Chapter 6

4IR and Transformation: Ally or Opponent? Reflections on the South African Higher Education System

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Abstract

The introduction of the Fourth Industrial Revolution (4IR) as a significant agenda item in the South African higher education system came at a time when the aspirations of students and staff were on significant shifts in transformation. Thus, the take of many theorists was initially negative. Nevertheless, since COVID-19, contentions on the 4IR have rightfully shifted to engage with both the challenges and possibilities of 4IR. In this chapter, we engage with these affordances and challenges from the lens of teaching and learning technologies in the South African context. We make a case for the importance of acknowledging the challenges so as to open up space for the possibilities and conclude by stating the significance of co-creation in making space for growing the affordances of technology-enhanced learning (TEL) and 4IR generally.

Introduction

The notion of the Fourth Industrial Revolution (4IR) was introduced in 2016 to South Africans as a viable endeavour for Africans to contribute as producers and not merely consumers. However, its introduction led to an uproar as it seemed to be overtaking and disrupting calls to transform and decolonise the higher education sector. These calls for 4IR came shortly after the #FeesMustFall movement for decolonisation of the higher education sector in 2015. The critique for centring 4IR was because, at this time, it seemed to be overtaking university

boardrooms, seminar programmes, teaching agendas, and funding imperatives and pushing the transformation imperatives called on by the #FeesMustFall movement to the sidelines. The arguments put forward to centre the 4IR was that South Africa should be vigilant lest they find themselves in the same situation as the rest of Africa at the times of the first, second, and third Industrial Revolutions. The 4IR and its significance was put forth by Claus Shwab in 2016 as a period of significant change. What is also important to note is that this change brings with it challenges and opportunities, including the rapid advancement of Artificial Intelligence (AI), which can increase the digital divide between the rich and poor (Goldstuck 2024; Safodien 2021). Thus, as Africans, we need to be cautiously optimistic of the challenges and affordances of teaching and learning during this revolution.

In South African higher education, these new calls for a focus on 4IR were spearheaded by then vice-chancellor and principal of the University of Johannesburg (UJ), Prof. Tshilidzi Marwala, who was later appointed to head the Presidential Commission on the 4IR by the President in 2019. The introduction of the 4IR as a potential tool for solving South Africa's socio-economic challenges resulted in a lot of debates on the challenges of jumping headfirst into the ideas around 4IR. Most of the early critiques came from sociologists arguing for more engagement on the concept and then on its current challenges in the West before assuming that it will solve all our problems (Sey & Mudongo 2021).

Undoubtedly, the time we are living in is one of great disruptive changes resulting from AI and its impact on multiple societal sectors. It would be a mistake to assume that the current Industrial Revolution will solve Africa's challenges. Benyera (2021) cautions that "instead of producing knowledge which exposes and challenges the (re)colonisation of Africa, African scholars' reason that Africa's moment has arrived courtesy of the 4IR". In this context of AI-driven change, Africa is seen to be mainly a consumer of these technologies and not actively leading in their developments. Therefore, careful consideration needs to be given to how technology is adopted in the African continent and how technology is guided by ethics and social justice (Johnson & Wetmore 2009).

There is therefore significance in focusing on the potential negative of 4IR. To this end, the National Planning Commission (2020: i) says:

> rather than focusing narrowly on the potential and dangers of so-called 4IR technologies, South Africa needs to develop a transversal digital policy that is far more comprehensive than one focusing on artificial intelligence (AI), machine learning, blockchain and drones although these would be important forward-looking parts.

In this chapter, we make a case for focusing on both the opportunities and challenges of using AI in teaching and learning.

To articulate the argument of this chapter, we reflect on the convergence of transformation and the 4IR and illustrate how the COVID-19 pandemic played an important role in fast-tracking the use of technology-enhanced learning (TEL), thus building a starting point for thinking about the challenges and possibilities of AI for society. TEL is defined as the use of Information Communication Technology (ICT) for the improvement of teaching and learning by creating learning opportunities for students whenever they choose (Watling 2009). The early jump into these technologies, however, lacked the necessary deep engagement of what TEL means and how we would want it to be ushered in should we want it in the first place (Moll 2021).

Moreover, post-COVID-19, it is clearer that technology alone cannot improve teaching and learning. Rather, a deliberate and thoughtful way to use technology shaped by passionate educators, contextual variables, instructional design, and digital tools supported by a shared culture whereby students learn through experience and social interactions is required (Wong et al. 2022).

Positionality of the authors

The authors of this chapter are academics: one from a distance higher education institution and one from a contact higher education institution based in Egoli. In this chapter, we consider

how TEL and AI have influenced our thinking, teaching, and learning as well as our environment. Our disciplines include sociology and social work. Both of us have used TEL in our work and have seen how disruptive it can be in how we communicate with students and colleagues (Khunou 2023; Pillay 2023). Consequently, we have both observed such considerations in our individual institutions and also in literature coming out of the African context. Using auto-ethnography, this chapter adopts a reflective approach to examining the realities of higher education post-COVID-19 by using our first-hand personal experiences of navigating the pandemic as a rich source of data (Roy & Uekusa 2020).

The second aspect of this chapter is transformation. We have both engaged with multiple shifts in the university sector as students, staff, and researchers. One of us is a transformation scholar and practitioner – a position that influences her thinking and how she navigates knowledge production, teaching, and learning. This positionality is also central to how we engage with the themes in this chapter.

Conceptualising the Fourth Industrial Revolution (4IR)

The 4IR is argued to be the fourth as its technologies are built on the back of the previous three Industrial Revolutions. For example, the first revolution focused on production using steam engineering; the second on the invention of electricity, and the third was driven by the digital revolution owing to the development of the transistor, facilitating easy information storage (Moll 2021; National Planning Commission 2020; Olaitan et al. 2021). Even though the '4IR' term is now in daily use in a taken-for-granted kind of way, it is a contested term and its usefulness in teaching, work, and general interaction remains questioned. The contestation is firstly on whether it is sequentially correct to call it 'the Fourth Industrial Revolution'. According to Moll (2021), an analysis of the debates between Shwab and Rifkin suggests that the notion of a 4IR is a leap too far.

However, there seems to be some agreement that the fourth is more accurate as many who engage in the idea choose it rather than the third. According to Olaitan et al. (2021), the fourth is particularly different from the third because "[t]his revolution, according to Schwab (2017: 1), is different in that it is technologically integrating physical, digital and biological worlds". So, the salient feature of the 4IR is its focus on blending historically separate systems. As a result of this blending, Olaitan et al. (2021) suggest that we will now see a growth in the development of 'smart industry', 'intelligent industry', 'smart factory', and 'smart manufacturing'.

According to Marwala and Nkomfe (2017) and Xing and Marwala (2017), the 4IR is driven by AI and cyber-physical systems (CPS) as compared to the third which was driven by the Internet of things (IoT). Another way of defining AI is the process whereby machines can be used and designed to imitate "human cognitive functions such as learning and problem-solving" (Cheuk 2021: 826). AI has been defined in a humorous way by Google's AI system, Gemini, as follows: "Artificial intelligence is when a computer can do something that you're pretty sure you could do with a few more hours and a lot less coffee" (Goldstuck 2024: 13). AI can save time and will make changes to almost every aspect of work and play. AI will become indispensable in solving current problems, but the ethics of social justice and care need to prevail (Johnson & Wetmore 2009). Therefore, there is a need for greater focus to be given to how this 4IR evolves, how technology is chosen, and how upskilling of citizens occurs in the African continent.

Transformation of the Higher Education Sector and 4IR

Higher education transformation was put on the agenda after the first democratic election of 1994 when the National Commission on Higher Education (NCHE) was appointed to develop a transformation framework for the higher education sector. The framework was later developed into a policy document directing the transformation of the higher education sector. The intent

of transformation was to address racism and sexism in higher education and address issues of equitable access (Soudien 2010). In 2015, however, the #FeesMustFall movement put on the agenda issues of epistemic justice and free education. This was an important moment in the history of transformation in the country. The significance of these demands was not that they were novel, but that they were reigniting the links between higher education transformation and structural transformation (Ntombana et al. 2023).

However, as early as 2017, the 4IR started framing debates within universities – shifting the focus from the possible wins of the #FeesMustFall movement and thus transformation. This shift rightfully influenced the initial negative take on the 4IR. According to Benyera (2021: 116), unlike the Industrial Revolutions prior, the 4IR does not destruct political systems but epistemologies and ways of doing things. It is therefore not a sociological moan to critically engage with the challenges presented by the 4IR for the African contexts. Rather, given the history of engagement between the West and Africa, it is an important endeavour. Benyera (2021: 118) argues that for Africa to participate fully in the 4IR it should have various contextual variables in place such as

> Conventionally, the key success factors for any country in the 4IR are political stability, sustainable macroeconomic policies, ICT skills, ICT infrastructure, and finally the rule of law, not rule by law. Africa, by colonial designs and by its own failures and omissions, lacks all the above or has them in negligible quantities and qualities.

It is therefore important to engage with what the 4IR means for Africa from a suspicious and critical perspective. It would be remiss to do otherwise.

We are also aware that technology can, in a suitable context, improve equality and allow access for those who might have not had it. As we think from a critical perspective, we also ask what these possibilities for Africa are and will they improve the lives of the majority, or are they marginal? It is, therefore, the contention of this chapter to foreground this history of Western extraction as

we address the issue of opportunities and challenges of TEL in the South African context.

South Africa is a new entrant as a user and developer of the multiple tools of the AI revolution. Although the use of these tools is growing, South Africa and much of the African continent are still largely left behind in the development of these tools (Olaitan et al. 2021; Sey & Mudongo 2021). What is obvious thus far is how little we have engaged with the implications of the developments emanating from 4IR. The work of Marwala (2020, 2021), Schwab (2016), and others leading the debates on this socio-economic phenomenon has been limited to its benefits. Most recently, the edited volume by Ngwane and Tshoaedi (2021) begins to engage with the challenges of the 4IR from a sociological perspective, thus providing the much-needed critical engagement on how this phenomenon is impacting everyday life. Moll (2021) illustrates how deep conversation and thinking on the implications of these technologies on teaching and learning are important if we are to centre human-centred teaching pedagogies.

In South Africa, moves towards the 4IR came at a time just after the #FeesMustFall movement of 2015. Thus, the focus of both government and leaders in the higher education system on 4IR seemed to be a shift away from the wins of the 2015 movement and transformation imperatives put forth after 1994. This was because university agendas and budgets started shifting towards funding 4IR themes in research. Bursaries also started focusing on themes related to 4IR. The 2019, State of the Nation address was the first moment we saw the formal shift towards the 4IR as a significant agenda for education institutions. In this address, this agenda setting was articulated thus:

> The President went on to say that the education sector will be introducing several new technology subjects such as technical mathematics, technical sciences, maritime sciences, mining sciences, aviation studies and aquaponics. The president in preparing for the nation for 4IR believes that the education sector plays an important role and as a result subjects should be realigned with 4IR dynamics. (Maisiri 2020: 4)

Thus, budget and university priorities shifted accordingly. According to Maisiri (2020: 6) this was evident at the University of the Witwatersrand (Wits) when the vice-chancellor announced that

> We have invested R500 million in an ICT upgrade, adopted a new cutting-edge research strategy, and introduced innovative blended learning options, including a digital campus, online courses and high-tech classrooms.

Furthermore, Prof. Vilakazi, vice-chancellor in his plans for Wits, said one of his goals for his tenure is to create a Massachusetts Institute of Technology-styled digital technology hub at the university that will commercialise some of the ground-breaking research it produces. At the same time, he was scathing of 4IR indicating that skills development and a culture for respect of facts and scientific reasoning was required which went beyond students sourcing information from Wikipedia (Mthethwa 2021).

Other concerns raised with the idea of 4IR as a leap too far is its contributions to existing epistemic injustices (Benyera 2021). One reason for this injustice is that relying on technologies from elsewhere potentially impedes transformation as such technologies were not necessarily developed with our context, cultures, and cosmologies in mind. Benyera (2021) argues that, similarly, debates have been raised by scholars in the United States and England. They have been contending with the everyday impacts of developments from these technologies on human rights and how they perpetuate existing inequalities as the algorithms used in the development of these technologies learn from an unequal socio-economic and political environment (Olaitan et al. 2021). What has been visible from Western countries as a result of social equality scholars and activists is also how the development space for these technologies is led by one main demographic – white males. What does this mean for decolonial and transformation scholarship in South Africa and elsewhere in a context where data mining by large Western corporations is not regulated or is under-regulated? Benyera (2021) suggests that the power of the West in the 4IR context is 'coloniality of data' and its effects will be similar for those without the same powers. This

is evident in how some of the technologies coming out of these data sets are beginning to show discriminatory tendencies against people from Africa.

Education Access Equality and 4IR

During the COVID-19 pandemic, we appreciated the availability of digital tools for teaching and learning as many of us in the higher education sector were thrust into lockdown and in no time forced to find ways to continue teaching and learning (National Planning Commission 2020; Shange 2023). For many that meant converting existing digital tools like WhatsApp to keep in touch with students and to source new tools like the invigilator app (Shange 2023) for online teaching and learning. Some learning management systems (LMS) like Moodle and Canvas were integrated into the university systems to allow for online teaching, examination writing, and assessments. These LSMs were not without challenges. For example, in the distance higher education institution environment of the first author, the pressure to maintain integrity in our online teaching, learning, and assessment during the lockdown required us to use online invigilation or a proctoring app. Although this app was important in allowing exams to continue during lockdown, it came with a multitude of challenges. Shange (2023) found that some of these ordeals included issues with personal data protection, system failures due to the difficulty the app had with recognising dark skin, and pedagogical issues. The issue with 4IR and the recognition of dark skin is an epistemological one and it makes Africans inferior in an effort to recolonise them (Benyera 2021).

As a result of this recolonisation, these current tools ignore transformation imperatives made possible by face-to-face engagements. For example, Shange (2023: 218) makes a case that some of the proctoring tools used do not support "transactional and transformative education". This is a challenge in the South African context as transformation is an important aspect of teaching and learning in the higher education sector. Challenges experienced in a contact institution included students who lived in areas that did not have adequate Wi-Fi signal, overcrowded homes, and digital literacy required for take-home examinations

and online assessments (Czerniewicz et al. 2021; Nichols et al. 2023).

In the few years since COVID-19 lockdowns, we have learnt that the 4IR is not a panacea for all societal ills and that it is not all doom and gloom. As much as there are possible wins brought on by AI, there are also challenges. In the teaching and learning space, the challenges have to do with existing inequalities and their continuities. In South Africa, these inequalities are exacerbated by infrastructure challenges. Hlatshwayo (2021) illustrates that electricity challenges in the country impacts equitable access to these technologies. These infrastructure challenges also mean that as a country we are unable to participate optimally in the production spaces of these technologies (Benyera 2021; Khunou 2023). Olaitan et al. (2021: 2) further highlight the importance of readiness for countries in the South to benefit from AI. These readiness challenges include inadequate digital technologies, IT infrastructure, and digital literacy. Without these resources, Olaitan et al. (2021) suggest that countries in the South will be impacted negatively by 4IR developments. Continuing resource challenges would also mean a further decline in employment as the adoption of these new technologies will mean more job losses. Benyera (2021) argues that 4IR will lead to deindustrialisation in Africa, and this is why unemployment will increase.

Notwithstanding, a country like South Africa can benefit from the possibilities offered by the 4IR. These possibilities include addressing unemployment, poverty, inequality, improved public service delivery, organisational efficiency, and deindustrialisation (Olaitan et al. 2021; Sey & Mudongo 2021). The first opportunity lies in education. Olaitan et al. (2021: 3) suggest that "to avert the risk of job losses, there should be sufficient investment in training of the future workforce and retraining of the existing workforce". This is similarly articulated by Sey and Mudongo (2021), who argue for the importance of deliberate skilling if Africa is to compete in the scientific development of AI technologies and the challenge of bias automated decision-making.

While Sey and Mudongo (2021) argue for positive possibilities presented by skilling and AI impacts in Africa, the

chapter cautions against the challenges of leap-frog strategies, showing how the ideas of acceleration in the African context have failed to make the continent competitive, an equal player, in previous revolutions. Catching up does not always work due to historical distortions and their continuing inefficiencies. To avoid these possible inefficiencies in skilling to accelerate, Sey and Mudongo (2021: 7) make the argument that whilst

> rapid skills development can produce short-term boosts in expertise; however, in the long-term, the result might be a work-ready, but narrowly tooled workforce with primarily entry-level job capabilities (Garrido & Sey, 2016). In contrast, the slower (e.g., formal education system) route may produce less work-ready graduates, but with a broader knowledge base, critical thinking preparation and more readiness for management-level positions.

Therefore, it is important for universities to urgently take on appropriate teaching for this new era.

Opportunities and Challenges for Using Technology in Formal Education Systems

Opportunities for TEL in teaching and learning

The world as we know it has changed and continues to change as we move beyond the pandemic days. There are some changes that have been positive such as the greater and wider use of TEL and how blended learning has become the new normal. Soon all students both at distance and contact institutions will develop greater agency and will request TEL as part of a central requirement for curriculum design.

For a distance university where students come from all walks of life, the use of TEL and Authentic eLearning has been a boon for allowing students from various geographical areas to gain access to knowledge and qualifications. Simmone Titus (2024), an educator from South Africa, regards the creation of personalised learning as one of the affordances of AI in higher education. Titus suggests that personalised learning is a significant benefit

because learning can be adapted to the needs of the students and this adaptation is part of an ethic of care. Another advantage is that TEL offers multiple perspectives and gives students a wider range of knowledge sources. This access teaches students skills in the discernment of information and critical thinking.

A huge opportunity of online resources is that it results in flexible anytime learning by extending classroom learning to online learning. In this way, students have access to knowledge when and where they choose to study, which is most beneficial for part-time students. The opportunities of using pedagogical theory to better design courses using TEL can result in:

- The development of critical thinking and decision-making skills (Cottrell 2017).
- The consumption, construction, and co-construction of knowledge (Herrington et al. 2010).
- The development of understanding where to seek and discover information and tell fake news from facts.
- Learning how to collaborate in online spaces for peer learning (Zurita & Nussbaum 2004).
- The development of reflective and reflexive skills (Özverir 2014).
- The availability of a multidimensional approach to learning (Herrington et al. 2010).
- The development of skills in using the World Wide Web for students' learning, both for current studies and beyond, thus increasing the skills that will be required in the real world.

The development and design of courses using pedagogical theories that support the use of TEL may include theories such as the Community of Inquiry (COI) social cognitive and teaching presence (Garrison & Arbaugh 2007), Laurillard's Conversational Theory (Laurillard 1999), the Authentic eLearning framework (Herrington et al. 2010), and Wenger's Community of Practice (Wenger 1998). It must be clear that this list is just the tip of the iceberg and there are various other learning theories. For example, the Authentic eLearning framework is useful as it emphasises the use of "complex, realistic task[s] closely linked to real world professional practices" (Herrington et al. 2010:

58). This framework is important in the South African context as transformative teaching and learning should be constantly contextualised. Then again, it is clear as South African higher education moves forward after the COVID-19 pandemic that TEL and 4IR will be a necessary and essential part of this journey. In doing so, one needs to be cognisant of the constraints.

Challenges of TEL

While there are significant affordances of working in the 4IR period using TEL, there are some very real challenges that require attention, especially when considering the social justice and ethics of care considerations. High on this list of constraints is reaching students who live and work in poorer areas that have unstable Wi-Fi and have to contend with expensive data. In a study by Msekelwa (2023: 59), writing from the Eastern Cape, the issue of expensive data was captured thus by one of his participants: "The cost of one hundred megabytes is relatively high, amounting to twenty-nine rand, and its usage duration is limited to a mere twenty minutes". For poor students having to study online, a 20-minute purchase is not enough as one lecture lasts for about 45 minutes. In addition, concerns about poor network coverage remain a huge infrastructure challenge for online learning.

Another big concern about using TEL is that many educators have gone back to a chalk-and-talk mode of teaching, partly because this is what they know best and partly because of insufficient training and fear of technology. Often, the statement is made 'I am a BBT', which means 'born before technology'. Thus, the need for effective personalised and discipline-specific training is required to upskill educators to design courses for specific use in a TEL environment. This specificity will foster the learning goals of students and integrate transformative principles, and not just as a repository for storing information.

Often, the reason cited to go back to traditional ways of teaching and learning is the fear that once students begin to use AI, real concerns around plagiarism will arise. The need to teach students how to use AI is a matter of grave importance. Equally important is teaching students the skills to distinguish fake

from authentic facts. One way to overcome this fear is by asking students to get a first draft of an assignment from ChatGPT or other programmes, hand this in as a first draft, and then rework the assignment. In this way, the learning is designed to use AI to develop ideas and concepts and then refinement by students so that through the process of iteration, learning is enhanced.

AI based on large language models from the global North has been seen to be biased, racist, and even unethical. Consequently, Cheuk (2021) advocates for a more socially just type of machine learning. There are various examples of how machine learning has prejudiced people of colour. For example, money lenders who used an algorithmic model to screen their clients have found that it created "discriminatory impacts for Latinx and African American borrowers" (Bartlett et al. 2019). In another study, Buolamwini and Gebru (2018) discovered that machine learning resulted in Black females being the most misclassified group in three commercial classification models, unlike that of white males. Therefore, white normative able-bodied people are more privileged by AI because it is mainly developed in the West from data mined from these contexts (Bunyera 2021).

In South Africa, English is the most used language for teaching and assessment and educators need to be mindful of how students who have English as an additional language may be discriminated against as they might not speak standard academic English. The use of African languages in teaching and learning is a fundamental transformation issue, and many universities in South Africa have put in place language policies to address it. However, what we see is that these languages have still not made it into the teaching and learning space. With the introduction of 4IR, we see possibilities of further marginalisation of these languages and, most importantly, those who speak these languages. Many students do code-switch when learning and may struggle to express themselves in academic English, which may prejudice them when AI and machine learning programmes are used for screening. Thus, their thinking "is at odds with how it polices linguistic borders and place learners into proficiency bins" (Cheuk 2021: 828).

Structural Factors and TEL

Any discussion of the cost benefits of AI involves open access to all, which requires open-source software and Open Education Resources (OERs) so that there is a socially just and ethical manner in which knowledge is shared, curated, and reused. Other benefits include allowing all people to build and use ethical AI systems. Proceeding with an ethical framework and decolonised curriculum, mindful stewardship is important so that the Internet can be a tool for good with the potential to solve many global problems (Goldstuck 2024; Johnson & Wetmore 2009). TEL and 4IR offer great conditions for emergent learning and cultural cognisance of complexity theory. Using TEL and a variety of activities to engage students and educators across disciplines and institutions to co-create African homegrown magic and solutions is possible.

Given that teaching and learning do not exist in a vacuum, co-creation is important for the effective uptake of TEL in the South African context. This co-creation should be based on the idea that there are other factors that support the effective and efficient use of TEL and AI. These factors include physical infrastructure and shared personnel for upskilling of staff. Below is a list of some of the possible scenarios for how these factors can come together for effective TEL in Africa and South Africa.

- Higher education institution infrastructure – creation of spaces where students can work. In East London, a town in the Eastern Cape province, there is a new library called the Phyllis Ntantala Collaborative Library centre where three higher education institutions offer services to students, including a safe 24-hour learning space, with ongoing power, good lighting, and desks. In a face-to-face establishment, the library is easily accessible physically and users can borrow both physical and digital resources with friendly and helpful staff.
- Professional development and training. Benyera (2021) illustrates that Africa is lagging behind in terms of appropriate skilling for effective engagement in 4IR, whilst future thinking shows that 4IR will lead to growing unemployment

for those whose jobs will be replaced by 4IR. Unlike the current education system that teaches remembering, we need to teach critical thinking skills, innovation, and solution-oriented thinking.

- Financial and infrastructure support policies. We will not be able to participate optimally in the 4IR with our current electricity challenges and other communication-related infrastructure problems.
- Content creation in Indigenous languages.
- Access to water is another structural challenge necessary for effective teaching and learning. Water shedding, like electricity load-shedding, is a concern that faces students and educators alike.
- Improve the ability to download information from LMS, use it without Wi-Fi, and ensure the use of LMS and online resources are mobile friendly.
- The careful and nuanced use of data analytics to support students and not just for punitive measures to identify students at risk.
- The creation of learning centres and libraries for differently-abled students.

It is clear there will be future challenges and disasters, and the use of TEL and 4IR can offer more opportunities for educators to change learning environments to suit the needs of contextual occurrences and learning conditions.

Conclusion

As we navigate the changes of 4IR after COVID-19, we are forced to think of both the challenges and opportunities. This is important as history teaches that Africa has not benefited equally from the previous three Industrial Revolutions. We are thus called to engage with the question of what would be different with the 4IR. This is especially important given that the 4IR was introduced in the South African context at a time when many were looking for strengthened funding and agenda setting on transformation.

What the chapter has illustrated is that even though the 4IR brings mirrored challenges, it also brings possibilities in the

teaching and learning space. It is, however, unfortunate that these opportunities will require a lot of catching up as South Africa and the rest of the continent are still caught up in challenges of poverty, inequality, and growing unemployment with a possibility of continuities as the 4IR brings rapid deindustrialisation. The possibilities in TEL hold some positives for not only improving access for students but also for providing the necessary training for improved participation in 4IR. However, these possibilities require co-creation and a recentring of African languages.

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