the existing textbooks in teacher education are mostly authored based on Eurocentric and epistemic knowledge, which makes decolonisation of teacher education in the South African context to be challenged. In a longitudinal study by Sayed et al. (2017), the majority of the textbooks for pre-service teachers in South African universities have been written based on Eurocentric bodies of knowledge to support teacher education. Gordon (2011) opined that 'geography of reason' indicates the availability or non-availability of textbooks on any curriculum in either the South African context or the Western context. Seemingly, Tabulawa (2013) concurred that students in African countries are isolated from their contexts when their textbooks only share experiences of colonisation and characteristics of Western education. Decolonisation of teacher education can only be attained through the right intellectual frames and biographies of the lecturers in HEIs.

Sayed et al. (2017) also identified HE institutional contexts as another influence on the struggle to decolonise teacher education in South Africa. The institutions should provide synergy for lecturers and students on how to smoothly decolonise teacher education. Although there is a need to make provision for all the required facilities, however, inadequate funding to these institutions makes this impossible or limited to many institutions (Le Roux & Breier 2012).

Conversely, teacher education continues to experience changes both locally and globally to prepare knowledgeable, skilful, adaptive and competent teachers, who should be change agents in schools and society.

Textbooks and teaching materials for teacher education

One of the challenges that limit the decolonisation of teacher education has been the available textbooks and other teaching materials for teacher education. The question remains, how do these materials align with the aim of decolonising teacher education? Do they recognise or integrate the realities of diverse African perspectives into knowledge construction? Most of the textbooks and teaching materials have been written or designed in absolute Western knowledge. Maposa (2015) avers that most teacher education textbooks do not provide students with critical discourse analysis that can provide insight knowledge construction. The contents of these materials do not offer tools that can make students critique, interpret and appreciate diverse perspectives that exist around. Teacher education materials should be centred on African philosophy to present the world around it.

Textbooks and other teaching resources to be used in teacher education are produced based on learning goals or learning experiences that students need to acquire. These materials, which also include other classroom fittings, can also influence the decolonisation of teacher education. Buildings and classrooms are designed and decorated for teacher education based on the Western context, and seem to neglect African philosophy. Teacher educators use materials that can support and promote learning objectives to facilitate teaching and learning, most of which are Eurocentric. Thus, the atmosphere of learning for teacher education is the one that promotes regurgitation of Western knowledge as knowledge production, in which the absence of creativity does not allow the students to contextualise knowledge to their local needs.

Students' assessments

Assessment is critical to knowledge production. It is a method of determining what a student has learnt and can reproduce. According to Fomunyam and Mnisi (2017):

> [*A*]ssessment is a process which lecturers use to generate data, using a variety of tools and strategies to ascertain what students know, can do, and identify gaps in understanding to plan future teaching and learning to address the gaps. (p. 4154)

Assessments are used to ensure learning and also to check the kind of learning experiences to which students are exposed. The assessments are also used to modify learning experiences or to attend to diverse learners' needs. These assessments can be either formative or summative (Kanjee & Sayed 2013). According to Fomunyam (2014), the formative assessment is often used to improve teaching and learning, whilst summative assessment is often used to test comprehension and confer grades or qualification. Assessments that will present students to develop knowledge and skills that can be adapted to the

realities of their environments promote decolonisation of teacher education. The assessments should provide students with equal opportunities to decolonise teacher education that enables local experiences. Moreover, a review of the work of Uleanya et al. (2019a) shows that students perform better when assessed using a local phenomenon, which includes language, practices and experiences. This implies that assessments in teacher education should be varied to reflect students' local experiences.

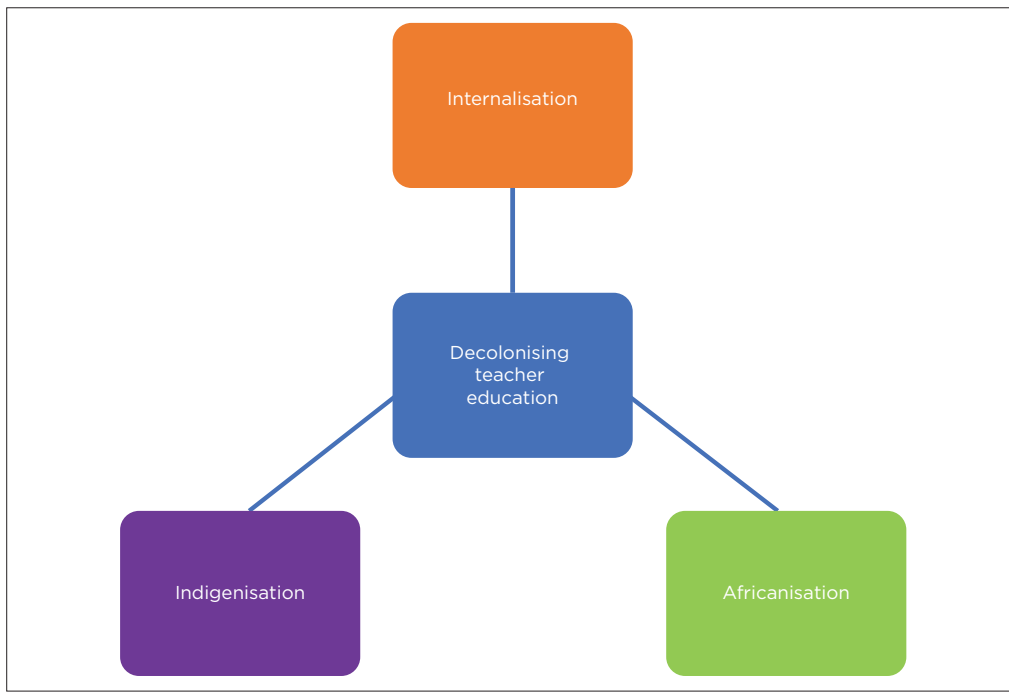
Strategies to enhance decolonisation in teacher education

Discourse on decolonisation of teacher education is gaining more momentum, the reason is to secure and provide quality African education that will give social identities to students in the real South African contexts. Some South African universities have been strategising on how to decolonise the system for remarkable transformation. Several universities have been reported to have engaged in different strategies to ensure decolonisation and knowledge transformation in the universities (King 2001). Decolonisation of teacher education in HEIs is a process that requires strategies that can enhance decolonisation and transformation of teacher education.

Various HEIs have diverse institutional approaches that should direct or determine the phases in the process of decolonisation of teacher education. The universities need to draw strategic plans that should guide the transformation of knowledge and decolonisation of teacher education. The significance of using a defined strategic plan for different universities is to cater for differences in their characteristics and institutional structures to achieve feasible decolonisation. The development of several feasible strategic plans by representatives of all stakeholders for each university should focus primarily on their institutional approaches, which include diversification of academic, reformation of the curriculum for every programme in teacher education, admission requirements and process for the students, promotion of diverse student residences, language policy for teaching and learning, naming of institutional structures, sourcing of all institutional needs, membership and structure of institutional bodies or committees.

Regular and adequate training for teacher educators is necessary for decolonising teacher education. They need to be empowered with appropriate knowledge and skills towards decolonising teacher education. This will reposition and encourage a customised approach to decolonising teacher education. Reflections on decolonising teacher education curricula imply that teacher education needs to be contextualised within this frame of thinking using Curriculum Studies as an intellectual space. Jansen (2017) suggested six approaches to decolonising HE, which can be applicable to decolonising

teacher education. These approaches include decolonising through addictive-inclusive knowledge; decentralisation of European knowledge; critical engagement of curriculum with settled knowledge, repatriation and linking of occupied knowledge to the society; Africanisation of curriculum contents and decolonising the curriculum for encounters with entangled knowledge. According to these approaches, recognition of indigenous knowledge is important in building of knowledge for the pre-teachers. The indigenous knowledge is not to replace Western knowledge but to be integrated into what needs to be learnt, thereby using it to frame curriculum for the teacher education. According to Mama (2015), some elements of indigenous knowledge are critical for adoption into curriculum for African learners to understand. Integration of these six conceptions into decolonising teacher education implies the deconstruction of curriculum contents for teacher education to prepare pre-service teachers for realities in the South African context. Decolonising teacher education can promote the possibilities of decolonising education to understand ourselves through decolonised knowledge (Jansen 2017). Thus, decolonising teacher education can be promoted through the integration of internalisation, Africanisation and indigenisation in HE (Figure 8.1).



Source: Adapted from Le Grange (2018).
FIGURE 8.1: Decolonising teacher education.

Internalisation of indigenous knowledge is critical to teacher education. As South Africa is diverse in nature, the existence of different cultural practices makes South Africa to be multicultural, and the multiculturalism needs to be explored in knowledge production. The indigenous approach to curriculum and teaching approaches in teacher education enable learning experiences to be related to diverse situational contexts of the students, which is an approach in Africanising knowledge production in South Africa.

Africanising teacher education is a concern to invigorate lines of flight from points of rupture in existing disciplines. It is an attempt for trans-disciplinary knowledge by South African teacher education for service-learning programmes. Hence, decolonising teacher education will recognise knowledge production from different places by different people at different periods. Decolonised teacher education will enhance production of knowledge that can connect people, places and skills together (Le Grange 2014).

Aims and ways of decolonising teacher education

The words of Nelson Mandela cited in Du Plessis (2021:51), '[e]ducation is the most powerful weapon we can use to change the world', imply that several changes and success, including decolonisation, can be achieved through education. This suggests the reason for the various continuous curriculum changes across the globe. Uleanya et al. (2019b) hold the view that teacher education can be used to achieve several phenomenal changes that may be considered important in the lives and activities of students, consequently societies. In this regard, the drive for decolonisation in any society, especially as it concerns African nations, can be achieved through teacher education. Suffice to state that if teacher education is successfully decolonised and teachers buy in on this, the process of decolonisation amongst learners or students is envisaged to be successful following their impacts, influence and inputs in the attainment of students or learners. Sayed et al. (2017) opined that decolonising the curricula of teacher training programme and academic culture is contributory to the ways by which teacher education can be decolonised considering its importance in this regard. Moreover, according to Sathorar and Geduld (2018), decolonising teacher education would lead to change of practice. Review of the work of the National Council of Teachers of English (NCTE) (2021) shows that the roles of teachers in ensuring the success of decolonisation in any society is pivot. Meanwhile, if teachers' education is not decolonised, it may be difficult to get teachers to embrace and support the drive for decolonisation. However, the question remains: how can teachers' education be decolonised?

The submission of NCTE (2021) suggests the following ways by which the classroom can decolonise, by extension, teachers' education. This includes the following: diversification of materials and use of local content (Sathorar &

Geduld 2018), educating teachers to train towards achieving learning outcomes that address power and social justice; educating teachers to design assessments that allow various students to exhibit mastery in different ways; educating teachers to involve students in the creation of knowledge, content and curriculum; teaching and motivating teachers to embrace the use of different languages, especially indigenous languages in interactions, teaching, writing and tests; and educating teachers to get involved in advocating for equity at institution, community, state and national levels. A review of NCTE (2021) further suggested that for teacher education to be decolonised, there is a need to make them examine themselves and their beliefs. In this instance, they would be able to reflect the attributes of decolonisation on their students, especially taking hidden curriculum into consideration. Other ways by which teacher education can be decolonised following the submission of NCTE (2021) include educating teachers during their training to consider themselves, the curriculum with which they would work, the content to be taught and their classrooms as existing within certain contexts, such as historic, subjugation, racism and control.

Furthermore, teacher education should involve teachers challenging systemic oppression, whilst acknowledging the collective experiences of marginalised groups (NCTE 2021). Teachers should be educated on the need for avoiding the devious idea of objectivity in the classroom, of maintaining political neutrality, and of viewing all sides and positions as having an equal impact on marginalised groups. They should be educated to teach their students to learn to live in the discomfort of having to take a stand. Meanwhile, during teacher training, teachers should be made to see, accept and address the ordeals that different forms of oppression, such as colonisation, sexism, poverty, racism, amongst others, can and do cause for marginalised individuals. Moreover, decolonisation entails undoing established colonial practices and systems that were in motion during the era when one nation maintained dominance over another (Jones 2019).

Additionally, following the submission of NCTE (2021), other ways of decolonising teacher education may include educating teachers whilst avoiding to promote the ideas of a standard, correct and preferred language in teaching. Teachers were trained to view that promoting a language as standard above others in teaching implies perpetuating colonisation and enhancing marginalisation of some others. Meanwhile, Ryan and Tilbury (2013), cited in Sathorar and Geduld (2018), had earlier stated that decolonisation of teacher training programme includes the discouragement of predominant pedagogical strategies and structures that support a particular world views. For instance, endorsing that Western Eurocentric view or approach supersedes others, forgetting that every nation and continent is unique in its own way. Martin and Pirbhai-Illich (2016) described such act as hegemonic practice. Suffice to state from the foregoing that the decolonisation

of teacher education is a major route to consider when advocating for decolonisation in any society. This can be performed by reviewing the curriculum and practices of teacher education in training. Meanwhile, achieving decolonisation at that level is likely to be a major tenet upon which decolonisation can be achieved in the society at large as teachers transfer values to their students who, in turn, do apply the same to the society.

Conclusion

This chapter intended to explore the aims and purpose of decolonisation of teacher education in HEIs of South Africa and how to enhance the decolonisation of teacher education in the South African context. The chapter explored explicitly the concept of decolonisation, indigenisation and Africanisation. Decolonisation of teacher education is a significant approach to entirely decolonise the HEIs, thus, providing learning experiences for the students in the realities of their environments. This form of knowledge makes them responsive and relate with their outer worlds using their situational contexts. Decolonisation of teacher education will promote in learners who are the recipients of the knowledge and skills acquired by student teachers from the teacher education, to be responsively provided with learning experiences that will be drawn from their immediate environments and can be used in realities of their relationships with others. According to Jansen (2017), decolonising the minds of the learners provide for real learning experiences that can make learners adopt or adapt to realities of their community. Thus, decolonisation of teacher education will ensure a shift from Eurocentric and epistemic knowledge that have long colonised the minds of the students. However, some challenges could hinder absolute decolonisation of teacher education, and these identified challenges could limit or challenge effective decolonisation of teacher education in the real South African context.

The chapter thus suggests that decolonisation of teacher education should reflect the South African context in its entirety of the South African education system to ensure learning experiences in realities of learning outcomes. Decolonised teacher education will dismantle Eurocentric knowledge, which has incapacitated the teaching and learning from reflective thinking about realities in the South African context, needed for a decisive and informed decision. The students need a decolonised curriculum that promotes their dispositions for their possibilities as South Africans.

Textbooks on teacher education should not project Western knowledge exclusively but should employ African philosophy to construct knowledge that will appreciate a diverse perspective for the acquisition of knowledge and skills. The continuing isolation of indigenous knowledge that recognises Africa as the centre of what to learn in education promotes the absence of Africanisation and indigenisation in teacher education.

Chapter 9

The affordances of open educational resources and student-centred open pedagogy for the decolonisation of teacher education in South Africa

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Abstract

In the context of the decolonisation of the curriculum, it is essential to incorporate student voices in order to situate learning in an appropriate milieu. To this end, this chapter explores the affordances of open educational resources (OERs) and student-centred open pedagogy as resources that can be used for teacher education. It is also suggested that the decolonisation of the curriculum process be focused on students. This chapter involves a critical analysis of the pertinent literature on OERs and open pedagogy interpreted

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against the background of the scholarship on the decolonisation of the curriculum. The literature shows how the past has influenced the learning process. Consequently, the decolonisation of teacher education is essential, and OERs, as well as open pedagogy, provide avenues to address this issue. Open educational resources involve various types of resources, mostly online, with specific licencing that allows for adaptation and localisation. Therefore, using OERs with adequate licencing from international sources would allow South African lecturers to adapt such resources in order to adhere to the needs of a decolonised curriculum. Furthermore, in the spirit of open education, such revised resources can then be shared to the benefit of others in similar contexts as a form of demiurgic decolonisation. In addition, this chapter approaches open pedagogy as not only the practice of using OERs in teaching and learning but also a means of facilitating greater participation by students. In this regard, students can be empowered to utilise, and ultimately revise and create OERs within the context of communal constructivism. Finally, a framework is provided for practices with OERs and student-centred open pedagogy towards the decolonisation of teacher education in South Africa.

Introduction

Issues of decolonising the curriculum have been topical in academic and popular discourses in South Africa, especially since the student-driven #FeesMustFall and related campaigns (Le Grange 2019). This conceptual chapter aims to explore the affordances of OERs and student-centred open pedagogy towards the decolonisation of teacher education in South Africa within the context of the looming 4IR. To this end, after a careful and critical source selection and interrogation was performed, in this chapter, I describe what decolonising the curriculum means, specifically with reference to the teacher education context. Furthermore, the concept of OER and the practical use thereof within open pedagogy are discussed. In this chapter, the prominence of student voices is fundamental to the discussion, and therefore, a student-centred approach to open pedagogy is supported. Finally, a framework is proposed for practices with OER and student-centred open pedagogy towards demiurgic decolonisation of teacher education in South Africa.

This chapter should be considered within a context where there is a strive towards an 'equal footing in treatments, agency, and perspectives in the social reference of respective societies and knowledge production' (Assié-Lumumba 2017:19). In this regard, it was found that student agency can also be developed as open pedagogy can potentially create an environment where students are involved in creating OERs. Baran and AlZoubi (2020:239) reported that in their research on open pedagogy, 'all students felt they had developed a higher sense of agency by constructively contributing to their own learning

while curating content, engaging in a community, and designing OER materials'. Therefore, the inclusion of student voices in OER creation can be highly relevant to the decolonisation of the curriculum discourse, specifically in preparing teachers for the 4IR in which access and production of knowledge might look different from now.

As is evident, the concept of OERs is central to this chapter. Different definitions exist for OER, but UNESCO (2019) defined OER at the General Conference meeting that was held in Paris in November 2019 as follows:

> [*L*]earning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others. (p. 5)

Consequently, OER is framed within an educational context without any specific requirement in terms of format or medium but with specific licencing and use requirements. Furthermore, it is important to note that according to the Commonwealth of Learning (COL) (2015), OERs can include:

> [*F*]ull courses/programmes, course materials, modules, student guides, teaching notes, textbooks, research articles, videos, assessment tools and instruments, interactive materials such as simulations and role plays, databases, software, apps (including mobile apps) and any other educationally useful materials. (p. v)

Importantly, OERs are not necessarily online resources, as they can often be printed as well (Butcher 2015; COL 2015), which makes them more accessible in contexts with limited electronic resources. This is especially relevant for South African contexts where printed OERs can also bridge gaps between the access to devices and the Internet as well as challenges in terms of digital literacies. However, for student teachers it is essential that they are exposed to OER from different formats and mediums, and that they are prepared to be adaptable to use different technologies. This is important as content delivery contexts are ever-changing in terms of the development and increase in access to technologies and specifically mobile technologies.

Even from the earliest initiatives for open education, learners have been mentioned in addition to educators as content creators. The Cape Town Open Education Declaration (2007), for example, acknowledges that there is an emerging 'new pedagogy where educators and learners create, shape and evolve knowledge together, deepening their skills and understanding as they go'. Hence, student agency is not just acknowledged but should also be promoted. This declaration further encourages 'educators and learners to actively participate in the emerging open education movement' and said participation entails 'creating, using, adapting and improving OERs; embracing educational practices built around collaboration, discovery and the creation of knowledge; and inviting peers and colleagues to get involved' (Cape Town Open Education Declaration). This statement implies a need for development

of students in order to empower them to actively participate in open pedagogy. Despite the advantages of including student voices in the curriculum, it is clear that this is rarely done (cf. Olivier 2020b). In addition, a lot more research is necessary to gauge the extent of comprehensive student participation in terms of not just content but also outcomes, learning strategies and assessment.

Open educational resource should be considered within the context of so-called open learning. However, it is essential to take note that these terms do not refer to the same concept (cf. Butcher 2015). The Department of Higher Education and Training (DHET) (2017) defines *open learning* as follows:

> An educational approach which combines the principles of learner-centredness, lifelong learning, flexibility of learning provision, the removal of barriers to access learning, the recognition for credit of prior learning experience, the provision of learner support, the construction of learning programmes in the expectation that learners can succeed, and the maintenance of rigorous quality assurance over the design of learning materials and support systems. (p. 363)

Open learning thus refers to a wider approach to learning with a strong resemblance of aspects of self-directed learning (Brockett & Hiemstra 2019). In this chapter, the pedagogy associated with the use of OER relates to the operationalisation of openness in the university context. The pedagogy with OER has been conceptualised as *open pedagogy*. The importance of such processes in the OER context is highlighted by UNESCO (2019):

> [*T*]he judicious application of OER, in combination with appropriate pedagogical methodologies, well-designed learning objects and the diversity of learning activities, can provide a broader range of innovative pedagogical options to engage both educators and learners to become more active participants in educational processes and creators of content as members of diverse and inclusive knowledge societies. (p. 5)

Therefore, OER cannot just be approached in isolation and learning contexts with their unique challenges, and affordances should be considered throughout. In terms of the decolonisation of the curriculum and also within the context of teacher education, the approaches used with OER are also relevant.

The use of OER presents many opportunities for the inclusion of different viewpoints. Cox and Trotter (2017) noted that:

> [*T*]he fact that lecturers in the Global South can add locally relevant materials online for other lecturers in the region to use – and thereby move away from a dependence on Northern-based materials – would also, presumably, encourage them to engage in OER creation and sharing. (p. 151)

Democratising the opportunities for content creation may create many possibilities towards the decolonisation of the curriculum. This is also explored in this chapter, focusing not only on lecturer-focused activities but also the possibility of students as content creators.

In the next two sections, decolonising the curriculum and aspects around OER and open pedagogy are discussed in terms of the wider context of teacher education.

Decolonising the curriculum

As this chapter explores the affordances of OER and student-centred open pedagogy for the decolonisation of teacher education in South Africa, the concept of decolonisation needs to be unpacked. According to Le Grange (2016:6), decolonisation 'involves a process of change that does not necessary involve destroying Western knowledge but in decentring it or perhaps deterritorialising it (making it something other than what it is)'. Hence, decolonising the curriculum implies some change with specific sensitivity to historical and political origins, and influence on knowledge within the educational context. Furthermore, the idea of not destroying existing knowledge and starting anew but rather building on existing knowledge and localising such content shows a clear alignment between decolonisation of the curriculum and what can be done within an open pedagogy approach with the use of sufficiently licensed OER.

The decolonisation of the curriculum is a complex and dynamic process. Assié-Lumumba (2017) noted that:

> [*T*]he colonial and post-colonial context in which research and learning have taken place, like slavery and the post-bellum context of research and knowledge production in general and in learning, has an organic continuity. (pp. 15–16)

Hence, lecturers and students need to consider the contexts and ideologies underlying knowledge used in classrooms. Assié-Lumumba (2017:16) added that 'there are the continued contradictions in educational processes and persistence of power relations that shape academic disciplines and pursuit'. Therefore, within an OER context, both lecturers and students should be made aware of the power relationships and the context inherent to knowledge infused in the open pedagogy context.

Furthermore, Le Grange (2016:5) contended that 'decolonisation is not an event but a process and it is not necessarily easy to achieve'. Therefore, this chapter relates to certain vehicles that can be useful to this process, such as the use of OER, embracing open pedagogy and fostering skills empowering students to become metaliterate responsible content producers. However, for the sake of practicality in this chapter, the verb *decolonising* is used to refer to the process of changing content and processes in order to situate the content within the South African milieu whilst being critical of existing biases towards the West and Global North. Yet, care is taken not to ignore or diminish the complexity involved in the process.

Issues around decolonisation are, however, not limited to the South African context. The work by Chimbunde and Kgari-Masondo (2020), in which they refer to *Ubuntulising* the curriculum, is an example of such initiatives. Similarly, Haipinge and Olivier (2019) also explored Ubuntu in terms of the wider context of the 4IR and especially how the curriculum needs to adapt to address the challenges of this changing world. Haipinge and Olivier (2019) made the following statement in this context:

> Within the Fourth Industrial Revolution the concept of ubuntu will be essential in order to support a Southern African student population to be competitive and prepared for global challenges. In this regard, ubuntu needs to be infused in learning and instructional design. (p. 10)

The process seems to be quite disruptive and extreme, however. According to Fanon (2004), decolonisation does not go:

> [*U*]nnoticed, for it focuses on and fundamentally alters being, and transforms the spectator crushed to a nonessential state into a privileged actor, captured in a virtually grandiose fashion by the spotlight of History. (p. 2)

Le Grange (2019) suggested decolonising the curriculum because, according to him, it 'requires a radical rethinking of the concept of curriculum, so that it is liberated from instrumentalist or performative language by introducing a language of improvisation' (Le Grange 2019:47). Therefore, the rethinking process extends beyond cosmetic changes to content; it also entails deeper structures and frames of reference. The challenge for lecturers in this context remains on how to support and empower students to play a role in this rethinking process.

In the teaching context, it is also interesting that the Revised Minimum Requirements for Teacher Education Qualifications (DHET 2015) state that newly qualified teachers should not only have highly developed IT skills but also 'understand diversity in the South African context in order to teach in a manner that includes all learners' (DHET 2015:64). In order to reach this goal, such an inclusive approach would imply not only recognising a variety of voices but also extending towards a decolonised mindset. In addition, as students play an increasing important role in different parts of the pedagogical process – as is advocated in this chapter in terms of open pedagogy – so should students also be empowered to respect and exploit epistemological and localised diversity.

In order to address the needs of a decolonised curriculum, the relevance of OER needs to be explored. This is of particular significance because, according to Butcher (2015), OER open up:

> [*G*]reater possibility for adapting existing resources for a better fit with local contextual and cultural needs without the requirement to spend time in lengthy copyright negotiation processes or, failing that, to duplicate development of the same core content. (p. 40)

However, in the South African context, such local contexts are often quite complex and there are not even quick fixes at a provincial or university level, and consequently, it is recommended that localisation efforts start with the individual students themselves.

Therefore, it is essential to unpack OER further in order to determine how these possibilities can be relevant for the wider academic context and teacher education specifically.

Open educational resources and open pedagogy

Open educational resources are relevant for this discussion because they allow for the adaptation of content that can potentially support decolonisation efforts. The transformative potential of OER in the educational context include '[r]eaping the benefits of contextualisation, personalisation and localisation', '[i]nvolving students in the selection and adaptation of OER in order to engage them more actively in the learning process' and '[u]sing locally developed materials with due acknowledgement' (COL 2015:3). Therefore, as a resource, OERs are particularly suitable for decolonisation of curriculum efforts.

The possible value of OERs towards the sharing, reusing and publication of indigenous knowledge was highlighted by Olivier et al. (2019). However, the uptake of OER in HE has been low despite some evidence that these resources are used by lecturers without them realising it (Baas, Admiraal & Van den Berg 2019; De Hart, Chetty & Archer 2015). It is essential to consider what OERs entail and how they can be used practically in open pedagogy and central to such an approach is appropriate licencing.

Licencing is noted in the UNESCO definition for OER used at the start of this chapter. In this regard, UNESCO (2019) defines an open licence as 'a license that respects the intellectual property rights of the copyright owner and provides permissions granting the public the rights to access, re-use, re-purpose, adapt and redistribute educational materials'. An important benefit of using OER is the fact that with appropriate licensing, the resources can be adapted to the needs of a specific context (cf. Baas et al. 2019). In addition, UNESCO (2019) expresses the importance of open licences as follows:

> [*T*]he application of open licenses to educational materials introduces significant opportunities for more cost-effective creation, access, re-use, re-purpose, adaptation, redistribution, curation, and quality assurance of those materials, including, but not limited to translation, adaptation to different learning and cultural contexts, development of gender-sensitive materials, and the creation of alternative and accessible formats of materials for learners with special educational needs. (p. 5)

Therefore, the affordances of using appropriate licences not only open up opportunities for adaptation of content with a Western or Global North focus, they also allow for the accommodation of different languages and even formats that open up access to students with special educational needs. In this regard, works that are merely protected by copyright through publication may limit the ways in which such works can be made appropriate for specific South African classrooms. Additional needs may also exist in terms of language, access for the disabled and, within the purview of this chapter, the decolonisation of such content.

According to Lesko (2013:116), as regards OER (with reference to OpenCourseWare in his publication), the 'use and production is a cost-effective mechanism to revise existing curriculum, and to create teaching resources'. As such, using OER would counter the argument of cost implications when it comes to decolonising the content. However, from a management perspective, it should be considered that revising and localising OER may take up time and need specific expertise. Hence, opting for OER cannot be merely a financial decision but also an academic one.

An initial issue for teacher education would be getting lecturers to adopt using OER. In this regard, Cox and Trotter (2017) proposed an OER adoption pyramid. According to this pyramid, lecturers move from (1) access to infrastructure; (2) permission to use or create OER; (3) awareness of OER; (4) capacity to find, use, create and/or upload OER; (5) availability of relevant OER of requisite quality; to (6) volition to adopt OER (Cox & Trotter 2017:154). However, Baas et al. (2019) found, in their context, that the pyramid did not sufficiently describe the sequence they observed. They concluded that 'the layer of availability must be lower in the pyramid as a prerequisite for teachers to explore their capacity and volition' (Baas et al. 2019:8). Furthermore, despite the value of describing some aspects of the process of OER adoption, there is some overlap and a lack of focus on pedagogy and the role of the context and especially students in the process in this pyramid. Yet, this provides a roadmap for OER adoption, whilst it is suggested here that elements of open pedagogy also be kept in mind of course.

As stated earlier, open pedagogy relates to the use of OER in terms of practice. Wiley and Hilton (2018:135) defined open pedagogy as 'the set of teaching and learning practices that are only possible or practical in the context of the 5R permissions which are characteristic of OER' (cf. Wiley 2013). One could probably also add assessment practices to this definition. In order to clarify the concept of the 5R permissions, David Wiley (2020) describes the 5Rs (cf. Wiley & Hilton 2018) as follows:

- Retain – the right to make, own and control copies of the content (e.g. download, duplicate, store and manage).

- Reuse – the right to use the content in a wide range of ways (e.g. in a class, in a study group, on a website and in a video).
- Revise – the right to adapt, adjust, modify or alter the content itself (e.g. translate the content into another language).
- Remix – the right to combine the original or revised content with other material to create something new (e.g. incorporate the content into a mashup).
- Redistribute – the right to share copies of the original content, your revisions or your remixes with others (e.g. give a copy of the content to a friend).

Hence, in terms of content for and by students and teachers, the 5R permissions should also be considered in the selection of content to reuse and create the original content.

Locally, there has been great interest in OERs in research (Cox & Trotter 2017; De Hart et al. 2015; Lesko 2013) and also from government. As regards governmental initiatives, the Open Learning Policy Framework for Post-School Education and Training (PSET) also supports the use of OER and committed itself to development of appropriate policies, practices and support of an appropriate licencing framework (DHET 2017:396–397).

Despite the admirable goals set in this document, not much has happened in this regard. As the document was published for public comment in 2017, no further developments have taken place. It is essential that this type of policy framework be put into practice in order to facilitate further use and development of OER in South Africa. Consequently, these steps need to be revisited and implemented. In addition, the openness agenda related to OER and open pedagogy should be embedded in teacher training and the wider academic context.

In this chapter, the use of OERs is specifically considered in terms of student-centred pedagogy and ultimately how this would impact efforts to decolonise the curriculum.

Framing student-centred pedagogy for demiurgic decolonisation

The need for increased student-centred pedagogy – especially in respect of using OER – is clearly expressed in the literature (Gunness 2012). It is essential that teacher education is informed by diverse views to oppose bias towards views from the West and Global North. In this regard, OERs 'have the potential to change teaching in HE by providing access to a diverse collection of resources, information and practices' (Baas et al. 2019:1). In addition, UNESCO (2019) supports the development of 'a global pool of culturally diverse, locally relevant, gender-sensitive, accessible, educational materials in multiple

languages and formats'. To this end, this chapter proposes a demiurgic approach to decolonisation.

The use of OERs can provide opportunities for student involvement. In this respect, Lesko (2013) noted that OERs:

> [*A*]re particularly useful in a context where there is a scarcity of content in certain subject areas, or in their efforts to encourage a more learner-centered approach by helping students develop skills needed in order to evaluate appropriateness of online content. (p. 116)

Through the use of quality-contextualised OER, the available content can be extended and repurposed for the specific needs of teachers. Teachers need to acquire the necessary information literacy and critical thinking skills in order to find and determine the appropriateness of resources. Similarly, should students also be supported in order for them to use such skills not only in the educational context but also in life.

Within the context of this chapter, student involvement extends beyond consuming content but also producing it. In this regard, Butcher (2015) made the following statement:

> [*T*]he principle of allowing adaptation of materials provides one mechanism amongst many for constructing roles for students as active participants in educational processes, who learn best by doing and creating, not by passively reading and absorbing. (p. 13)

Such a student-centred approach would require adequate support, but especially active creation of opportunities for students to create resources. Similarly, COL (2015) also supported student participation with OER and made the following statement in this regard:

> Academic staff can be encouraged to use student feedback on OER to improve their own materials and encourage students to publish and contribute to OER. Students can be encouraged and supported in seeking and using OER for the purposes of self-directed study and, at the more advanced levels, for developing their own curriculum/courses of study. (pp. 10–11)

Therefore, only through adapting pedagogical strategies and assessments to be supportive in involving students beyond consuming resources but rather playing an active role, this ideal can be reached. It is acknowledged that this may be performed in certain contexts; however, more can be done to promote such an approach to the classroom and affording opportunities for wider student agency and involvement. In this context, the content needs to address the needs of a decolonised curriculum through engaging with existing paradigms and theoretical aspects.

In addition, COL (2015) maintained that:

> [*S*]tudents can make a significant contribution to increasing the use of OER by publishing their work (preferably under the guidance of academic staff and within institutional protocols) under an open licence. (p. 12)

Here, the importance of both lecturer guidance and the use of appropriate licences is evident. Not only does this approach allow for education students to have agency and a voice in the HE curriculum, the generation of knowledge for the educational context is in fact something they need to be able to do in practice as teachers.

Localising the OER content in culture and language is essential and, to this end, UNESCO (2019) recommends that states support 'OER stakeholders to develop gender-sensitive, culturally and linguistically relevant OER, and to create local language OER, particularly in indigenous languages which are less used, under-resourced and endangered'. OERs are not necessarily available in many different languages, especially online (Mac Lochlainn et al. 2020; Oates 2009). With reference to the African context, Oates states that mainly English content is produced. However, Mac Lochlainn et al. (2020) showed how OER, such as a massive open online course (MOOC) in this case, can be a successful carrier and promoter of (minority) languages and cultures. Therefore, language should also be considered as an important variable when it comes to decolonising the curriculum. However, there needs to be incentives for OERs to be translated; however, essentially this could potentially be driven by grassroot efforts to create content in languages appropriate for different contexts. In addition, students' language skills may need to be considered in this context; however, such a translation process of OER can in itself – with sufficient scaffolding and support from language practitioners – be a learning opportunity.

The literature shows that although OERs are widely used, the adaptation of these resources is not so common (Baas et al. 2019; Cox & Trotter 2017). According to Baas et al. (2019:8), this is especially 'due to time restraints and a lack of skills'. Hence, relevant technical and information literacy skills will have to be developed, and teachers need to be informed of the affordances of localised resources. As stated earlier, students should not just be consumers of knowledge but also be active creators of knowledge. But similarly, teachers should not just be consumers of OER, but also be active creators of OER. However, for both groups, this implies certain literacies.

One of the ways to support student involvement in the creation of OER is to foster metaliteracy (Mackey & Jacobson 2011). This approach is highly relevant as 'metaliteracy prepares individuals to actively produce and share content through social media and online communities' (Mackey & Jacobson 2011:76). Importantly, Mackey (2019:1) stated that a 'metaliterate learner is a critical consumer of information, continuously developing effective questions, verifying sources of information including authorship, and always challenging his or her own biases through metacognitive thinking'. However, with learner's role as a producer within metaliteracy, the emphasis is not just on using the content but also creating it and then also doing that ethically. This issue is also

evident from the following four goals of metaliteracy (Jacobson, Mackey & O'Brien 2019):

- actively evaluate content whilst also evaluating one's own biases
- engage with all intellectual property ethically and responsibly
- produce and share information in collaborative and participatory environments
- develop learning strategies to meet lifelong personal and professional goals (pp. 6–7).

Importantly, the role metaliteracy can play is expressed as follows by Jacobson et al. (2019):

> Metaliteracy offers a pedagogical model to pro-mote an approach that goes beyond technological solutions, with open learning re-sources that may be adapted to a wide range of learning environments, from formal to self-directed. (p. 6)

A further important aspect within metaliteracy is the learners' roles that students can fulfil within this framework. According to Jacobson et al. (2019), these roles include author, collaborator, communicator, participant, producer, publisher, researcher, teacher and translator. The metaliteracy as pedagogical framework can also be infused in the self-directed multimodal demiurgic learning cycle mentioned below.

This chapter proposes demiurgic decolonisation. In order to facilitate student-centred pedagogy, institutions need to ensure demiurgic access. According to Olivier (2020a:123–124), demiurgic access refers to 'the type of access for students that would make the circumstances optimal for them to be successful co-creators of knowledge and contributors to content'. Therefore, the need is expressed to extend formal and epistemological access in order to also promote further student agency. In this regard, a possible process to follow would be the self-directed multimodal demiurgic learning cycle (Olivier 2020a), which would allow student-centred resource-focused learning. This cycle commences with students entering an interdependence zone after which they actively set goals and select resources and strategies to ultimately contribute to a learning resource corpus after some form of evaluation (Olivier 2020a). The whole process is collaborative and can be facilitated by a lecturer or knowledgeable peer who acts as a facilitator. The cycle is also multimodal as the operationalisation of such a cycle might involve different modes of communication, learning and delivery within the dynamic technology-enriched HE landscape.

Demiurgic decolonisation, therefore, implies an inclusive process where students contribute to the process of decolonising the curriculum by contributing knowledge as active responsible content producers to the benefit of others. This aspect relates to the original sense of the word *δημιουργ*□*ς* or

dēmiourgos where students become a 'worker of the people' (Olivier 2020a:123). Hence, the focus is not only on including students and promoting student agency but also on promoting a communal approach to knowledge generation. As students become self-directed in the process, they can also become active contributors to the knowledge economy and acquire skills associated with the knowledge creation and curation processes, which may also open up opportunities outside of the educational context. However, a lot more research is needed in this regard, and existing relevant, good practices need to be described and investigated.

In the 'Recommendations' section, general recommendations are made, after which a framework is presented for practices with OER and student-centred open pedagogy towards demiurgic decolonisation of teacher education in South Africa.

Recommendations

From the review of pertinent literature, a number of broad recommendations can be made in support of the proposed framework in this chapter.

It is recommended that institutional policies should be supportive of the adoption of OER (cf. Baas et al. 2019; Butcher 2015; Gunness 2012; Lesko 2013), and should also incentivise and support the creation of OER by lecturers, and especially students. Moreover, the establishment of national policies supportive of the use of OER and, in this regard, building on the ground-breaking work already carried out with regard to the Open Learning Policy Framework for PSET could be beneficial. Hence, grassroots advocacy for open pedagogy with wider student involvement should run concurrently with the creation of policies supportive of such work. When a conducive climate for open pedagogy is created at school level, then the need will also be realised within teacher training.

Furthermore, the recommendation is made that in support of the decolonisation of teacher education, embracing African languages should also be considered. According to Olivier et al. (2019:315), technology could aid in the 'accommodation of indigenous languages as carriers of indigenous culture and knowledge'. Therefore, the nature and context of content, as well as language, should be considered throughout the process. This should potentially be performed in conjunction with language and lexicography experts. Care should, however, be taken on the language development and standardisation processes that are ongoing and still need to be supported. Teachers should also be aware of dialectal variations and be sensitive to which language or variety would be more appropriate for a specific class and where a more pragmatic approach may have to be followed in order to make sharing of resources across language varieties possible. Additionally, the affordances of resources for related languages in this regard need further investigation.

Whilst integrating more OERs into HE, the issue of being able to search effectively for relevant resources should be addressed. In this regard, Baas et al. (2019:8) observed that 'even though there are many available repositories in which teachers can search for OER, teachers are not specialists in finding resources'. Lesko (2013:117) also stated that '[m]ore research is also needed to understand which factors academics take into account when evaluating quality and appropriateness of existing OER'. COL (2015:9) further promoted the idea that academic staff should '[d]evelop skills to evaluate OER'. The selection process involves how the quality assurance of resources can be performed (cf. Butcher 2015). An important aspect in extending the adoption and use of OER is collaboration with libraries because of their expertise in being able to search, select and curate OER (Baas et al. 2019). In essence, a number of skills are involved here. Teachers (and students) need not only the adequate language, information literacy and digital skills just to access repositories and content but also critical-thinking skills and content knowledge in order to judge the value and reliability of resources.

Involving students in the creation of OER would also counter the problem of disposable assignments (Wiley 2013). According to Wiley and Hilton (2018), '[d]isposable assignments are those assignments that both faculty and students understand will ultimately be thrown away'. By transforming assessments to include reusable OER, students do not only learn through the creation of purposeful artefacts but also through engaging critically with existing artefacts from previous students. Such renewable assignments 'both support an individual student's learning and result in new or improved OERs that provide a lasting benefit to the broader community of learners' (Wiley & Hilton 2018:137). Wiley et al. (2017:62) highlighted that such assignments should 'provide a learning benefit to the student and result in OER that provide a lasting benefit to the broader community'. Hence, assessment can be a highly appropriate vehicle towards driving open pedagogy where student agency is central to the assessment as the learning process.

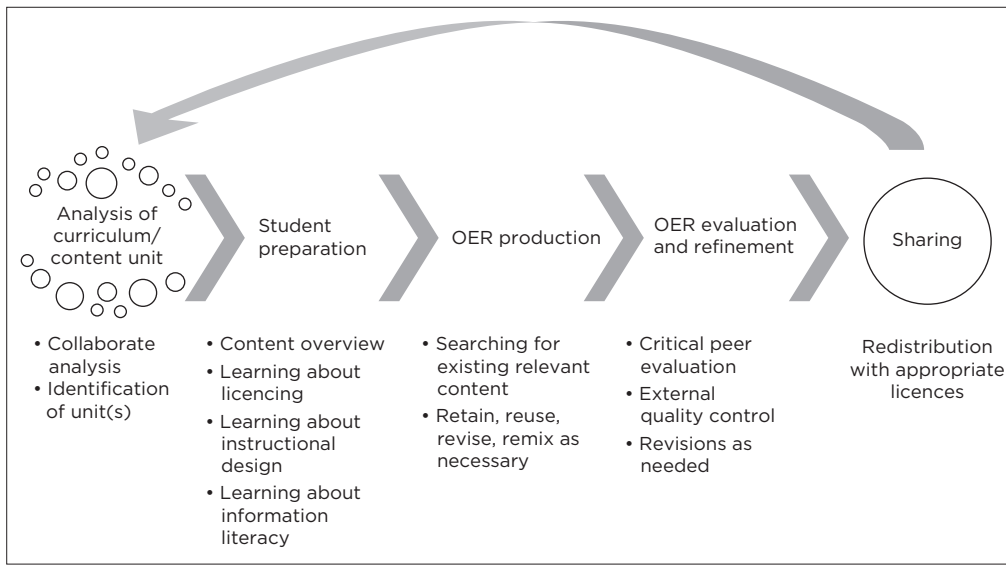
It is recommended that knowledge about OER, licencing (cf. COL 2015) and open pedagogy be recognised as essential aspects for teacher education. The lack of information in this regard in documents such as the *Revised Minimum Requirements for Teacher Education Qualifications* (DHET 2015) emphasises the problem. However, the Creative Commons (CC) licence framework (Butcher 2015) provides a clear and easy way to add licencing to works created by students and lecturers. Consequently, resource management and licencing will increasingly become important for teachers and student teachers in the context of the 4IR.

There is a myriad of resources available for institutions and governance structures in HE to build on in order to implement or extend the use of OER. This includes not only locally produced documents (cf. DHET 2017) but also

works by UNESCO and COL (cf. Butcher 2015; COL 2015; Glennie et al. 2012; Miao, Mishra & McGreal 2016; UNESCO 2019). In addition, there are already researched practices to draw on, such as the participatory action research carried out with pre-service teachers in creating OER (Sharma 2014) and research that reported on postgraduate students collaborating in creating OER (Hodgkinson-Williams & Paskevicius 2012). However, further coordination of such research efforts and wider participation across institutions nationally and regionally can support a clearer understanding of open practices.

A final recommendation, based on the discussion in this chapter, is a framework for student-centred open pedagogy. The framework (Figure 9.1) presented in this chapter serves as a summary for practices with OER and student-centred open pedagogy towards demiurgic decolonisation of teacher education.

From the framework, five phases are identified to support demiurgic decolonisation of teacher education. Firstly, a collaborative analysis of the existing content is carried out by the lecturer in collaboration with students to determine the needs as regards what content should be changed or supplemented. Hence, this first phase requires some pre-knowledge on the side of the students, as well as pedagogical and content expertise of the teacher as facilitator. Ideally, in terms of instructional design principles, all relevant stakeholders should be included (cf. Branch 2009), especially within



OER, open educational resources.

FIGURE 9.1: Framework for practices with OERs and student-centred open pedagogy towards demiurgic decolonisation of teacher education.

the broader educational and cultural context relevant to the identified unit or module. Consequently, in this initial phase, experts from the field – in this case, teachers – can also be consulted as they are in the position to determine what is needed and relevant in practice. However, in a wider sense, the wider community can be involved through student engagement in their own contexts.

In the second phase, students are prepared to contribute to OER production through providing opportunities for them to learn about the relevant content, licencing (such as the CC framework), very basic instructional design principles, as well as information literacy in order for them to be able to search for OER in OER repositories and elsewhere online. The content overview in this step not only draws from the first step's interactions with others and the community but also involves going through existing sources critically. It is important that already in this step, the focus is on OER and not just the commercial content. In this phase, many of the principles of metaliteracy – as mentioned earlier in this chapter – also come into play as students need to have the skills to contribute to the content generation process. In this regard, students are actively engaged in communicating through different media, including online technologies, and in translating, and in this case also localising and acting as authors bringing in their own voices (Jacobson et al. 2019). Furthermore, as producers of knowledge who research and collaborate, they can become ethical publishers of such content and in themselves fulfil a teaching role (Jacobson et al. 2019).

In the next phase, students carry out collaborative searches for the existing relevant content. Thereafter, they can then retain, reuse, revise and/or remix the content as necessary or even create a new content with the support of the lecturer if needed. This phase could also potentially include the accommodation of other languages. However, although it is sensible to draw on students' own language skills, it is essential to be aware that translation is a specialised skill, and in certain disciplines, new terms might have to be created and standardised. In such cases, outside consultations would be necessary.

Before the OER can be shared, there must be an evaluation and refinement phase. Here, students act as peer reviewers, after which a lecturer or teaching assistant can do external quality control of the content. Such an external process can, for example, also involve knowledgeable experts or keepers of indigenous knowledge, depending on the nature of the content. Only then the content can be revised and finalised. This phase is essential in order to ensure quality and also links up with the idea that assessment can, indeed, become the learning process in itself. Aspects of this phase can be performed in the form of peer assessment, and consequently, this can be a point where students

can upfront generate assessment rubrics in collaboration with the lecturer so that the students' involvement is limited to not only the content generation but also the wider teaching, learning and assessment process.

In the final phase, the OERs are redistributed and shared with others with appropriate licences. However, it is also important to note that this process can be repeated and should not be considered a once-off stage. Ideally, this content creation as learning can be embedded in the learning process of a module, thus making the demiurgic decolonisation process an ongoing endeavour. Such an approach could also counter the phenomenon of disposable assignments. Furthermore, such an approach would provide teachers with invaluable skills towards curating and creating content for their own classes in a contextually relevant and subject-embedded manner.

Conclusion

The affordances of OER for the decolonisation of the curriculum are evident from the discussion in this chapter. The recommendations made within this chapter should be regarded in the following statement from UNESCO (2019), in which member states are encouraged to address the following:

> [*T*]he inclusion of OER in transforming education, adjusting, enriching or reforming curricula and all forms of learning so as to exploit OER potentials and opportunities, and encouraging the integration of different teaching methods and forms of assessment to motivate the active use, creation and sharing of OER; and assessing the impact of OER on inclusive and equitable quality education. (p. 7)

In order to transform education through OER needs wider uptake and creation of contextualised OER by and for the South African teacher training context, and such a process starts by allowing student teachers work with OER in-depth and also not only consume but also produce OER. To this end, South Africa needs metaliterate teachers who are comfortable to function within the context of open pedagogy whilst acknowledging the need for and promoting demiurgic decolonisation in their own classes.

This chapter considered the affordances of OER and student-centred open pedagogy for the decolonisation of teacher education in South Africa. A decolonised curriculum prompts the need for the inclusion of student voices. This can be performed by student-generated content. Moreover, it is clear from the wider policy context and the literature on OER that students can contribute effectively to the creation of content through using such resources and implementing open pedagogy. However, this requires a suitable policy context, support in terms of technology, as well as fostering of information literacy and ultimately embracing metaliteracy as a

pedagogical framework. This chapter concluded with recommendations to support student-centred open pedagogy towards demiurgic decolonisation of teacher education.

It is clear that OER and student-centred open pedagogy can contribute positively to the decolonisation of teacher education in South Africa. However, this would not only require a conducive learning environment but also institutional and national policies supportive of such undertakings.

Chapter 10

Teacher education in the melting pot: Closing thoughts to the Fourth Industrial Revolution and decolonisation in higher education in South Africa

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Abstract

In this final chapter of this book, we attempt to provide a critical analysis of the key conceptual ideas of emerging discourses of the 4IR and decolonisation. We argue that the emergence of these two ideological orientations has the

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potential to influence the needed transformation but the fact that they also diverge in their purposes and assumptions has the potential to exacerbate epistemic violence. We utilise the available literature to explore and understand challenges and potentialities of the two discourses in transforming HE spaces. We further summarise the main arguments, methodology of the preceding chapters in trying to yield the potentials and barriers of the two discourses in transforming HE sectors.

Introduction

Ideologies have the power to transform societies, systems and their organisations (Jones & Jones 2004). At the dawn of democracy in South Africa, we witnessed the demise of the toxic ideology of apartheid through which the white settlers-maintained power, privilege and differentiated access to the nation's resources over the local population, who, for all intents and purposes, were second-class citizens in their own country of birth. In 1994, the new government introduced a democratic dispensation based on principles of equality, non-discrimination and non-segregation through which society, systems and organisations were to be reimagined and redesigned (Badat 2010).

In 2015–2016, with a deep sense that the intended changes which democracy promised were slow in coming, and that despite the change of guard, the legacy of apartheid was still alive and well in all aspects of life in the country and especially in HE. Through the UCT-led #RhodesmustFall and the WITS-led #FeesmustFall, the ideology of decolonisation occupied the centre stage in the HE sector in South Africa. It has now been almost 6 years since the student led protests began in 2015-2016, and despite the individual efforts of staff who carry out research studies on decolonisation, there does not seem to be a national policy framework for the decolonisation of universities in South Africa. Within the universities, decolonisation does not really enjoy strategic prominence, both in terms of being a senior leadership portfolio and in terms of its absence in the strategic visions and mission statements of the universities (Okeke-Agulu 2015). We shall return to this matter later in the chapter.

However, the 4IR is the next stage of the world's developmental process after the preceding three industrial revolutions (Schwab 2015). The 1IR was driven by developments from the steam engine, which revolutionised transportation and change from human- and animal-driven labour activities; the second IR grew out of developments in science and engineering as electricity became the basis of progress and change; the third IR was propelled technological developments, the applications of the world wide web (www) and the Internet. The current 4IR is the product of increasing digitalisation and automation, the dehumanisation of work through increased use of robots, AI, three-dimensional (3D) printing, amongst others. The emergence of the

4IR appears to be a seamless transition from previous IRs because of improvements in science, technology and increasing digitalisation.

From the chapters in this book, we identified eight themes that appear to characterise the 4IR and decolonisation, which have substantial potential to change the direction of teacher education into the future.

A focus on 21st-century skills

The so-called 21st-century skills (Stauffer 2020) are based on certain realities. Whereas finding information was a difficult process in years gone by, involving spending hours in the libraries reading prescribed texts from books that disappear from the shelves as soon as the lecturers prescribe them; having to travel long distances to study at universities with the best collections of reading materials; and having to rely on the librarian to arrange special lending processes with other libraries in order to make information available amongst other inefficient and time-consuming ways of accessing information. Today, any smart device, as long as it is properly connected via wireless, digital or fibre to the Internet and the www, can literally allow one to search for and access any material and resources needed to accomplish an academic or learning task. The following are the key 21st-century skills that are frequently discussed:

- creativity and innovation
- communication and collaboration
- research and information
- digital citizenship
- research and Innovation.

Creativity and innovation

Creativity is about thinking outside the box, defying conventions and utilising problem-solving skills to learn new things every time. Innovation is a continuous search for the most effective and efficient solutions to the problems and challenges of life.

Communication and collaboration

In a world of extreme interconnectedness, the ability to use more than one's home language is of critical importance. The tendency to migrate, either forcibly or out of own volition, has increased as the notion of global citizenship is rapidly becoming of greater currency and utility. In major cities of the world especially, the demographic composition of classrooms has become so diverse and multicultural. The most efficient teachers of the future will be those who

are capable of effective communication with their students from a variety of cultural and social backgrounds (Prozesky 2000). Both as a subject on the curriculum and as a life skill, communication will be at the heart of 21st-century living. Collaboration, however, recognises the need for working beyond disciplinary boundaries, understanding the world from multiple perspectives and an appreciation that the best solutions for today's challenges go beyond specific contexts to connect with global locations.

Research and information

Research will have to be taught more broadly outside the current confines of postgraduate study. Twenty-first-century teaching and learning will no longer be about solving standard textbook problems but will require a knowledge and understanding of broader problem-solving skills integral to the knowledge and applications of research. Equally, there is an abundance of information on any subject. The skills required to select, retrieve, store, apply and utilise information (Jenkins 2006) are now more important than the information itself.

Digital citizenship

The world has certainly become digitised (Buchholz, DeHart & Moorman 2020), with becoming digitally literate being no longer an option. This implies capacities in protecting private information, respecting other users and themselves, skills to recognise and deal with cyberbullying, respect copyright and intellectual property, managing one's digital footprint and working safely on the Internet are some of the skills required by all 21st-century digital citizens.

Research and innovation

Research should not just be about discovering new knowledge but also be used to create unique and creative solutions to both new and old problems, and above all offer ways of interrogating some of the most intractable challenges this world is facing.

At the heart of these five dimensions of 21st-century knowledge bases is the idea of critical-thinking skills, so called because they are aimed at developing inquisitive mindsets, which do not just accept other people's bright ideas but always question them in order to determine better ways of imagining the world (Jenkins 2006). Whilst these arguments resonate with developments across the world, in parts of the world, such as in many less developed countries and especially countries emerging from oppressive historical contexts such as post-colonial nations, the question of the digital divide invites us to ponder for whose development the 4IR is actually meant.

The digital divide

The research study reported in this book clearly shows that in societies blighted by wide socio-economic differentials, the 4IR may be a discourse that benefits the privileged as the poor people increasingly get pushed to the peripheries (Bornman 2016). South Africa is one of the most unequal societies in the world, '[w]ith a Gini coefficient of 0.65, higher than all SADC countries' (Bosch et al. 2010:8) and way above the 0.2 level considered to represent a near-perfect and equal society, South Africa has the largest wealth differentials in the whole world (IMF news 2020). Income distribution is highly skewed, leading to unequal access to resources and more importantly to opportunities. There are also very wide regional disparities in wealth within the country (Bosch et al. 2010).

The notion of the digital divide is complex and multifaceted. It, however, tends to trace the contours of poverty-induced inequalities, which, to a very large extent, reflect warped beliefs about racial differences between people of different races and skin colour. In South Africa, as indeed in many other parts of the world, the digital divide manifests in four main ways (Van Dijk & Hacker 2003). First is physical access, which in simple terms defines people's proximity to enabling technologies and digital infrastructures. Many less-developed nations have large rural spaces with minimal technological infrastructures where large populations sometimes representing the majority of the citizens live. Second is the economic access, which represents the differences in access to economic capital by different groups in society. Technology is a financially intensive commodity or resource, and those who live in conditions of relative poverty and deprivation, who in South Africa represent the majority, tend to consider investing in technology and digital capacities a luxury that comes way down low their priorities of life (Van Dijk & Hacker 2003). As a consequence, most research studies on technological uptake in South Africa show that low-income families have lower use of the Internet and of mobile devices; that gaps in use are also manifested along gender lines, implying that female students may be at greater risk than male students in terms of technological uptake and access; considerable gaps also exist between population groups, educational levels and location, which require differentiated attention especially, as teaching and learning are increasingly moving to online delivery formats rather than face-to-face modalities during the current COVID-19 pandemic. The third form of access is cognitive or mental access. This represents the inert capabilities that make navigating the technological and Internet terrains feasible. Again low-income families tend not to possess the social and material capital, which facilitate inherent capacities to utilise the new technologies.

The language of technology and the Internet can also cause cultural dissonance in low-income family households. For example, a mouse can be

seen in terms of the small troublesome household animal, which plays hide and seek with human occupants, leaving a trail of all sorts of destruction in the home. The same term is used for one of the most enabling features of technological devices in use on computers, laptops and desktop computer devices. The language of technology and the Internet can be quite complex and intimidating, and can constitute a formidable barrier to access for large segments of the population (Bornman 2016). The fourth dimension of the digital divide is the risk associated with carrying a technological device in public. Townships are generally the worst, closely followed by downtown areas in the large urban precincts. Using a mobile phone in public carries a huge risk of becoming a victim of crime. Anecdotal evidence suggests that people in townships and low-class areas of the cities tend to switch off their devices and keep them out of sight for as long they are in these areas reducing access to technological capabilities for these people. During the early stages of the current COVID 19 pandemic, almost 80% of students at the WITS School of Education where the authors work, who reported lost or stolen devices, were either from townships and other high-density settlements or rough areas of the cities.

The notion of the digital divide thus offers a window through which issues of equality and inequalities in access can be foregrounded and discussed. The realities and impacts of this phenomenon have serious implications at multiple levels of government, institutions, policy and even classroom pedagogical levels. The rise of technological, digital and Internet use has tended to exacerbate differences in epistemological access amongst university students and learners in schools, an issue that generally pervades the chapters in this book.

Equality, equity and epistemological access

Creating an equal society was the major reason black people in South Africa, and in many other parts of previously colonised world engaged in struggles for independence and democratic rule. The Constitution of South Africa places this creation of an equal society as its highest ideal. To a large extent, the physical dimensions of equality, such as the creation of unified structures for the management of education provision and the overarching policy frameworks that seek to dismantle all forms of discrimination in society and its organisations were the most visible signs of the intention to achieve an equal society post-1994 in South Africa. This was followed by unprecedented expansion of educational facilities allowing the widening of participation in education, at all levels especially to those segments of society that were previously disadvantaged and marginalised. However, these achievements mainly appear on the surface.

Below the surface of society is a festering wound, which has not healed yet, a wound so deeply inflicted through hundreds of years of colonial and

apartheid rule. For example, despite the increased participation of formerly disadvantaged learners, measured in terms of access and admissions to learning institutions, every piece of evidence available shows that these new entrants are marginally benefitting from education. Previously disadvantaged learners comprise the biggest proportion of those who fail to complete their educational cycles; who drop out of the system before completion of designated cycles; who, if they achieve success, tend to do so with relatively lower grades; who do not ordinarily progress to higher levels of learning; who take longer time to complete their educational cycles through repeating necessitated by inadequate evidence of achievement; who tend to proceed to low paying and largely technical jobs at the bottom of the career ladders and who constitute the highest percentage of learners who experience mental breakdown and other related illnesses because of the pressure caused by an increasingly alien educational system. These are manifestations of a highly unequal system of education whose benefits are distributed unequally, often on racial and class lines. The question then is, how might the 4IR help to reverse this trend. Available evidence suggests that, in the current circumstances, perhaps, only to a limited and insignificant extent.

Whilst equality speaks to evenness in the distribution of the resources and opportunities created through education, equity provides a deeper level of analysis, which speaks to the fairness implied in equal treatment (Fiske & Lard 2005). The uneven distribution of resources, the prevailing circumstances of poverty and disadvantage afflicting large proportions of society in South Africa, wide differentials of wealth along the contours of race and class, all combine to depress the epistemological access of previously disadvantaged and marginalised students in our learning organisations.

Whilst Morrow (2009) contributed immensely to a need for moving beyond physical access to epistemological access, we believe that there are two flaws in his argument. The first is to assume that physical access is not a part of epistemological access. Especially in this information-rich society, students have the potential to access knowledge in schools even without teachers. The second flaw in the argument is that all knowledge that schools teach is worthwhile. We disagree with this assumption quite strongly and argue that this belief has led to very little if any change in the post-colonial curricula in educational institutions of South Africa and in other parts of the previously colonised world. We think that the question, what knowledge is worth teaching in schools is not given sufficient attention in our educational institutions. In order to facilitate the bridging of this gap, we have argued elsewhere that three spaces of the past, the present and the future constitute legitimate areas for selecting the knowledge of the most worth in our educational institutions. The past holds knowledge about traditional and indigenous systems, not just about South Africa but also about selected areas and regions of the world. It is also a source of learning about the true intentions and purposes of colonial

education systems, again not just in South Africa but also in other regions of the world. The present speaks to the need for changing the disciplinary organisation of school learning, which tends to reify knowledge and the need for opening up disciplinary knowledge boundaries through a reformed curriculum that opens up spaces for imagining the world in different ways. However, the future deals with developing institutional and individual capacities of students to predict, transform and imagine the world beyond what it is today, through research, problem-solving, collaborative learning, and critical thinking and learning, and the development of digital citizenship skills.

All in all, we suggest that the understanding of epistemological access should be expanded to include three dimensions, relating to physical access, cognitive access and access to worthwhile knowledge. It is in doing this that we see confluence of the ideas of decolonisation and those of the 4IR. The final theme emerging from these chapters is the notion of the myths of the 4IR to which we briefly turn.

The myths of the Fourth Industrial Revolution

This theme was amply discussed in Ian Moll's chapter but is frequently though subtly mentioned in other chapters too. Several myths about the 4IR have been identified. We focus on one of these here as it is the one that seems to cause the greatest consternation in the academy: the myth that the 4IR will result in the dehumanisation of careers.

The argument is frequently presented that because of the increasing developments around AI and robotics more commonly called intelligent or smart machines that many jobs are going to be lost creating high levels of unemployment, especially amongst low skills and unskilled labour segments of the working class. As Kurzweil suggests, over the next couple of years, virtually all routine physical and mental work will be automated. This does now suggest that human agency, intelligence and desire for continuous improvement will be made redundant. In education, for example, learning is not simply about repeating what other people have already discovered but it is also about, and more importantly we would suggest, a continuous process of increasing and deepening our understanding. Machines can be helpful, but only in so far as they are enabled and designed by humans to do so, and once they are commissioned, any change of thinking and alteration of the status quo will be rejected as an error. Human intervention and mitigation will forever be essential in the educative process. Similarly, although there are now programmes that can assess essays, they do not have the sixth sense to judge whether what may look and sound to be off topic in an essay might still be worth different sets of judgemental outcomes. We all recall the few times when our teachers went off the script to pass essays, which had been so well

and interestingly written despite not having answered the prescribed question, which robots are incapable of do. People displaced from their jobs will be required to reskill in different areas in order to enhance systemic self-improvement on an ongoing basis. Turning this myth on its head, we could say that the automation and robotisation of careers will propel organisational self-improvement as people learn new skills beyond the traditional ones.

Social and cognitive justice

A major task not only for South Africa but also for most of the African governments 'was to promote racial equity in the state of education systems' (Fiske & Lard 2005:97). Prior to 1994 in South Africa, education provided benefits along the lines of race. As a result, the discourse of decolonisation has the ambition to spread the benefits of education to a wider group of people, thereby promoting social justice. Social justice is the redistribution of the cognitive capital that any country wishes to develop amongst its citizens to all the citizens rather than to select groups of students as was the case in the colonial eras (Fraser 2009). Whilst universities have, to a large extent, achieved the issues of social justice in extending the benefits of education to a larger number of people, the issues of cognitive justice have barely been of focus in HEIs. As discussed in the previous section, we found that many countries in Africa have succeeded in establishing racial equity as equal treatment primarily through race-blind policies. We, however, noted that aspects of cognitive justice and worthwhile knowledge are under-researched; yet, they also form a significant part of epistemological access. Thus, we further discuss the two concepts in the quest to flesh out their significance in aiming to achieve social justice in HE.

The concept of cognitive justice is based on the 'recognition of plurality of knowledge and expresses the right of the different forms of knowledge to co-exist' (Schulte 2020:250). Hargreaves et al. (2002) argued that in order to accommodate other forms of knowledge, the curriculum should go beyond school subjects and standards. Schulte (2020:12) defined the concept of cognitive justice as a 'normative principle for the equal treatment of all forms of knowledge'. On one hand, cognitive access compliments but goes beyond physical access in promoting effective learning across the curricula disciplines, ensuring the attainment of high learning outcomes as in obtaining good grades, desire to persist and not to prematurely curtail learning journeys, and the promotion of a deep sense of progressing to higher levels of learning in and across the different levels of schooling. Overall, the record in promoting cognitive access has not been encouraging in South Africa, as the figures for outcomes, persistence and progression have tended to trace the contours of race and ethnicity across most educational institutions in the country.

On the other hand, there is an emerging type of epistemological access, which specifically requires educationists to ask the question of what knowledge is of most worth in education. Whilst we appreciate that a number of HEIs are gradually responding to the 'call for a 21st century knowledge framework by identifying the student knowledge necessary for living and learning' in the 21st century, we feel that there is still much to be carried out concerning the relevance of knowledge in the students' contexts (Kereluik et al. 2013:131). For example, calls for the decolonisation of education require institutions to rethink the nature of knowledge, which seeks to liberate individuals from the bondage of the colonial experience which appears to persist despite the demise of former colonial influences (Ndlovu-Gatsheni 2019, 2020). Essentially, decolonised education seeks to interrogate the persistent coloniality of knowledge, of being, and cultural and linguistic preferences, and of people's dreams about what a worthwhile life is all about. It seeks to interrogate the tendencies to place a higher value on everything from the West and to refocus people's attention towards building local IKS, which have the potential for improving people's lives in significant ways.

The issue of cognitive justice has also been discussed extensively by Henderson, Selwyn and Aston (2017), and they paid particular attention to how the adoption of ICT is central to the world of work and remote teaching and learning; yet, the students and the teachers lack digital competencies. They further argue that whilst the attempts are made by education institutions to provide digital access to students, they think that in order to achieve cognitive justice, there is a need to understand digital learning, as well as the interplay between technological advancement and instructional delivery. Dlamini and Nkambule (2019) mapped the digital technology affordances against the four key principles for learning: 'autonomy, connectedness, diversity and openness' (Cain & Fanshawe 2020:6).

The widening of participative agenda

Before 1994, some HEIs in South Africa seem not to value social inclusiveness of various groups in higher education, particularly people from disadvantaged backgrounds. Despite the call to widen participation in HE in post-apartheid, access and widening participation have been problematic and difficult to sustain, especially with students from poor and under-represented social backgrounds. During the apartheid era, provision of HE followed the contours of race, with 86% being white students and only 14% being black students. The 'apartheid system created educational inequalities through overt racist policies' (Fiske & Ladd 2006:98). Racial classification was the foundation of all apartheid laws. It placed individuals in one of the four groups: 'native, coloured,

Asian or white' (Ndlovu-Gatsheni 2015:489). All people were identified as either whites or non-white people.

As 'these policies ensured that the content and amount of education perpetuated social inequalities, changing these policies in a post-apartheid era was the logical step towards social equality' (Fiske & Ladd 2006:101). The situation has now been almost reversed where we have more or less 90% black students in the universities and almost 10% white students, which is more reflective of the population dynamics of the country. Between '1994 and 2014, the number of black graduates with degrees being produced each year more than quadrupled' (Fourie 2017:61). However, despite the efforts made, disparities in cognitive access as well as access to worthwhile knowledge still exist, especially with most of the black students of the rural and township schooling background in basic education. The disparities are exacerbated by lack of funding, which has a huge impact on the quality of education just like what happened in pre-democracy. The idea of integrating all races was a noble one; however, it was not totally achieved because those who come from low socio-economic backgrounds cannot fund their education, and thus, the participation gap remains apparent. The progress made, to date, has been still viewed as insufficient to the needs of the country and its black majority population, and the education system is still, by any objective standard, failing both students and the country. Deep divides between the country's top-performing and lowest level institutions remain, as do overwhelming gaps in the rates of white and non-white people who obtain HE degrees (see Macha & Kadakia 2017) The divides had led to simmering resents that manifest through universities protest of opposition to rising tuition as seen in the #FeesMustFall movement to physical reminder of South Africa's colonial past in the #Rhodesmustfall movement (cf. Mpofu 2017).

In Chapter 9, Olivier brought a dimension of how participation in HE can be broadened in order to promote full participation, especially to those who were previously denied the rights to participate. He seems to be arguing that in order to avoid the destructive protest by students, as in #FeesMustFall and #rhodesmustfall, we should prioritise and incorporate student voices, especially in decision-making on issues that affect them as students. Consequently, he explores the affordances of OERs and student-centred open pedagogy as resources that can be used for teacher education. For him, open pedagogy is not only the practice of using OERs in teaching and learning but also a means of facilitating greater participation by students. Thus, he argued that students can be empowered to utilise and ultimately revise and create OERs within the context of communal constructivism. His main contribution is a framework for practices with OERs and student-centred open pedagogy towards the decolonisation of teacher education in South Africa.

The physical transformation versus the cognitive or epistemic transformation in higher education

More has actually been achieved on physical access and not much on cognitive access (Van Dijk 2017). For example, dropouts and progression episteme trace race and the previous structure of apartheid, and therefore, cognitive transformation has not been thoroughly dealt with in HE; yet, decolonisation is a discourse of redress of and emancipation from the past stolen through the selfish motives of the colonisers (Ajam 2019). It can be argued that universities in formerly colonised spaces are more concerned with righting the wrongs of the past, and their focus includes issues of transforming the knowledge bases of university curricula, the reduction of persistent inequalities in HE and the improvement of physical, cognitive and worthwhile knowledge access of students, especially those from previously marginalised communities. Moreover, its focus is on the removal of vestiges of colonialism that remain in practices, systems, symbols and structures of universities in the post-colonial dispensation. This chapter specifically focusses on two forms of access, namely, cognitive and worthwhile knowledge access, as vital in understanding how decolonisation and the 4IR converge in promoting epistemological access.

Ajani and Uleanya in Chapter 8 argued that whilst we have witnessed substantial physical transformation in education, a lot still needs to be performed to promote cognitive access so as to achieve epistemological access. They further argued that in order to achieve epistemological justice, teacher education in HEIs should prepare prospective teachers – the pre-service teachers, with the necessary training for desired educational goals. Thus, even in the midst of both the 4IR and decolonisation, teachers have an important role in developing learners who can responsively fit and relevantly develop their immediate environments. Thus, we argue that the Western ideologies like the 4IR may be adopted, and made useful and converge with the principles of African HE as well as decolonisation. For them, decolonising teacher education involves making students become aware of the realities around them, as the teacher educators become flexible in classroom teaching for the desired change in the society.

The notion of coloniality

Most of these issues are exemplification of the deep coloniality of the South African HE system, which needs transformation, and this will take us to an Afro-global kind of transformation. The concept has the view that colonial societies have systematically banished indigenous forms of knowledge from their archives, and the indigenous people have accepted and internalised the

operation to such an extent that they remain caught in the coloniality mindset (Quijano 2007). However, some scholars, for example, Maldonado-Torres (2011) and Ndlovu-Gatsheni (2015) emphasise the decolonial turn, and argue that colonial theories should be replaced with indigenous concepts, which can be fruitful in the efforts to unhinge the modern colonial system. The chapters of this book are united in the quest to turn away from coloniality to decoloniality. In this chapter, we argue for an Afro-global kind of transformation that integrates different kinds of knowledge relevant for an African nation to be appropriate in both the continent and the globe.

In Chapter 7 of this book, Charamba argues that the notion of coloniality is deep rooted in HE system to such an extent that colonial power is perpetuated through self-colonisation. Charamba's argument has specific focus on decolonising the language of learning and teaching. He contends that the curricula of African countries show that they are still largely Eurocentric following the monolingual ideology of 'one nation, one language', with foreign languages being the lingua franca for these multilingual societies. This in itself shows a lack of understanding on what decolonisation entails. According to Charamba, the movement away from self-colonisation and coloniality involves the incorporation of epistemic perspectives, knowledge, thinking and languages from the African continent.

Revisiting the notion of convergences and divergences: What is the way forward?

As argued earlier, ideologies have the power to drive transformation in quite significant ways. However, when two powerful ideologies occupy the same physical and epistemic space, there is a need for great caution. We end this chapter, and hence, the book first with an analysis of the ideological convergences and divergences as a prelude to our proposal for what we call an Afro-global episteme which has the potential to harness the purposes the two ideological positions present (Leader Maynard & Mildenberger 2018).

Table 10.1 provides a snapshot of key comparisons between the core assumptions, values, purposes and philosophical bases of the 4IR and decolonisation. The weight of the evidence seems to suggest that there is a stronger likelihood that the 4IR will be more readily accommodated, with higher chances of adoption within the South African HE sector. We hypothesise that this would be the case in other post-colonial states too. The 4IR is powered across the world by the sheer force of technological or digital and Internet resources through which economic activities are set to become more productive and efficient. In business terms, the 4IR provides a more robust base for improvement that does the decolonisation agenda. In addition, the 4IR is a centre to periphery model of development, which derives from powerful technological and economic bases and plays into the thinking behind

TABLE 10.1: Convergences and divergences of the assumptions behind the Fourth Industrial Revolution and decolonisation.

Ideological dimension	4IR	Decolonisation	Analytical proposition
Agency	Driven by powerful technological or digital multilateral organisations at the centre of world economic systems (Seniuk 2018)	Driven by dispossessed populations in the peripheries of world economic systems, especially in post-colonial societies (Heleta 2016)	Centralised economic systems have enormous power to leverage change at scale. The chances that decolonisation might be turfed out of contention are high
Purpose	To harness the potential of technology, digital platforms and the Internet in the creation of global wealth, social and economic development (Nkosi et al. 2020)	To reimagine a new world order that resurfaces banished local knowledge systems and values as both an alternative and partner in world development (Wilder 2015)	The inherent appeal of technological power and potential, built on already existing systems, is likely to be viewed as a logical and valid basis for conceptualising development
Epistemological argument	Building on validated and reliable systems to promote faster development is seen as the most scientific way to stimulate development (Oztemel & Gursev 2020)	The epistemological bases are at best claimed to exist despite have been banished by colonial systems. The epistemological bases are thus less secure and will need time to re-establish (Mawere & Mubaya,2016)	The impatient world is likely to prefer development based on what is already known rather on knowledge that still requires reconstruction and re-establishment
Ontological argument	Truth resides in the evidence of the past technological and digital potential and advances which the 4IR proposes to propel to greater heights (Ahmad & Nabi 2021)	Truth resides in hidden and banished recesses of local and traditional systems, systematically destroyed by colonial world systems (Ince 2018)	Nostalgic truth might provide a great systemic push for change but perhaps not to the same extent as readily verifiable and visible truths in world economic systems
Axiological argument	The values and attitudes derive from modernism and postmodernism through which Western values are dominant (Oztemel & Gursev 2020)	The values and attitudes derive from a deep desire to reinvent a new world free of epistemicide and linguistemicide (Heleta 2016)	The coloniality of values and of being are likely to work in favour of the assumptions and purposes of the 4IR in the broader scheme of things
Methodological argument	Based on the scientific models and the theory of innovation (Oke & Fernandes 2020)	Based on archaeological methodologies aimed at rediscovery of lost knowledge and innovation (McClure 2021)	Depending on who validates the new discoveries, excavated knowledge is likely to require time to establish itself as an alternative or partner system in world development ambitions
Target beneficiaries	Big global multinationals, efficient national economies (Seniuk 2018)	Dispossessed people around the world, especially those phases of coloniality (Heleta 2016)	Decolonisation could be summed up as a largely emotional project, whilst the 4IR is a largely economic project

4IR, Fourth Industrial Revolution.

some of the most powerful multinational corporations on the planet. The financial benefits set to accrue to these entities are phenomenal, which, in turn, will provide a huge push for adoption across business, commerce and educational sectors around the world. On the other hand, decolonisation is a periphery to the centre model of development, which, to a very large extent, does not have comparable financial, technological and economic resources to push for large-scale adoption, even within the peripheries themselves.

In terms of purpose, ideologies that speak more directly to wealth creation are more likely to receive more widespread support than those which address issues that make relatively oblique reference to the economic argument. Epistemologically, the 4IR is securely based on the dominant discourses of science and technology, which provide an overarching basis for development. Ontologically, envisaged truth that shapes the arguments of the 4IR has been tried and tested, the current impetus is for expanding these truths and knowledge to the widest possible extents in order to create the maximum value for societies across the world. However, given that truth behind decolonisation is largely concealed in inaccessible spaces and that as things stand, because of forces of coloniality, the version of truth prevailing around the world is closer to that presented by the 4IR than that aspired to by decolonisation, the 4IR stands a better chance of stimulating development than does the impetus for decolonisation. Similarly, the coloniality of being suggests that the value systems that have been moulded by principles of modernity, post-modernity and liberalism, which have shaped the modern Western thought, to date, are more likely to form a basis for aspirations and intentions across the world compared with the values underpinning decolonisation.

There are, however, some convergences, which can form a sound basis for integrating the two ideologies at the same time. For example, both ideologies are about change and transformation of society; both seek improvement even though the targets for this improvement are polarised; both are based on versions of equalitarian arguments, largely in terms of serving the greater good even though the purposes driving these ambitions may be wealth creation, on one hand (the 4IR), and social justice, fairness and restoration of human dignity on the other (decolonisation).

Essentially, the 4IR is a runaway ideology based on accelerated wealth creation and economic development, unprecedented in its scope and speed, and impatient with those slow to adopt, and thus, carries a potential for leaving some, especially the more vulnerable behind in its wake. However, decolonisation, although urgent, is an ideology that focuses intently on societies most vulnerable, providing these with a sound basis for being counted as individuals worth waiting for and worth investing in their lost knowledge and truths, and as real alternatives and companions for reshaping the world.

Conclusion

We conclude this book by outlining sets of assumptions and principles for what we call an Afro-global episteme.

Assumptions:

- Ideologies that shape the future should provide both a forward and backward gaze to ensure that no one is left behind. For us, there is no better pairing of ideologies, which in their different ways provide both gazes in sufficient amounts.
- Post-colonial societies are deeply wounded societies burdened by the realities of coloniality of knowledge, power and being, which draw them closer to dominant global epistemes, in ways which estrange them from their true rather than adopted identities.
- Left alone to their own devices, the 4IR is more likely to gain acceptance and adoption in the academies of post-colonial societies, whilst the decolonisation agenda takes a back seat especially as it does not have a firm economic and resource base.
- The 4IR speaks largely about values of modern and developed societies, which tend to have larger segments of middle-class populations, whilst decolonisation tends to speak about values of the poor and dispossessed working-class majority populations in the less developed post-colonial nations.
- Development takes place most securely when people are certain about, not only who they are but more importantly about their dreams and aspirations.
- Leaving segments of the population behind in developmental trajectories is as bad if not worse than ignoring the developmental wisdom of others. Whilst development should be about forward thinking and planning, it should also always seek to ensure that the disadvantaged are never left behind.
- Development should thus be first and foremost about uplifting the plight of the previously disadvantaged and help them to reach the levels where they can more equitably access the benefits of opportunities created in society.

Based on the above assumptions, we propose a HE Afro-global episteme, which is defined as follows:

It is an integrated model, which unapologetically prioritises self-discovery, local knowledge and understanding as an authentic basis for engaging global knowledge systems.

The word Afro is a proxy for post-colonial condition. On the African continent, it specifically refers to African countries, all of which had different colonial experiences since the Berlin Conference of 1834-1835 when the

continent was partitioned to facilitate its exploitation, subjugation and plunder by European settler colonialists.

We provide below a set of principles, which we have carefully drawn from the convergences and divergences between the two ideologies and which we believe will constitute a formidable framework for an Afro-global episteme in HE:

- Integration of local and global knowledge must always be a priority at all stages of teaching and learning and of curriculum construction and instruction.
- Priority must be given to self-knowledge and local understanding, not because they are superior to global knowledge systems, and equally, not because they do not present challenges of their own, but because without these, the world outside remains a mirage, ever shifting and unreachable as its secure understanding depends on a full understanding of self and local.
- The principle of epistemic and socially just pedagogies must always pervade teaching and learning at all levels.
- The curriculum and experiences of learning must, at all times, be a judicious selection from the past, the present and the envisaged futures.
- Evaluation regimes must utilise the principles of assessment for learning and the importance of group learning and achievement above assessment of learning and individualised assessment.

The training and education of teachers in South Africa have remained locked in the dominant Western episteme. Although many changes have been attempted since 1994, available evidence suggests that teacher education in South Africa continues to be under the influence of the dominant Western episteme. The content of training and education, the pedagogical approaches, the assessment modes and the overall purposes have been barely transformed. Inside the melting pot of teacher education exists a stubborn concoction of a colonised recipe of teacher preparation. The two ideological frameworks of the 4IR and decolonisation have also entered the melting pot of teacher education in South Africa. These ideologies have substantially unequal prospects of settling well within the teacher education sectors. Despite the powerful arguments behind the decolonisation agenda, largely to do with social and cognitive justice and the big push from a relentless student body politic, the pace of decolonisation does not seem to be as fast as intended and as required. There are two main obstacles that combine to confound the pace of decolonisation of teacher education in South Africa, which include:

- Inadequate conceptual understanding of the idea of decolonisation in the academy. At the very minimum, two forms of decolonisation are recognised: the physical decolonisation, which includes transforming the funding of teacher education to become pro-poor, widening participation to include non-traditional students in university programmes, increasing black participation in the academy, increasing support for growing a black

professoriate, renaming of buildings, lecture rooms, amongst others. The second dimension is the epistemic decolonisation. Not much has been achieved in this dimension, largely because of staff inertia, lack of conceptual grounding to scaffold the epistemic decolonisation agenda and fear of deskilling the academy, including the implications of its reskilling.

- Decolonisation is not a strategic priority in the academy. Although there is much to talk about decolonisation in all universities, it is yet to get strategic status in the academy. Since 2015-2016, the matter of decolonisation does not appear in the portfolios of senior academic administrators at the level of Deputy Vice Chancellors. The matter seems to be highly debated at school and faculty levels within the universities; however, beyond that, decolonisation does not see much light of day in the universities. This suggests that it is a low-priority issue given less attention.

The discourse of the 4IR has many sympathisers in the academy. When universities were forced to close because of the COVID-19 pandemic in March 2020, there seemed a global unanimity around turning to online teaching and learning. However, apart from making the technologies for online teaching and learning available to students, and negotiating zero-rated Internet and Wi-Fi support with large commercial providers, there was little reflection on the challenges poor students would face in this new way of teaching and learning. Issues of access to the technologies that support online learning, to the Internet, and Wi-Fi, home environment factors and the state of local communities were largely considered as an afterthought (Maringe et al. 2020). As a consequence, large groups of disadvantaged students were left behind. The pandemic has not only exposed inequalities in HE but also widened them in the aftermath of the turn to online teaching and learning.

In this chapter, we have proposed a model through which the two ideologies can be brought to the service of each other in the future reconceptualisation of teacher education in South Africa and in other post-colonial nations. Decolonisation can, indeed, provide deeply contextualised checks and balances required to moderate centre to periphery ideologies, such as the 4IR.

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Chapter 1

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Index

The idea of this book emerged from the Education Deans Forum (EDF) meeting held in Johannesburg in 2018. The forum discussed the twin issues of the Fourth Industrial Revolution (4IR) and decolonisation and how these were likely to impact the future development of higher education (HE) in South Africa. Essentially, the book provides scholarly analyses of a range of possible impacts of the two discourses. On one hand, the discourses are discussed as representing convergences and divergences in relation to their epistemological, ontological, axiological and methodological assumptions. On the other hand, they are portrayed as competing for dominance in the contemporary and future discourses in HE. As a scholarly compilation of high-end research, the book is a must-read resource for academics generally and, those researchers in teacher education disciplines especially. Issues of the automation of academic workspaces, impact of digital divides, the opportunities and constraints of the technologisation of curricula, pedagogies, teaching and learning and the intractable challenges of remote modalities of university instruction are dealt with by some of the leading thinkers among South African academies. Readers are invited to critically engage with the contributions in this book as part of wider conversations around reimagining the future of HE locally and internationally.

This book is an interesting read which offers varieties of viewpoints on the subject of higher education in general, and teacher education in particular, as it relates to decolonisation and the 4IR. The issues discussed are current and varied, making the book a much-needed addition to the body of work on HE in general and studies on decolonisation and the 4IR as it relates to education in particular. While some of the authors look at the origin and the workings of the 4IR, others look at how it is shaping education and how universities should respond with regards to teaching and learning and research. Others go further to look at teacher development programmes for Education 4.0 and it is, or should be, influencing education as we know it. Others go further by looking at decolonisation in conjunction with the 4IR and how they should influence one another. I therefore recommend the book to any researchers interested in these issues in HE, and especially all lecturers within the same sphere.

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