Chapter 1

Quality Education for What, How, Who, and Why in the Fourth Industrial Revolution?

Simon B. Khoza
University of KwaZulu-Natal
khozas@ukzn.ac.za

Kehdinga George Fomunyam
Durban University of Technology
georgek@dut.ac.za

Abstract

In this chapter, we argue for quality education (curriculum) defined as a reconstructed process of teaching and learning based on the critique of pragmatic, performance, and competence-based curricula, in order to address the 'why' question of education (driven by education reason). This is a proposed quality education theory (QET) for higher education which is not only integrating digital technologies for a performance or competence-based curriculum, but also for addressing the 'who' and 'why' questions of education. Digital technologies have been used by higher education institutions (HEIs) to address societal (competence-based), and professional (performance) needs, through responding to the 'how' and 'what' questions of education. This has been happening at the expense of addressing personal needs that respond to the 'who' and 'why' questions of education. Even after the integration of various digital technologies in education, student results or performances have not improved because the integration process is not driven by

relevant education theories. This chapter does not intend to discuss any specific digital technology, because the QET is proposed to incorporate any relevant digital technology for the 4IR. The chapter includes the influence of the conscious, subconscious, and unconscious mind, in driving reflections to produce relevant critiques that inform academics and students of the relevant reasons for education that drive any digital technology used in education.

Keywords: *competence-based*; *curriculum*; *digital technologies*; *Fourth Industrial Revolution*; *performance*; *quality education*

Introduction

Even after the emerging of the Fourth Industrial Revolution (4IR) in the twenty-first century (Schwab, 2016), higher education institutions (HEIs) used digital technologies for the teaching of prescribed course content known as legacy content. This label was applied because the content is based on print media, needed by digital immigrants or refugees (Khoza & Manik, 2015; Prensky & Berry, 2001), and used by HEIs to keep their legacy (Khoza, 2017). Digital immigrants or refugees are digital users who are not fluent in using digital technologies. On the one hand, when students use digital technologies, especially various types of learning management systems (LMSs) to master the legacy content, they pass their courses with high marks; HEIs claim this as quality education. On the other hand, the majority of students learn better with electronic activity-generated content or future content, because they are digital natives, residents, or the Google or DotNet-generation (Khoza, 2016a; Prensky, 2001).

Students prefer to start learning by using activities to interact with others (especially through social networks and media), in order to produce or generate content (future) for their courses, legacy content being abstract to the majority of them. For the students, activity-generated content produces quality education. As a result of these various definitions of quality education, the majority of students fail to finish their qualifications within the prescribed period; which is a

cause for concern for HEIs and students themselves (Khoza & Biyela, 2019).

The 4IR, with its technologies, has disrupted most of what HEIs and students have been doing. These digital technologies are introduced in order to improve teaching and learning that may result in high throughput rate. As witnessed by Schwab (2016, p. 7), although these digital technologies are in their infancy, they are starting to catch academics and students off guard, having this unresolved issue of teaching and learning preference.

> *"Consider the unlimited possibilities of having billions of people connected by mobile devices, giving rise to unprecedented…the staggering confluence of emerging technology breakthroughs, covering… artificial intelligence (AI), robotics, the Internet of things (IoT), autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing,… Many of these innovations are in their infancy, but they are already reaching an inflection point…"*

The unresolved issue or contestation between the definition of quality education by HEIs and students suggests an important need for a new definition of quality education. Such a novel definition would harmonise these two definitions of quality education, based on the 4IR needs. Therefore, in this chapter, we argue for new ways of defining quality education through interrogating performance (drives legacy content for the 'what' question) and competence-based (drives future content for the 'how' question) curricula, studies suggesting this as a major concern in HEIs (Biesta, 2015; Khoza, 2018; Schwab, 2016; Waghid, 2019). The new ways of defining quality education should be able to answer the questions of 'to whom is the quality education directed?', and 'why?'. This chapter may be useful to HEIs, students, academics, departments of education, and other related sectors.

Integrating Digital Technologies for the 'What' of Education

Digital technologies are used to master the prescribed or legacy course content when academics (teachers) use performance curriculum in teaching and learning (Khoza, 2019). Performance curriculum is a prescribed or formal plan for teaching and learning, in which the system of teaching is driven by prescribed structures. Such structures must be followed by both academics and students in order to address professional, discipline, subject, or course needs (Khoza, 2018; Mpungose, 2019a). The prescribed structures include prescribed course content collected by academics from prescribed policies before they teach, in order to teach students to master the content. Mastering the content will lead to students being able to reproduce the content when they write examinations or tests. Digital technologies are programmed to support academics in drilling students with prescribed course content (Khoza, 2016b; Mpungose, 2019b). An example of this is a teacher robot designed by Bengaluru School in India to teach more than 300 students, while teachers were focusing on social and personal needs of the students. The strength of the robot teacher was that it was able to teach all the students in the same way, even when it was asked to repeat the prescribed content several times. Such is not possible for the teachers (academics) to do. Over and above the prescribed course content, prescribed structures of performance curriculum consist of prescribed objectives, activities, and summative assessment (Shoba, 2018; Tyler, 2013). Table 1.1 is an example of teaching based on the performance curriculum.

For example, if teachers were to teach students to *create a table* (Tables 1.1 and 1.2) using any application software, they would search for the prescribed *teaching objectives*; steps of a specific application software (Microsoft Excel) with content of Tables 1.1 and 1.2 to represent the *content*; model of the table to represent *activities*; and a *summative assessment*.

Table 1.1: Model Example of Creating a Table

Test Marks for Grade 10					
Surname and Initial	**Test 1**	**Test 2**	**Test 3**	**Total**	**Final**
Ali SB	54	61	66	181	60
Basi PT	62	59	65	186	62
Dongwe ZC	45	56	48	149	50
Pillay YN	70	67	73	210	70
Smit RE	66	65	68	199	66
Zondi P	83	80	91	254	85
Highest	83	80	91	254	85
Lowest	45	56	48	149	50

Objectives are short-term goals for teaching guided by the research of Benjamin Bloom (Hyland *et al.*, 2006; Fomunyam, 2017). In an example of a teaching objective for this table (Tables 1-1 and 1-2), one may say: "*Students will understand the concepts of creating a spreadsheet table using relevant formulae and functions*". This objective use of 'understand' is a keyword for the cognitive domain, while 'creating' would represent the higher-order levels (evaluating and creating) (Budden, 2017). Activity is any product of hardware and software resources that guide teachers' and students' actions (Govender & Khoza, 2017; Khoza, 2017).

A resource that may produce activities is defined as any object or person that communicates teaching and learning (Khoza, 2018). An important resource for teaching is the idea or theory that drives hardware and software resources, known as the ideological-ware (IW) resource (Khoza & Biyela, 2019). Activities that may come with the teachers are given in Tables 1-1 and 1-2 (in the form of worksheets), so that students would know what the steps set out by the teachers would produce. Students are assessed by means of summative assessment. Summative assessment is a system of asking students specific questions based on the content they have learnt, in order to collect, analyse, and store the responses, with the aim of

Table 1.2: Model with Formulae and Functions

Test Marks for Grade 10					
Surname and Initial	**Test 1**	**Test 2**	**Test 3**	**Total**	**Final mark**
Ali SB	54	61	66	=B3+C3+D3	=Average(B3:D3)
Basi PT	62	59	65	=Sum(B4:D4)	=Average(B4:D4)
Dongwe ZC	45	56	48	=Sum(B5:D5)	=Average(B5:D5)
Pillay YN	70	67	73	=Sum(B6:D6)	=Average(B6:D6)
Smit RE	66	65	68	=Sum(B7:D7)	=Average(B7:D7)
Zondi P	83	80	91	=Sum(B8:D8)	=Average(B8:D8)
Highest	=Max(B3:B8)	=Max(C3:C8)	=Max(D3:D8)	=Max(E3:E8)	=Max(F3:F8)
Lowest	=Min(B3:B8)	=Min(C3:C8)	=Min(D3:D8)	=Min(E3:E8)	=Min(F3:F8)

grading students. The questions asked are guided by prescribed objectives. Summative assessments for this lesson may be class tests or examinations. Teachers teach as instructors who give instructions to passive students. Both parties follow the linear system, and are forced to follow set instructions (Makumane, 2018). According to Le Grange (2016), this is a market-driven system which treats students as products produced by machines, because students have limited or no voice in the system. According to Biesta (2015) and Khoza and Biyela (2019), the strength of a performance curriculum is that it grades students, moving them to the next level of thinking, by giving them qualifications that record their cognitive development. The above studies support the notion of Kanu and Glor (2006, p. 102) of an 'over-regulation and soul-less standardization' system, in which teaching aims at advancing disciplines at the expense of human beings (students) because it does not consider students' different abilities and needs. For example, if Microsoft PowerPoint software is prescribed as the teaching resource, academics may even use it to teach 'students with blindness', without supporting them with job access with speech (JAWS) or Braille technology. As a result, the students may fail their courses, not because they are challenged by the content, but because they are affected by the teaching resource. At the same time, if prescribed structures are always aligned with students' abilities and needs, students become dependent on prescribed structures, failing to produce their own structures for themselves taken from those of their disciplines.

From the above example and discussions, it is clear that in a performance curriculum, teachers and students know in advance what is to be taught and learned; the objectives guiding teaching and learning; the activities used for engagement; and the assessment that will be administered for grading. Therefore, prescribed objectives, content, instructor role, activities, and summative assessment become the five minimum requirements for *quality education* in the performance curriculum. Any digital technology used should at least be in line with these requirements, in order to advance

and address subject or professional needs. As a result, HEIs mostly use LMSs such as Blackboard, Moodle, WebCT, and others to reflect the performance curriculum. LMSs can be programmed for the prescribed, structured programmes, to which only course registered students have access.

Integrating Digital Technologies for the 'How' of Education

Using digital technologies to answer the 'how' question is a function of a competence-based curriculum (Hoadley, 2018; Khoza, 2016a). A competence-based curriculum is an experienced plan of teaching and learning. Under the competence-based curriculum, students are given activities in which to interact in order to produce content for the course. For example, in the above example of creating the table (Tables 1-1 and 1-2), students would be given computers and be told to create a table. Students would reflect on their experiences of creating the table using various types of application software (eg, MS Word, MS Excel, MS Access...). Facilitators (academics) would ask at least one student from each software group to demonstrate to other students how such application-type software is used in creating the table. When they demonstrate, students use their skills or competences generated from their experiences, based on their societal needs and history. When students reflect on their experiences in order to create the tables, they achieve learning outcomes as their student goals. Assessment may be in the form of peer-assessment; the main aim is to facilitate students to learn as a group, or to collaborate with others. The students demonstrate how learning takes place in addressing the 'how' question of education, while also addressing societal needs.

Therefore, the minimum requirements for a competence-based curriculum are learning outcomes, resources to drive learning activities, facilitating role, and peer-assessment. These principles suggest a minimum criterion of defining quality education within competence-based curriculum, which seems to be preferred by digital

natives. The most popular resources that drive the students to interact in the 4IR are mobile devices with WhatsApp, Facebook, Instagram, and others, together with various student IW resources (Khoza & Biyela, 2019; Schwab, 2016). Students become good at debates, but poor in terms of planning that demands that they follow strict rules (Dlamini, 2018). Although the competence-based curriculum involves democratic decisions through collaboration, in most cases, these decisions overlook self-reflection as one of the important principles of democratic quality education (Waghid, 2019). Self-reflection helps academics to address the 'who' question of education, as demanded by the 4IR (Fomunyam, 2014; Biesta, 2015; Khoza, 2018; Schwab, 2016; Waghid, 2019).

'Who' are digital technologies for?

Self-reflection is a process of questioning or interrogating one's mind in order to improve one's teaching and learning actions. The mind is the cognitive structure of thoughts housed in the brain. The mind is divided into conscious, subconscious, and unconscious divisions (Khoza, 2018). The conscious mind is the one that helps us to reason. It processes several items of information at a time, and it needs to rest in order to have a long lifespan. Through its reasoning power, it helps to predict our future actions, using past or present information from the subconscious mind. The subconscious mind stores information on all actions we experience every second of our lives. It does not rest, nor is it replete until we die. The subconscious mind helps us to perform actions even when the conscious mind is busy with other important actions or is resting. Although the subconscious mind stores both the past and present information for future actions, it only responds to what is demanded by the task at hand. The subconscious mind always needs to be guided by the conscious mind, to distinguish between what is real and what is imaginary. The subconscious mind overpowers the conscious mind when we are excited, upset, drunk or drugged, or sleeping. The unconscious mind is the body system that helps us with breathing, heartbeat, perspiration, digestion, and with all our bodily systems and

processes. These systems are driven by the historical (past) nature of our body that conditions us to be physically healthy, or to be what we are, and the conscious mind has limited or no control over the unconscious mind.

Self-reflection occurs when the conscious mind is questioning or interrogating the past and present information of actions from the subconscious mind, required by the tasks at hand that must be addressed. Self-reflections are important resources that help academics and students to go beyond the definitions of the performance-based (the 'what' of professional needs) and competence-based (the 'how' of societal needs) curriculum, in defining quality education. When academics and students reflect 'on' (what - past prescribed professional information), and 'in' (how - present societal information), and 'for' (who - personal), subjects become aware of whose needs are being addressed by generated definitions of quality education (Khoza, 2019; Mabuza, 2018; Maxwell, 2013). Self-reflections help academics and students to find and understand their identities that address their personal needs. Such can be achieved through combining strengths of both the performance and competence-based curricula (Pinar, 2012). When academics and students reflect, they play the role of researchers because they collect, store, and analyse information. This is in order to know and understand their needs for reconstructing their next level of thinking about their teaching and learning (Khoza & Biyela, 2019). Academics and students who have mastered the self-reflection process, adopting it as their lifestyle, become the self-actualised individuals who, according to a study conducted by Tay and Diener (2011) in support of Maslow (1970) make up less than one per cent in the entire world. These few 'self-actualised' individuals ('self-actualisers') have unique qualities in which they accept themselves and others as they are. Self-actualisers perceive reality efficiently and tolerate uncertainty; they look at life objectively; are highly creative; are problem-centred; maintain strong moral or ethical standards; need privacy; amongst many other features, as recommended by Maslow (1970). However, it

should be noted that these qualities only indicate that they know or understand their identities, not necessarily that their life actions are better than other people who are not self-actualised.

According to Berkvens *et al.* (2014), academics' and students' identities are influenced by their physical (professional), financial (social), and cultural (personal) abilities. For example, students with disabilities need special digital technologies to address their needs, and special financial support for their activities. Disabilities are driven by various cultures of how they address their needs. This suggests that self-reflections should use these three principles as the minimum criteria for defining quality education, based on 'who' one is defining quality education for. In turn, the definition produces a pragmatic curriculum which is a curriculum designed according to the knowledge, skills, and values of the users. Such features guide the number of performance- and competence-based curricula issues required in education (Khoza, 2014). The pragmatic curriculum does not have a final design: even after it has been enacted, the curriculum users keep on reflecting on it, improving it for the next enactment. According to Waghid (2019), reflections are only strong enough to address the 'why' question of quality education if they are driven by critiques that bear witness to effectiveness.

'Why' digital technologies?

> *"To bear witness, implies that the person him or herself is conscientious and committed to making the act of critique unfold. It is witnessing that allows one to tackle the inhumane from inside, in other words, to prevent a thinking university from collapsing into an abyss of deceit, dishonesty, academic perjury and injustice" (Waghid, 2019, p. 2).*

A critique is a resource that advances self-reflection, using the conscious mind to draw information from the subconscious mind based on a performance, competence-based, or pragmatic curriculum in order to improve teaching

and learning actions. These types of curricula help academics and students to bear witness to take through the critique and re-construct new ways because they are consciously aware of the 'what' (descriptive), 'how' (operational), 'who' (personal), and 'why' (philosophical) questions apropos of quality education. Biesta (2015) argues that critiques of good education should be guided by the purpose or reason (the why of education) for education or educating. Such a reason is divided into qualification (the what of performance-based), socialisation (the how of competence-based), and subjectification (the who of the pragmatic curriculum). When the critiqued resources have been enacted to address the why question, academics and students should reconstruct their curriculum according to the outcomes of their reflections and critiques of the existing curriculum (performance- and competence-based) (Khoza & Biyela, 2019).

Concluding Thoughts

This chapter concludes by proposing a Quality Education Theory (QET) (Figure 1.1) for the Fourth Industrial Revolution (4IR). QET goes beyond what Biesta (2015) termed good education, which consists of teaching for the three domains (qualification, socialisation, and subjectification) of education. QET proposes teaching and learning that start by critiquing the intended curriculum to be enacted, with the aim of reconstructing it so that it will be enacted according to the needs at the time of both academics and students. This suggests that the critique for the reconstruction should be driven by a pragmatic curriculum with its reflections, in order to align physical, financial, and cultural needs of academics with the strengths of the performance- and competence-based curricula. When these needs are considered in the reconstructed curriculum resulting from the critique, this may improve the student throughput rate. Any digital technology to be used in teaching and learning should be part of the comprehensive process that defines quality education, based on the intersection of the three predominant types of curricula. Therefore, according to QET, quality education is

defined as a reconstructed process of teaching and learning. Such reconstruction is based on the critique of pragmatic-, performance-, and competence-based curricula, in order to address the 'why' question of education. In other words, self-reflections and critiques should drive education at all times, in order to prepare for any disrupting digital technologies within the 4IR.

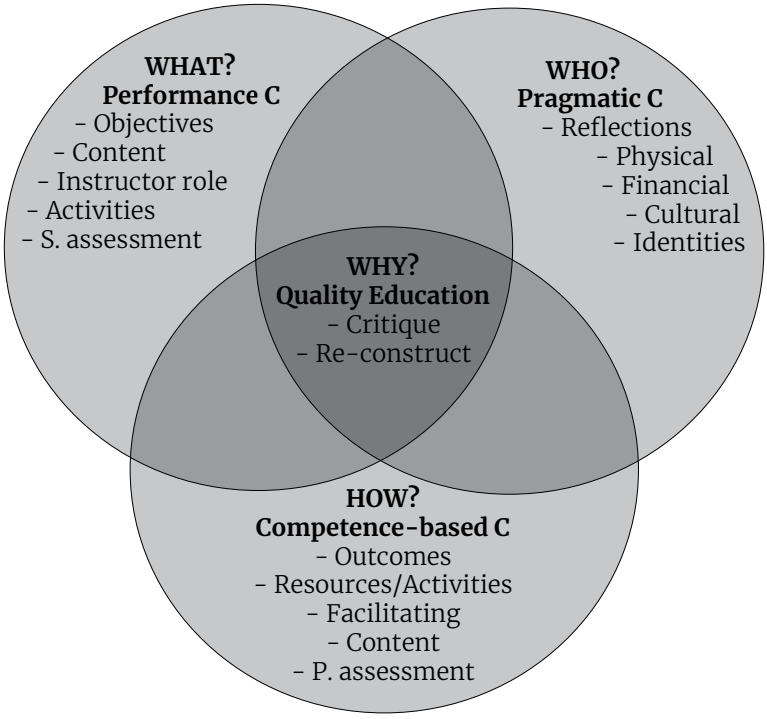

Figure 1.1: Quality Education Theory (QET) for the 4IR

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