Chapter 4

The Curriculum Implementation Dilemma Imposed by the Covid-19 Pandemic: Reengineering the Curriculum through Self-Directed Learning Approaches

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Abstract

In responding to the curriculum challenges imposed by the COVID-19 pandemic, most schools face certain resource constraints. Online platforms such as WhatsApp, Google Hangouts, Microsoft Teams, Zoom, YouTube and Blackboard present opportunities and challenges for curriculum implementers. The total collapse of online teaching following the COVID-19 pandemic (eg, students' inadequate autonomous learning and the lack of effective online instruction) forced many schools to revert to traditional face-to-face teaching strategies. Studies reveal massive investment in multimodal teachings, such as hyperflex classes, to allow for the integration of Microsoft Teams and Zoom into teaching and learning. These learning management platforms offer learners various opportunities to improve their self-directed learning strategies, skills and values. To this end, ground-breaking theories were explored, and curriculum theorising took place to understand how the required curriculum reforms in Curriculum Assessment Policy Statements (CAPS) were implemented during the COVID-19 pandemic. This descriptive

study draws from the partial implementation of the multimodal blended learning introduced in 2020 and 2021 as a critical intervention approach to curriculum implementation. The chapter concludes that introducing new subjects such as robotics, automation and coding is a necessary curriculum change that may improve the quality of education and enhance students' prospects for creating entrepreneurial opportunities, thus alleviating dependence on job creation. The current study has important implications for curriculum theory in terms of how to design improved curricula capable of enhancing students' creative-thinking abilities and problem-solving skills.

Keywords: *curriculum, implementation, experience, pandemic, theory*

Introduction

The emergence of the digital revolution led to the birth of a digital education curriculum, a knowledge economy and 21st-century skills, which present both challenges and opportunities for South Africa. As part of its theorising approach, the National Curriculum Statement (NCS) aims to stimulate active learning, encourage personal interpretations, develop independent thinking, and nurture inquisitiveness (Jacobs *et al.*, 2012). Both higher and basic education institutions embark on curriculum theorising to provide a scientific approach and alternative solutions to societal problems (Maistry, 2021). The main objective is to integrate innovative teaching methods, modern lesson designs and presentations to provide meaningful learning experiences. In the post-COVID-19 pandemic environment, South Africa needs to accelerate the momentum of infusing a digital-based curriculum underpinned by equality and quality education to achieve socio-economic freedom. For example, I argue that to hone learners' problem-solving skills, schools must prioritise Self-Directed Learning (SDL) strategies for learners while introducing 21st-century cutting-edge technology and

skill sets in line with knowledge economy driven by robotics, automation and programming in our schools.

This chapter explores curriculum theorising and implementation dilemmas encountered during the COVID-19 pandemic and how teachers reengineered alternative curriculum pathways that led to the trimming and reorganisation of the curriculum while promoting digital literacy. The urgent need to infuse digital literacy within the curriculum opens new possibilities for the development of SDL skills for learners. Therefore, it is necessary to underscore the importance of theorising curriculum content and the pedagogical skills required to handle curriculum change during the pandemic. The pandemic forced schools to embark on a curriculum alignment strategy driven by trimming the school curriculum content (Maree, 2021). This process involved nuances of curriculum implementation that changed the course of history in the entire education system in South Africa (Hoadley, 2018).

Theorising curriculum change

Both higher and basic education institutions prioritised curriculum theorising to craft scientific-driven interventions and propose alternative solutions to societal problems (Maistry, 2021). Scholars in the field of curriculum development have presented several approaches that inspire seamless curriculum change (Fomunyam, 2015; Fomunyam, 2021; Fomunyam & Khoza, 2021). One of these approaches includes structural theorising, which is concerned with the interrelationships of curriculum elements. The focus of this interrelationship is on the students, their learning abilities and habits. This approach calls for the integration of SDL skills to promote learning independently of others in a socially isolated situation; that is, during the COVID-19 pandemic, learners must continue to learn under the lockdown environment. Digital learning is the best example of SDL in a sociological sense characterised by autonomous, independent individuals capable of undertaking learning without outside pressure from

teachers (Hoadley, 2018). Students equipped with SDL skills have the ultimate power and responsibility to make decisions that would change the course of action based on choices presented to them by the teacher and relevant authority (Deng, 2018). Based on this assertion, policymakers must embark on scientific facts so that scholars can be engaged in a research process that allows them to be neutral and objective. Further, it assesses the process of implementing and evaluating the curriculum, as well as the social and cultural values inherent in education (Fomunyam, 2021). These social norms and values shape thinking about how to influence curriculum for the better.

The second approach to theorising concerns the outcomes of the curriculum instead of curriculum-making (Fomunyam, 2021). The conceptualisation of the curriculum must be done such that any individual must feel the overall impact of the school. Whether the curriculum is narrow or broad, the attainment of educational experience must change their character and outlook. The priority placed on curriculum outcomes implies that the entire pedagogical milieu is the responsibility of the learners. The learning process must be driven by SDL based on the degree of freedom learners have in setting up their learning goals, planning, and implementation in order to achieve desired learning outcomes. These theorisers argue that self-direction can be learned, developed, and considered a goal (Fomunyam, 2021; Fumanyam & Khoza, 2021; Wallin, 2011). Much of the emphasis is placed on assumptions, beliefs and perceived truths underlying any alternative decisions of what to teach is the highest priority. In other words, by using information generated outside education, these theories obtain insight into the process guiding educational processes. They are critical of the present and past formations of curriculum that impose limitations on education discourse and implementation within the classroom and society. Contemporary curriculum theorising has started to overlook curriculum development based on the empirical reality of schooling (Deng, 2018); instead, it now shines a spotlight on developing a heightened, sophisticated

understanding or interpretation of educational experiences informed by wide-ranging theoretical sources.

Analysis of a Schwabian perspective reveals that curriculum theory and theorising should be concerned with practice and the inner work of schooling, defined by specific curriculum content or material, specific students and specific teachers within a specific instructional context (Wallin, 2011; Fomunyam, 2021). In this conception, curriculum practice is mainly underpinned by a deliberate decision-making process. At the centre, the main goal is to enhance the quality and integrity of the curriculum enactment to address specific issues and problems arising from the interface between theory and practice based on the desire for improvement. This process is driven by deliberate decision-making, which involves critical thinking and reflection, reinterpreting, reengineering, positing, imagining, and envisaging (Wallin, 2011). In essence, for a theory to be relevant for practice, it needs to be guided by a practice–context–theory nexus in curriculum theorising. This approach further advocates for the identification of problematic issues and problem areas hampering practice as a point of departure for any curriculum inquiry and theory development. The analysis of the local relevant context and culture situates the issues facing education institutions, in turn proposing solution-driven outcomes, also known as 'significant frames' for understanding issues and solutions (Fumunyam, 2021). Most solutions to curriculum inquiry and theory development come from external sources aligned with best practices to produce new practical solutions and new theories (Deng, 2018).

The literature proposes that curriculum theorising should be driven by investigating the daily realities of any complex education institution characterised by unique complex social and cultural milieus (Hoadley, 2018). Deng (2018) and Fumanyam and Khoza (2021) suggest that any theory should be guided by scientific evidence based on research problems troubling any school as an institution and should be based on a comprehensive analysis of a set of theoretical categories for understanding the culture and the

institutional character surrounding the practice. To illustrate this, Teo (2012, p. 663) used the phrase 'the Potemkin school' to demonstrate how an image of a school was created based on missions, visions, goals, and achievements with the sole purpose of branding and attracting outsiders. Teo reveals how a good-looking school was characterised by 'conflicting ideas and actions', 'layers of ideologies', 'diverse expectations', and 'multiple kinds of facades created by various stakeholders'. It is interesting to note that these sets of categories succinctly explain the complex nature of the relationship that shapes a school's character and teachers' enactment of the reformed curriculum.

Decolonisation of Curriculum and Digital Integration of Technology

Education reform in South Africa is more urgent to address severe economic, social, and political threats, and hence plausible solutions have been suggested, for example, the decolonisation of the curriculum and the integration of digital technology into the curriculum (Fomunyam & Khoza, 2021). Decolonial pedagogy is a recent major shift in educational theory and is closely linked to free quality education (Jaramillo, 2012). It seeks to question the normalised exclusion embedded in established curriculum structures and raise awareness of the enduring logic of the coloniality of power in schools. This has been the longest crisis to have influenced the curriculum trajectory in every aspect of educational endeavour.

In decolonial thought, Western conceptions of curriculum implementation are challenged by espousing individualistic and non-profit aims and objectives (Jaramillo, 2012). As Li *et al.* (2021) put it, education, from curriculum to pedagogy, from teacher to learner, from learning to assessment, and from location to time, can and should be radically transformed by infusing SDL approaches. Loeng (2020) argues that SDL entails individuals taking initiative and responsibility for their learning. In the quest to decolonise education, studies recommend integrating SDL values into

education principles both inside and outside formal education institutions. Teachers, as agents of change, are responsible for championing knowledge and technology found within the local environment to facilitate learning, not transmitters. Most researchers agree that any curriculum theorising must elevate SDL to a level ready to empower learners to take control over either or both the planning (goals) and the management (support) of learning experiences to achieve quality learning outcomes (Loeng, 2020). As such, changes in the curriculum may be driven by a variety of reasons, such as learning goals and objectives. The sudden changes in the education system driven by the COVID-19 pandemic opened a dialogue with suppressed knowledge(s) and voices to advance educational practice in support of diversity (Maree, 2021). Infusing SDL philosophy in support of diversity is not entirely dependent on the opportunity but also on the ability to make learning decisions beneficial to suppressed groups in order to address the imbalance of the past. The intention is to introduce national and local curriculum reforms that benefit formal learning situations underpinned by collaborative processes between teachers and learners known to policymakers for centuries (Maree, 2021). It has become common knowledge to Africans in general and South Africans in particular that decolonial pedagogy wields social difference in support of collective humanity (Fomunyam & Khoza, 2021).

Jaramillo (2012) warns governments against perpetuating curricula that continue to espouse indoctrination into singular worldviews and epistemologies. However, the entire higher and basic education system needs to transform its institutions which continue to inflict colonialist models on aggrieved populations. The main reason is that curriculum changes deliver profound educational changes over time and space, and the real impact can be felt over time (Li *et al.*, 2021). Evidence from the literature suggests that many countries have rushed the decolonisation of curriculum reform processes only to receive a backlash from teachers, school principals and other stakeholders, yet the sudden curriculum reforms or theorising introduced during the COVID-19 pandemic

received a positive response from the majority of stakeholders (Mpungose, 2020; Maistry, 2021; Chimbude & Kgari-Masondo, 2021). Such reforms are necessary and prove that policymakers can expedite the reform process to respond to emergencies as opposed to their long-held assumptions about curriculum reforms and implementation.

Dynamic changes resulting from curriculum interventions

The National State of Disaster declared by the president in March 2020 created a unique situation which demanded urgent intervention by the Department of Basic Education (DBE) and the Department of Higher Education and Training (DHET). The DBE initiated curriculum reorganisation against the backdrop of the COVID-19 pandemic to reengineer curriculum implementation (DBE, 2020a). Two government spheres, the DBE and the Provincial Education Department (PEDs) responsible for curriculum delivery, were mandated to formulate a plausible framework for curriculum recovery plans post the COVID-19 pandemic. The outcome of curriculum reorganisation was categorised into two approaches: the first being streamlining the content delivered, and the second being curriculum trimming and implementing catch-up programmes.

Streamlining the content delivery

These approaches to curriculum reorganisation were developed through consultation with schools, policymakers, school governing bodies and other important stakeholders in re-packaging and integrating subjects or topics, embedding knowledge and skills foci and balancing depth as a key strategy to reduce content overload. It is clear that educational institutions in South Africa face myriad challenges that require urgent attention to be placed on managing content by re-packaging and integrating subjects to reduce content overload (Amin & Mahabeer, 2021). Schools were at the heart of curriculum implementation, and the context was about

merging fragmented and compartmentalised discipline-based content from related sub-topics into integrated topics of learning. This approach to curriculum theorisation was best explained by Booi and Khuzwayo (2019) and Luckett (2009) as an approach responsible for the hybridisation of content and knowledge in both knowledge construction and pedagogy.

The purpose of curriculum reorganisation according to the DBE (2020a, pp. 15-16) is summarised as follows:

- Reduce the envisaged curriculum to manageable core content, including skills, knowledge, attitude and values, so that schools have ample room for deep and meaningful learning.
- Define the core knowledge, skills, and attitude to be taught and assessed more specifically so that it provides guidance and support to teachers.
- Align curriculum content and assessment to the available teaching time.
- Maintain alignment in the learning trajectory for learners without compromising learners' transition between grades; and
- Present a planning tool to inform instruction during the remaining school terms,

The idea of framing a new curriculum strategy under the guise of curriculum reorganisation and reducing content overload feeds into the idea of curriculum theorising philosophy. The product of this paradox demands new insight from curriculum developers and implementers alike to methodically combine content, the breadth and depth to be intertwined, which in my view, feeds into the complexity of curriculum theorising (Amin & Mahabeer, 2021). In essence, the reengineering of the curriculum is necessary, but it requires highly skilled teachers with the foresight and professionalism to respond to curriculum design, selection and implementation. However, resource constraints ranging from human resources predicated by high teacher absenteeism and online resource constraints compounded the slow process of effective curriculum reform in the post-COVID-19 pandemic. Therefore, one can deduce

that teachers need sufficient practice and professional training first to understand the rationale behind curriculum reorganisation and trimming to respond confidently to the curriculum policy demands of the 21st century and beyond. Post the COVID-19 pandemic, curriculum responsiveness continues to pose challenges for school management teams and teachers in many schools to achieve intended educational outcomes.

Curriculum trimming

According to the DBE (2020a), curriculum trimming involves removing less important content that is deemed irrelevant for enhancing learning. In this chapter, curriculum trimming remains at the heart of curriculum reorganisation and theorising. Policymakers develop a blueprint that guides the development of curriculum trimming in line with the prescripts of the laws guiding the education framework in South Africa. This approach presents a plan for identifying redundant and outdated content, identifying core and extended parts of the curriculum and flexible modes of reorganising study content. These changes trigger important critical debates regarding curriculum reorientation and theorising. Most studies have pointed out curriculum overload as a serious impediment shaped by curriculum, textbooks, tests, and teacher expectations. In theory, curriculum trimming allows teachers to interrogate the curriculum thoroughly and point out discrepancies overburdening an industry of superficiality.

The education system in South Africa is complex, given the nature of secrecy and top-down approach syndrome. For instance, no matter how much teachers voice their frustration with certain curriculum content included in the annual teaching plan (ATP) and how little their learners understand and are learning, the system remains untransformed, rendering the concept of curriculum theorising and reorganising irrelevant. In other words, the nature of bureaucracy or red tape discourages teachers, in particular, from having a say in how the system should be transformed. In practice, curriculum trimming relieves the already

overburdened curriculum system, affording teachers a grand opportunity to have a say in deciding what topics to keep and what to give up, ensuring that the load is manageable with the time available (DBE, 2020a).

Catch-up programmes

Ramrathan (2021) recognises the closure of schools and the catch-up programme as a normal phenomenon in South Africa. In the past, these closures were precipitated by industrial action undertaken by teacher unions, service delivery protests by the community, student protests and other volatile political situations. These disturbances called for an urgent review of the curriculum, which involved lining up catch-up programmes implemented during school holidays. The provincial Departments of Basic Education (DBE) adopted these catch-up programmes to coerce teachers to teach outside their official timetables, that is, before school starts and after school hours. These practices have been normalised during and after the COVID-19 pandemic, putting more pressure on teachers and the already constrained resources. Some of the most notable curriculum changes include tampering with the ATP to improve curriculum coverage, support assessment changes and reduced professional support programmes (Maree, 2021).

It should be noted that these cosmetic changes have a fundamentally negative impact on curriculum delivery; however, their normal acceptance affects both teachers and learners. Currently, Grade 12 learners attend ATP programmes every weekend, pointing to a significant change in curriculum implementation (Maphalala *et al.*, 2021). The literature identifies curriculum overload for many grades under the CAPS, which has a direct impact on curriculum coverage and teaching and learning. This has led to a generalisation in education circles that current curriculum planning is ambitious and not realistic for delivery based on the current ATP. Therefore, streamlining the curriculum by tampering with the ATP arises from the emerging needs imposed by the COVID-19 pandemic. Usher and Barak (2020) argue that

policymakers have a responsibility to try and accommodate the demands of various sectors or interest groups, thereby creating unintended curriculum overload, particularly when very little consideration is given at the curriculum design stage to what is to be included, what should be removed, and why.

The overload phenomenon in the CAPS curriculum may lead to narrow, fragmented or distorted ways of implementing the curriculum, resulting in poor-quality experiences for student learning (Mafugu & Abel, 2021). Changes in the ATP negatively impact the psychological well-being of both teachers and learners. Too much pressure on teachers and learners to achieve ambitious outcomes heightens stress levels and burnout as they are expected to work and study outside official school hours to catch up and meet new curriculum requirements. In 1884, Spence (cited in Ramrathan, 2021) conceded that addressing fundamental socioeconomic and cultural dynamics in society should be the focus of our attention. This has particular relevance for streamlining the curriculum to address the emerging needs of the COVID-19 pandemic. The question of whose knowledge is worthwhile and why this knowledge is worthwhile for learners remains relevant post the COVID-19 pandemic in South Africa.

The process of curriculum theorisation through experience with the active involvement of educators and students reveals that the decolonisation of the curriculum faces numerous barriers (Mafugu & Abel, 2021). These barriers include a lack of content and pedagogical knowledge, poor infrastructure, and a lack of political consensus to debunk and reconfigure curricula free from colonial propaganda. To adequately address these issues, those who develop the curriculum at the policy level, adopters at the stakeholder level, and implementers at the school level should always be alert to possible distractors and be prepared to address them adequately to minimise the impediments to curriculum implementation.

Protocol adopted minimised curriculum disruption during the COVID-19 pandemic

Studies suggest that many South African schools adopted relevant technologies, prepared to learn and staff resources, set systems and infrastructure to establish new teaching protocols and adjust their curricula (Donitsa-Schmidt & Ramot, 2020; Mpungose, 2021). Although the transition was smooth for some schools, it was difficult for others, particularly those schools based in rural and semi-urban environments, which were greatly affected by limited technological infrastructure (Pham & Nguyen, 2020; Simbulan, 2020). Inevitably, the majority of schools were forced to reorganise their learning spaces to migrate partially to online learning modalities as the country continued the battle to control the vicious spread of the COVID-19 virus. This recommendation, with all its intention and purpose, did not serve well for schools with limited space and no access to Internet connectivity and modern technological devices. These schools were vulnerable to the virus, and learners who lost valuable time were left behind, leading to the highest dropout rate in the history of this country (Maree, 2021; Ramrathan, 2021).

Three scenarios were running concurrently in the DBE system. The first was well-resourced schools with enough space to implement social distancing as well as running online classes for curriculum coverage. The second was schools with access to a few resources during the COVID-19 pandemic, such as mobile classes and personal protective equipment (PPE), but which had no technological devices to assist with curriculum implementation. The third encompassed those schools with no space or infrastructure existing to implement either physical distancing or online classes owing to a lack of providing infrastructure and remote locations.

Of course, the COVID-19 pandemic had a major impact on curriculum implementation and delivery in many schools irrespective of their socioeconomic background. Still, unequal distribution of educational resources has negatively impacted many schools following the pandemic. When the restrictions

were in full force to minimise the spread of the COVID-19 virus, online learning became a temporal solution. Online learning refers to a learning environment that uses the Internet and other technological devices, tools and platforms for the synchronous and asynchronous instructional delivery and management of academic programmes (Jansen, 1999; Fullan, 2015; Phaeton & Stears, 2017; Huang, 2019; Usher & Barak, 2020). The distinction between the two online learning approaches had to be explored to better understand curriculum implementation during and after the pandemic phase. Synchronous online learning involves real-time interactions between the teacher and the students, while asynchronous online learning occurs without a strict schedule for different students (Singh & Thurman, 2019).

Several issues arose within the context of the COVID-19 pandemic: online learning replaced face-to-face teaching in the form of interim remote teaching, which served as a response to an exigency. Varea and González-Calvo (2020) identify several socioeconomic and political concerns that emerged during curriculum delivery that are worth noting to guide education following the pandemic. The migration process from an old learning space to a new one never took place smoothly. This transition raised several major policies, pedagogy, logistics, socioeconomic, technology, and psychosocial concerns (Donitsa-Schmidt & Ramot, 2020). This was a period of introspection for the DBE and government education agencies, as many schools were left scrambling to create foolproof policies on school governance structures and teacher and student management. Teachers in a few selected schools where technology was commonplace were called to embrace conventional teaching delivery and were also obliged to embrace technology despite their lack of advanced technological literacy. To address this problem, online learning webinars and peer support systems were created. On the part of the students, dropout rates increased for economic, psychological, and academic reasons. Academically, although students can learn anything online, learning may perhaps

have been less than optimal, especially in courses that require face-to-face contact and direct interactions (Franchi, 2020).

Challenges of and opportunities for integrating digital education

The COVID-19 pandemic seriously threatened multimodal curriculum implementation and the entire education sector in ways never imagined. To counter this threat, the DBE proposed many intervention programmes to address the challenges posed by the rapid integration of digital technologies in curriculum implementation. It was evident that the integration of digital technologies and various online platforms suggested an incredible potential for achieving much-needed access to education for all. However, lack of funding has been identified as one of the main challenges affecting the successful implementation of digital education in South Africa. This is despite a notable increase in the budget for education over the past few years, with the COVID-19 pandemic eroding prospects of technological integration into the mainstream education sector.

Research conducted by Zhao and Witterston (2021) accuses the government of negotiating in bad faith with the Internet Service Providers' Association (ISPA) of South Africa. An application for zero-rating must be approved by the DBE, the Department of Higher Education and Training and the Department of Health. The lack of laws governing the availability of free mobile data in schools or zero-rated online education platforms remains an impediment to a smooth transition to online or multimodal learning. In certain schools, new mobile data-based technologies are beginning to transform curriculum implementation, teaching methods, practices, structures, and even education cultures. Fomunyam and Khoza (2021) have spent their time specialising in teaching and learning strategies and have discovered that introducing technology in rural schools can change the learning culture and improve innovation over many years to come. Schools must be capacitated first before they are declared institutions

capable of providing solutions to curriculum problems. Indeed, schools empowered with self-directed learning approaches have the potential to transform and reengineer the curriculum system so that students can achieve valuable skills and better learning outcomes (Vandeyar, 2017). The time for taking teachers for granted is over, and they should be acknowledged as skilled technicians who dutifully realise a given way of teaching set by the directives of management (Zhao & Witterston, 2021). Therefore, during the COVID-19 pandemic, teachers took conscious decisions to be active participants in the creation of new realities, with some actions within the context of their beliefs, attitudes and perceptions of relevant teaching situations.

Maree (2021) acknowledges that private schools and schools in more affluent areas have adapted their curriculum reasonably well and have successfully used a combination of in-person, hybrid online and digital teaching and learning formats. Greyling (2023) and Mpungose (2020) argue that affluent schools enjoyed access to various messaging apps, and digital communication platforms, as well as conferencing services such as WhatsApp, Google Hangouts, Microsoft Teams, Zoom, YouTube and Blackboard, which were used to communicate with learners and share information (teaching and learning support material, etc) with them. Virtual platforms used (and which continue to be used) are zero-rated (meaning they require a relatively small amount of mobile data) and have recently gained popularity. In addition, teachers in well-resourced schools received training to use these platforms for effective teaching and learning (Maree, 2021).

The opposite is true for rural and marginalised schools. Studies reveal that even though the majority of learners have had unlimited access to education since 1994, the gross participation rate of black South Africans continues to decline considerably more than for white South Africans (Badat, 2020; Kayembe & Nel, 2019). Poor Internet connectivity, absence of human connections, lack of opportunities for collaborative learning, lack of teacher supervision, a decline in hands-on

learning and poor assessment during examinations are some of the challenges online education platforms face. This does not remove the fact that the quick implementation of online learning has been a saviour. South Africa remains an unequal society; therefore, the majority of schools in disadvantaged, impoverished and resource-scarce regions continue to be marginalised from participating in the new modern technology. This is due in part to poorly resourced schools that have struggled to adopt the transition from an exclusively in-person format to teaching and learning success in an online format (Maree, 2021). It is worth underscoring the sad reality experienced by learners attending affluent schools who either did not have smartphones or access to the Internet or Wi-Fi or did not have the necessary skills needed to navigate the available online resources. The parents and guardians of these learners were not ready to support their children to instantly switch to online platforms or to pay private tutors to assist their children to gain confidence in using these platforms.

Rebooting, reimagining, and reengineering the curriculum through self-directed learning (SDL) approaches

Many studies have given higher education reform more attention during the COVID-19 pandemic than the general education sector (Fomunyam & Khoza, 2021; Maree, 2021; Mpungose, 2021; UNESCO, 2020). As such, many schools in South Africa and on the African continent need to rethink and reengineer education implementation in the wake of the COVID-19 pandemic (UNESCO, 2020). The implementation of creative, innovative teaching and learning strategies demonstrated during the COVID-19 pandemic should be promoted in all facets of education. Many institutions and government agencies are grappling to save the soul of education following the COVID-19 pandemic by rethinking and reengineering curriculum discourse and implementation (Naidu, 2022). Some obvious questions for researchers, policymakers and stakeholders are which part of the curriculum needs urgent transformation, where to start,

and how. One of the obvious submissions to address these questions is the realisation that going back to where we were before the pandemic is neither possible nor desirable.

The first process for reimagining the curriculum is engaging key stakeholders to put their hands on deck both during the reform process to help mitigate resistance to change and during the implementation process (OECD, 2020). Inculcating the principles of a participative approach to curriculum change may enhance the quality of outcomes. Such an approach is based on consensus and the professional expertise of teachers, policymakers, and the political heads of institutions. The same approach to curriculum reform both during and after the COVID-19 pandemic required knowledge of what had to be reformed and how and gave a voice to stakeholders to help represent the interests of the masses of people on the ground.

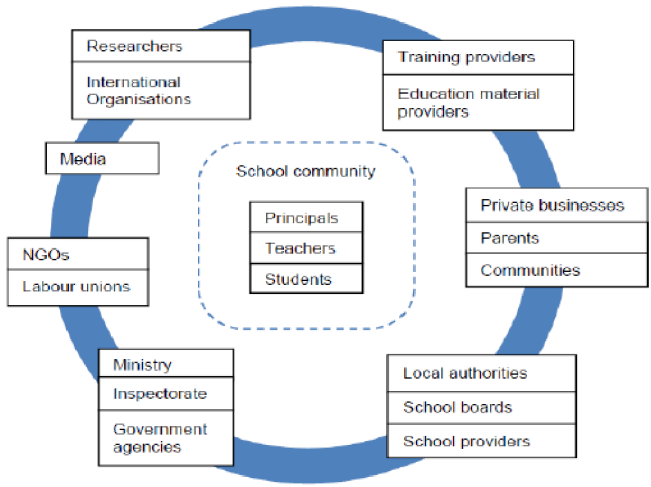

Figure 4.1: Potential stakeholders in education (Burns & Köster, 2016)

Figure 4.1 demonstrates the complex and tedious process of engaging stakeholders, where the process might take forever to finalise before a consensus is reached (Burns & Köster, 2016). For the effective implementation of the curriculum with minor

changes, the DBE must learn how to engage with stakeholders through the principles of involvement, transparency, and communication, as well as respect for stakeholders so that they will support curriculum change. The DBE has learnt that in the future, this process cannot be subverted or overlooked to the detriment of expediting curriculum implementation resulting from emergencies such as the COVID-19 pandemic. Zhao and Witterston (2021) argue that unnecessary shortcuts were taken, and the DBE missed a golden opportunity to persuade key stakeholders to embrace multimodal teaching or blended learning. Similarly, teachers and learners rejected the integration of online teaching and learning and opted instead for a rotation system for curriculum delivery (Mpungose, 2021; Naidu, 2022).

The changes brought by the Fourth Industrial Revolution are serious enough to scare the government and the DBE in South Africa into implementing regular changes in the curriculum. Initially, the curriculum was shaken by the COVID-19 pandemic for two years, leaving huge gaps in learner knowledge attainment owing to the excessive reduction of content considered no longer essential or useful by subject field experts. The first issue that needed urgent attention brought on by the State of Disaster was trimming subject content on various levels and grades to streamline the curriculum (Zhao & Witterston, 2021). The study by Maree (2021) revealed that teachers rejected the idea of a limited trimming programme (LTP) by using the original ATP to ensure a solid foundation for subsequent grades. The irony in South Africa is that the essential skills required by the Fourth Industrial Revolution have not been introduced into the mainstream curriculum. The reengineering of the curriculum would propose that new subjects be developed and included in the current curriculum to replace those subjects considered redundant and less impactful (Naidu, 2022). There is room for the introduction of subjects such as robotics, automation, and coding to this cohort of learners to ensure these subjects start benefiting learners' occupational future. Previous studies have provided enough empirical evidence of the effectiveness

of a robotics curriculum for knowledge acquisition, high-order cognitive ability, attitudes, and hands-on operation (Chen & Cheng, 2018). Maree (2021) and Dawson, Fouksman and Monteith (2021) hold strong sentiments about future education at all levels, particularly amongst young people who have never done waged or salaried work before.

Studies conducted in the field of computer science including coding and artificial intelligence by Angeli *et al.* (2016) interrogated the idea of integrating coding and robotics. The first framework developed introduced learners (aged 6 to 12) to computational thinking concepts, a blueprint for the development of algorithms and programming language. The outcome of this framework was to introduce five critical and scarce skills (abstraction, generalisation, decomposition, algorithmic thinking, and debugging) (Nardelli, 2019) to be developed across different subject areas. The demand brought by the knowledge economy and robotics necessitated the development of an innovative curriculum framework. This shift in approach brings nuance in developing thinking skills such as abstraction, generalisation, decomposition, algorithmic thinking, and debugging (Chalmers, 2018; Shute *et al.*, 2017). In a nutshell, changes introduced to CAPS focus on promoting the use of algorithmic thinking to devise sequences of actions to be executed and develop the skills of abstraction and generalisation from one solution to another by identifying familiar patterns. In the final analysis, Chalmers (2018) saw this framework as a benchmark for an iterative problem-solving process which allows learners to explore new skills such as debugging skills as they identify and fix issues and errors.

Current studies show that programming knowledge fits the 21st-century description of digital innovation, and problem-solving systematically (Ching *et al.*, 2018; Geldenhuys & Fataar, 2021). Learners who are exposed to computational thinking through programming, develop algorithmic thinking, problem-solving, logic, and debugging skills (Buitrago Flórez *et al.*, 2017). Based on findings, the view that teaching programming is the best approach to teaching

computational thinking has become accepted. This is only the case, however, if curricula are centred around the development of computational thinking skills and not solely focused on teaching children coding languages (Buitrago Flórez *et al.*, 2017). The ability to write lines of code according to Geldenhuys and Fataar (2021) is regarded simply as the vehicle through which the learners can create stories, animations, objects, mobile apps or games and solve problems. It is during teachers' planning, execution and improvement of these activities that computational thinking is developed in young learners (Geldenhuys & Fataar, 2021).

Summary

A curriculum is an interrelated set of plans and experiences learners encounter during the enactment of programmes in a school environment. The role of policymakers is to conceptualise and develop a curriculum framework that responds to changes in the socioeconomic and political dynamics of the country. The CAPS curriculum was tested during the COVID-19 pandemic when experts considered trimming the curriculum by partially removing certain content regarded as redundant and less important. This intervention followed a top-down approach whereby teachers were instructed to revise the ATP, focusing on specific subjects targeted by this curriculum reform process. Like all other responsible agencies of the state, the DBE developed a guiding protocol to minimise curriculum disruptions during the COVID-19 pandemic. Most schools were forced to infuse multimodal teaching while others could switch completely from face-to-face teaching to an online mode. However, the majority of schools were underprepared for several reasons, such as a lack of resources, poor connectivity and a lack of infrastructure to implement physical distancing. This was a golden opportunity for the DBE and government in general to address these shortcomings, but instead of seizing the opportunity, the DBE started tampering with the curriculum by trimming certain content as a result of a lack of funding from the national government. The CAPS in part focuses on

the content of individual subjects and how they should be taught and assessed. Owing to this focus, teachers are used to teaching these subjects by following the ATP and very specific guidelines of assessment. Any deviation from the planned ATP means that teachers have to start from scratch to develop new lesson plans and assessment activities in line with the proposed changes by the DBE.

It can, therefore, be concluded that the changes in CAPS documents were rushed so that the DBE has bought more time to address curriculum issues sensibly. These changes have not given teachers a chance to understand how to implement them, let alone engage learners in meaningful learning experiences such as the participative approach suggested by the CAPS.

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