Analysing the curriculum philosophy of *equipping learners with values*, and its conceptualisation for integration into life sciences teaching in South African schools

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Abstract

Value(s) is a conceptualisation, and it is abstract because it does not have physical presence. The National Curriculum Statement (NCS) Grades R–12 is a postapartheid values-driven policy statement currently used for teaching and learning in South African schools. From the start of democracy, curricular documents used in South Africa have been built on certain fundamental values that inspired the nation's Constitution. However, against the backdrop of its imprecision in the policy statement, this study examined what the NCS's philosophy of *equipping learners with values* connotes, and how it could be conceptualised for integration into classroom teaching of life sciences concepts. The qualitative study was underpinned by the cultural-historical activity theory as theoretical framework. Textual data in form of words, phrases, sentences, excerpts, quotations, or entire passages from policy documents were analysed using the Bowen (2009) approach to document analysis. The Manifesto on Values, Education, and Democracy (Department of Education, 2001) provided the framework for deductive and inductive approaches to analysis. The study offers explanation on how equipping learners with values can be understood and interpreted in terms of nurturing, seeding, instilling, or inculcating South African constitutional values in learners and awareness pertaining to strategies that can be used to accomplish this are established. How the curriculum philosophy can be conceptualised for integration into classroom teaching of life sciences concepts is also proposed.

Keywords: curriculum philosophy, equipping learners with values, values (noun), cultural historical activity theory (CHAT), Manifesto on Values, Education and Democracy

Introduction

> The National Curriculum Statement Grades R–12 serves the purposes of: equipping learners, irrespective of their socio-economic background, race, gender, physical ability or intellectual ability, with the knowledge, skills and values necessary for self-fulfillment, and meaning for participation in society as citizens of a free country. (Department of Basic Education [DBE], 2011a, p. 4)

The excerpt above conveys an important aspect of the general aims of the National Curriculum Statement (NCS) Grades R–12, which is a postapartheid values-driven policy statement currently used for teaching and learning in South African schools. Against the backdrop of its imprecision in the NCS, this study examined what the policy statement's philosophy of *equipping learners with values* connotes, and how it could be conceptualised for classroom teaching of life sciences concepts. This study becomes pertinent considering that teachers, among others, have been blamed for not "convey[ing] a positive value system to learners—thus perpetuating the problem of a society in decline" (Anass & Louw, 2011, p. 199). Hence, how a positive value system could be conveyed to learners through classroom teaching of life sciences formed a premise upon which the study was established. Although an ambiguous term (Maringe & Prew, 2014), curriculum has been variously defined (Maringe & Prew, 2014; Sherin & Drake, 2009; Young, 2013). UNESCO (2017) described curriculum as a

> systematic and intended packaging of competencies (i.e., knowledge, skills and attitudes that are underpinned by values) that learners should acquire through organized learning experiences both in formal and non-formal settings. (p. 12)

In this regard, and from the start of democracy, curricular documents used in South Africa have been built on certain fundamental values that inspired the nation's democratic Constitution (DBE, 2011a). Well-established in this Constitution are 10 fundamental (constitutional) values, namely, democracy, social justice and equity, equality, non-racism and non-sexism, ubuntu (human dignity), open society, accountability, rule of law, respect, and reconciliation (Department of Education [DoE], 2001; Dube, 2020).

Furthermore, these values form the basis of the multiracial Republic of South Africa (RSA) and are thus fundamental to the survival of its postapartheid democratic structure. Moreover, the values are well delineated in the Manifesto on Values, Education and Democracy (MVED; DoE, 2001), another values-driven educational document in the country. Congruent with this, values indicate the significance or worth of something (Kostrova, 2018; Wilson & DuFrene, 2009; Bonow & Follette, 2009). Values are "concepts and not facts . . . [they] are relative and not understandable till they become objective" (Dehghani et al., 2011, p. 3079). Values have also been reported to impact human behaviours, choices, and decisions (Gamage et al., 2021; Kostrova, 2018; Sagiv & Roccas, 2021). Correspondingly, the NCS's curriculum philosophy of equipping learners with values is "necessary for self-fulfillment, and [their] meaningful participation in society as citizens of a free country" (DBE, 2011a, p. 4).

However, challenges related to curriculum are still on the front burner of education in South Africa (DBE, 2018). According to the South African Department of Education (DBE, 2011c), school curriculum presents one of the fundamental barriers to learning. Critical features of curriculum normally arise during curriculum development and design (Priestley & Philippou, 2019; Rizvi & Lingard, 2009), and can result in curriculum complexities (Alexander & Hjortsø, 2019; Priestley & Philippou, 2019).

Moreover, such features comprise major philosophical underpinnings as noted, for example, in a science curriculum (Hodson, 1985; Levinson, 2018). Additionally, these philosophical underpinnings are based on particular epistemological views (Barnett, 2000). Consequently, curricula are designed and developed with a philosophical approach whose underpinnings certain scholars have referred to as *curriculum philosophy* (Bialystok, 2017). The NCS's equipping of learners with values is considered one of such philosophies that need to be unpacked. Maringe (2014) has argued that educators and other stakeholders within the educational context of South Africa may have been given the opportunity to freely interpret the curriculum. However, coherent interpretation of curricula, especially with respect to certain philosophies or critical features is pertinent to achieving educational outcomes. Rhodes and Roux (2004) stated that not only should teachers be cognisant of the values prevalent in a curriculum, they need to facilitate these in their teaching in the classroom. Consequently, an understanding of what equipping learners with values connotes is germane to conceptualising how values can be appropriately incorporated into the classroom teaching of life sciences concepts (Rhodes & Roux, 2004). Thus, the motivation for this study resulted from the ambiguity of the NCS regarding its curriculum philosophy of equipping learners with values during classroom teaching. The study was guided by the following research questions: In line with its general aims,

- What does the NCS's curriculum philosophy of equipping learners with values connote?
- How can the curriculum philosophy be conceptualised for integration into classroom teaching of life sciences concepts?

Literature review

The concept of value(s)

The concept of value(s) as a social phenomenon is abstract (Frese, 2015) and has an elusive nature (Seewann & Verwiebe, 2020). This is because value(s) does not have physical presence—it is unobservable or intangible (Huitt & Cain, 2005). This makes values a "conceptualization" (Kluckhohn, 1951, p. 395) depending on the lens with which it is viewed. Additionally, values may be in form of a noun (Magendanz, 2003), for example, honesty, love, truthfulness, respect, and so forth. Moreover, different uses of the concept of values portend that it influences human behaviours (Eyal et al., 2009). Rhodes (2003) reported that values were integrated into the eight learning areas of two curricula policy documents known as Curriculum 2005 (DoE, 1997) and NCS 2002 (DoE, 2003) formerly

used in South Africa. In relation to this, Rhodes and Roux (2004) acknowledged and identified factors that determine the values in a society. Thus, certain parameters, which include the following, can be used to determine the values in a society: moral, aesthetic, political and legal activities, etiquette, intellectual, religious, economic, and custom (Rhodes & Roux, 2004). These factors determine the key words (values) that underscore the nature of societal activity, and the values-laden key words identified and described by Rhodes and Roux (2004) comprise religion; ideologies, ethics and morals; humanitarian, values and beliefs systems; human and social values; policies and procedures; aesthetics and norms of appreciation and culture. These values are commensurate with the 10 fundamental Constitutional values mentioned above.

Curricular transformations in South Africa

As a values-driven cultural acquisition (Gervedink et al., 2013), the NCS Grades R–12 is ideologically and socio-politically inspired (Hildebrand, 2007) arising from apartheid rule in South Africa. Over a period of 17 years, a number of values-driven curriculum transformations have been recorded in the country (DBE, 2011a). These began with Curriculum 2005, implemented in 2000 (DoE, 1997). This led to enactment of the Revised NCS Grades R–9 and NCS Grades 10–12, 2002 (DBE, 2011b). These policy documents were reviewed in 2009. Moreover, "from 2012 the two National Curriculum Statements, for Grades R–9 and Grades 10–12 respectively, are combined in a single document" (DBE, 2011a, Foreword) that culminated in the development of the currently utilised NCS Grades R–12. The policy statements containing the Curriculum and Assessment Policy Statement (CAPS) for Senior Phase (Grades 7–9) Natural Sciences (DBE, 2011a), and Further Education and Training (FET) Phase (Grades 10–12) Life Sciences (DBE, 2011b), were examined in this study. According to the tenets of the NCS, offering natural sciences is compulsory for all learners at the Senior Phase. Congruent with this, the Senior Phase prepares learners for subject selection (including Life Sciences) in the FET phase during which they write their final National Senior Certificate examination at the end of Grade 12. Ultimately, Natural Sciences "prepare[s] learners for active participation in a democratic society that values human rights and promotes responsibility towards the environment" (DBE, 2011a, p. 9). This further underscores the focus of the current study.

Values-driven curricula initiatives

The initiative, Values, Education, and Democracy: Report of the Working Group on Values in Education (RSA, 2000) was targeted at identifying values to be included in the South African curriculum (Ferreira & Schulze, 2014; Rhodes & Roux, 2004). This climaxed in another document, Manifesto on Values, Education and Democracy (DoE, 2001), which was built on the 10 fundamental Constitutional values mentioned earlier. Postapartheid educational reforms tied to a values-driven curriculum also included the enactment of the Guidelines for Inclusive Teaching and Learning (DBE, 2010) and Guidelines for Responding to Learner Diversity in the Classroom (DBE, 2011c). Notably, these postapartheid transformations and initiatives were targeted at promoting values of and for social justice, equity, and development, among others, in a democratic South Africa (Chisholm, 2005).

Against the backdrop of a postapartheid democratic context, the current NCS Grades R–12 was "built . . . on the values that inspired [the South African] Constitution" (DBE, 2011a, Foreword). A similar global trend in this direction was reported pertaining to curricula used in China (Wang, 2019) and Australia (Australian Curriculum, Assessment, and Reporting Authority [ACARA], 2012). In the same vein, using the categories of values described by Caravita et al. (2008), Clément (2012) characterised those values espoused by science and science education curricula. These values, closely related with values enshrined in the Constitution of the Republic of South Africa (RSA, 1996), comprise existential, ecological, aesthetic, economic, cultural, social, political, and ethical aspects.

Curriculum challenges in South Africa

As stated above, challenges related to curriculum are still on the front burner of education in South Africa (DBE, 2018). Moreover, concerns regarding improved classroom teaching through curricula reforms were reported in the 2008/09 annual report of the South African Department of Education (DoE, 2009). Such reforms relate to how critical features of curriculum are understood for appropriate implementation during classroom teaching (Roblin et al., 2017; DBE, 2018). Congruent with this, the failure to achieve desired outcomes regarding science teaching is related to science teachers' "degree of confusion in the philosophical stance implicit in many science curricula" (Hodson, 1985, p. 19). Similarly, it has been argued that challenges pertaining to classroom science teaching in South African schools are traceable to an inability to comprehend critical features of the curriculum (Hoadley & Jansen, 2009; Rhodes & Roux, 2004).

As previously discussed, one of the underlying philosophies of the NCS Grades R–12 is that through the teaching and learning of CAPS-approved subjects, teachers are required to equip learners with values enshrined in the South Africa Constitution (RSA, 1996). Further to this, Jeannette and Julialet (2003) have argued that, in South Africa, violence, lack of discipline and high crime rate are associated with a "lack of values conducive to a healthy society and a well-disciplined school community" (p. 354). Such occurrences have been reported as a global phenomenon (Steyn et al., 2003), and teachers, amongst others, have been blamed for this. Contingent upon that, this study suggests how classroom teaching of life sciences concepts could be used to equip learners with values (for example, those values enshrined in the South African Constitution) and help to instil a positive value system in them.

Theoretical framework

The cultural-historical activity theory (CHAT) was used as theoretical framework in the study. The CHAT, which originated from the activity theory (Engeström, 1987), evolved from Vygotsky's (1978) social constructivist principles. That is, human (subject) actions or activities in relation to an aspect of the world (object) are negotiated via culturally evolved artefacts (Alexander & Hjortsø, 2019; Mentz & de Beer, 2021). In other words, human interactions are mediated by the use of cultural tools (culture and history) that impact the collective will of a people regarding the activities they engage in (Alexander & Hjortsø,

2019). Moreover, such actions or activities usually culminate in an outcome or transformation of that aspect of the world. Consequently, the CHAT undergirded by the activity theory:

> emphasizes how *tools* mediate action between a number of *subjects*, oriented by an *object* to produce an *outcome* . . . the analysis also examines the impact and influence of the surrounding *community*, explicit and implicit *rules*, and the *division of labor*. (Alexander & Hjortsø, 2019, p. 306)

These tenets (my italics) comprise the nodes of the activity system (Engeström, 1987). However, a major aspect of the CHAT is that during the symbolic-tool mediation process, there may be contradictions between the nodes in an activity system (Alexander & Hjortsø, 2019). Barab et al. (2002) described contradictions as an anomaly that exists within and among elements, different activities, or between various formative stages of a single activity. Also, this usually creates problems or challenges within the activity system (Kuutti, 1996). Correspondingly, the contradictions impede efficient implementation and thus need to be addressed by reexamining and reevaluating each tenet of the activity system (Alexander & Hjortsø, 2019). These authors stated that contradictions could assist in recognising challenges that emerge in the process of curriculum development. Thus, the CHAT provides the study with a framework for "linking micro-level analysis of the human interaction with macro-level processes in its environment and draws on two perspectives relevant to the process of curriculum development: systems thinking and social constructivism" (Alexander & Hjortsø, 2019, p. 305).

Therefore, tenets of the CHAT are used to foreground the cultural-historical perspective of curriculum development (or reforms) that culminated in the NCS Grades R–12. I consider that one of the ways in which the reform was expressed is through the curriculum's philosophy of equipping learners with values. Furthermore, the curriculum reform took place within the activity system of an educational context located in a larger South African socio-cultural milieu. Considering that knowledge and context are inseparable (Batiibwe, 2019), learning about curricula ambiguities requires the construction of considerable knowledge in the same context in which the knowledge will be used (Mishra & Koehler, 2006). Figure 1 below indicates a proposed framework by which the CHAT is used to analyse the NCS's curriculum philosophy of equipping learners with values. The figure illustrates the tenets and nodes pertaining to their relationships with briefs of their specific content in relation to the subject matter of focus in the study.

Figure 1

Proposed framework by which the CHAT was used to analyse the NCS's curriculum philosophy of equipping learners with values, based on the 2nd generation of activity theory by Engeström (1987)

In Figure 1, all events surrounding both the pre- and post-colonial and apartheid, but now democratic context of South Africa, form the bedrock of the cultural-historical aspect of the CHAT. These events are all embedded within the activity system of South Africa. However, the postapartheid democratic Constitution represents the now fundamental *symbolic-tool mediator* (Vygotsky, 1978) guiding all activities within the cultural milieu of South Africa. The environment of these activities is analysed in terms of the major influence or forces of a post-colonial and apartheid democratic context within which such activities now take place. Thus, the above values-driven Constitution, as a cultural acquisition or artefact, is a cultural object found within the South African socio-cultural context but employed adaptively, depending on the social activities being engaged in (Hennig & Kirova, 2012). Moreover, the Constitution of South Africa serves as a "source of life" for other policy documents such as the NCS and the MVED. As previously explained, these policy documents are built on the values that inspired the Constitution.

In particular, the Constitution's Bill of Rights (RSA, 1996) underscores the 10 fundamental values of democracy, social justice and equity, equality, non-racism and non-sexism, ubuntu (human dignity), open society, accountability (responsibility), rule of law, respect, and reconciliation (mentioned previously) enshrined in the Constitution. These values underpin the NCS's curriculum philosophy of equipping learners with values. The above-mentioned policy documents are cultural tools available within the larger community of a postapartheid South Africa and the microcosm of an educational context. In this case, such tools particularly provide guidelines for teachers and other stakeholders such as principals, subject

advisors, administrators, school governors, and other personnel within the educational community in the country. In essence, the documents foreground "rules" upon which such a community is established.

The community (context) considered in the activity system in this study has to do with schools in a postapartheid South Africa. The idea of context is an essential factor to the CHAT, and was considered when employing it as a theoretical framework for this study. This is because a snag in curriculum change research has been identified as failure to fully analyse the context, with only a sketchy and shallow conception of it (Hargreaves, 2005). This gap has been avoided in this study as the cultural-historical context of South Africa within which curricula changes are experienced is well defined. Moreover, the subject is the teacher who, as a facilitator or activator of classroom teaching (science teaching to be specific) is the end user or operator of the curriculum in the classroom. To achieve educational outcomes and goals, subjects depend on the tools, which are produced through transformation or reform processes.

Furthermore, the subjects (life sciences teachers, in this study) do not work alone but within a community of teachers (of other subjects). More importantly, each of the stakeholders within the community has differentiated responsibilities and roles to perform (division of labour). These divisions, according to Alexander and Hjortsø, can "run horizontally with tasks spread across members of equal status in the community, and vertically where tasks are distributed up and down divisions of power" (2019, p. 306). It is only through the use of tools directed towards an object, that the subject will produce expected outcomes. In this study, the object relates to the NCS policy statement and, specifically, the curriculum philosophy of "equipping learners with . . . values" as requested by the document (DBE, 2011a, p. 4). And, the outcome pertains to the values "necessary for [learners'] self-fulfillment, and meaningful participation in society as citizens of a free country" (DBE, 2011a, p. 4).

Thus, in proposing the CHAT framework, the context of the study is to fully understand the above value-driven object (curriculum philosophy), and how it can be conceptualised for integration into classroom life science teaching in the educational context of postapartheid South Africa. Further, the contradiction (problem/challenge), as earlier explained, associated with the activity system in our proposed CHAT framework relates to the imprecision of the NCS's curriculum philosophy of equipping learners with values.

Research methods

Qualitative research design

As a qualitative research study, I explored a systematic inquiry into questions arising from people's perspectives and meanings attached to certain vital aspects of a social phenomenon (Hammarberg, et al., 2016). Hence, I searched for descriptions in words (texts) or any forms of description in policy documents that could assist in answering the research questions.

Data collection

Bowen's (2009) approach to document analysis (or document review, Dalglish et al., 2020) was employed in the study. Bowen (2009) stated that document analysis involves an "iterative process of . . . skimming (superficial examination), reading (thorough examination), and interpretation [combining] . . . elements of content analysis and thematic analysis" (p. 32). The following policy documents were selected for document analysis because that they contained pertinent information that could assist to achieve the research aims of the study: two NCS Grades R–12 policy statements, one comprising CAPS for Senior Phase Natural Sciences (DBE, 2011a) and the other comprising CAPS for FET Life Sciences (DBE, 2011b). By skimming and reading, textual data in form of words, excerpts, quotations, or entire passages were extracted from the above policy documents (Bowen, 2009). Moreover, topics related to life sciences were randomly selected from the policy statements (Section 3 in both documents), and they supplied textual data from which values infused in scientific content and concepts were identified (and characterised).

An adaptation of the grids used for description of values suggested by Rhodes and Rouxs (2004) and Caravita et al. (2008) guided how the values incorporated into the topics were characterised. Further, the MVED (DoE, 2001) provided a framework by which I resolved how the characterised values corresponded with the 10 fundamental values enshrined in the Constitution of South Africa. The topics randomly selected were used to propose how the curriculum philosophy could be conceptualised for its integration into classroom teaching of life sciences.

The processes of superficial and thorough examination of documents were repeated throughout the document analysis process. I familiarised myself with the textual data collected through reading and rereading personally before engaging in general discussions among colleagues to share notes. This enhanced data immersion (Green et al., 2007). Data immersion strengthened overall meaning making of data and assisted in coding and category construction (Bowen, 2009). The coding process produced substantive categories and these interlinked data collection and interpretation (Charmaz, 2006). This reduced the whole pile of data into "small chunks of meaning" (Maguire & Delahunt, 2017, p. 3355). Coding underscored the element of content analysis while the "authenticity criteria" (Guba & Lincoln, 2001, p. 7) underlined that research quality and rigor were ensured.

Data analysis

Content analysis involves "organising information into categories related to the central questions of the research" (Bowen, 2009, p. 32). Therefore, values characterised from the content and concepts inherent in the topics selected were categorised accordingly. Through thematic analysis, patterns within the data portraying emerging themes were recognised. I did a back-and-forth interplay with the data by carefully re-reading and reviewing the codes and categories. Ultimately, a hybrid of inductive and deductive approaches to data analysis (Azungah, 2018) was used for coding, category, and theme development (Fereday & Muir-Cochrane, 2006). These approaches were particularly employed to propose how the

curriculum philosophy could be conceptualised for integration into classroom teaching of life sciences (i.e. answering Research Question 2). Figure 2 below shows an example of the processes involved in the hybrid of inductive and deductive approaches to data analysis using a topic approved in the CAPS for Natural Sciences. By these processes, themes were developed through interpretations made from the raw data and using the MVED as a framework. My experience as a life sciences teacher for more than two decades enhanced my interpretations.

Figure 2
Processes involved in the hybrid of inductive and deductive approaches to data analysis in the study (author's design)
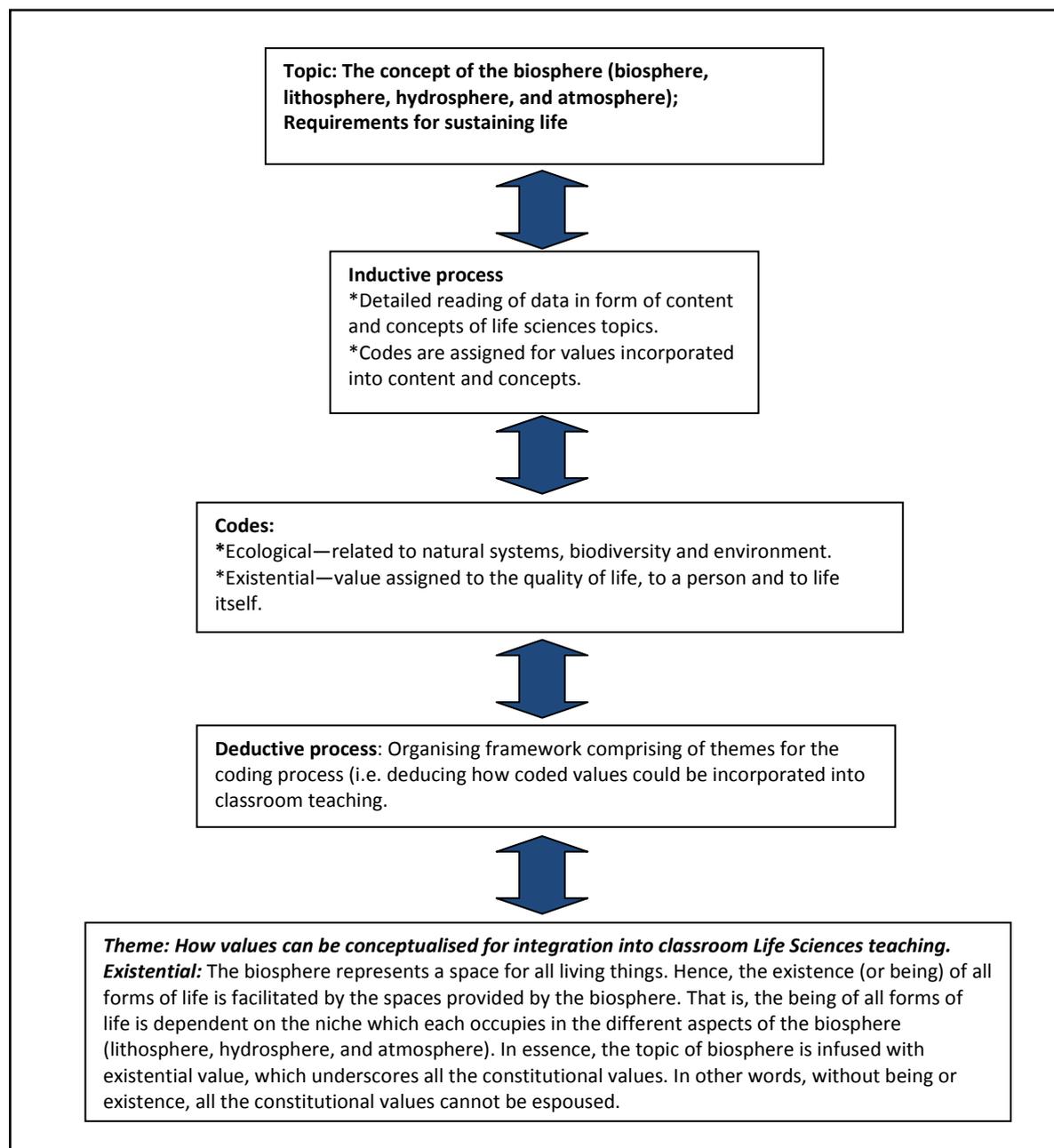
Results

The results are discussed in the following order: Theme 1 presents my findings on what the curriculum philosophy of equipping learners with values connotes, Theme 2 highlights the MVED's strategies for instilling democratic values in young South Africans in the learning environment, and in Theme 3, using the values characterised from the selected topics, and in consonance with the 10 Constitutional values described by the MVED, I indicate a proposal on how the curriculum philosophy could be conceptualised for integration into classroom teaching of life sciences concepts.

Theme 1: What the curriculum philosophy of equipping learners with values connotes

The excerpts below, derived from the MVED (DoE, 2001), provide clues that suggest how the curriculum philosophy could be better understood and interpreted.

Excerpt 1 (DoE, 2001, p. 3)

> Inculcating a sense of values at school is intended to help young people achieve higher levels of moral judgement.

Excerpt 2 (DoE, 2001, p. 3)

> We also believe that education does not exist simply to serve the market, but to serve society, and that means instilling in pupils and students a broad sense of values that can emerge only from a balanced exposure to the humanities as well as the sciences.

Excerpt 3 (DoE, 2001, p. 7)

> [Constitutional values] are explored in a way that suggests how the Constitution can be taught, as part of the curriculum, and brought to life in the classroom.

Excerpt 4 (DoE, 2001, p. 3)

> The Manifesto outlines sixteen strategies for instilling democratic values in young South Africans in the learning environment.

As a start, the literary meaning of the word "equip" was examined and, according to the Cambridge Dictionary (n.d.), it stipulates, "to give someone the skills needed to do a particular thing." In this regard, findings arising from the above excerpts indicate that the MVED provides clues with which to understand or interpret the curriculum philosophy. Correspondingly, the excerpts above contain phrases that are related to, or provide some insight into, what the curriculum philosophy connotes. Such phrases include "inculcating a sense of values at school," "instilling in pupils and students a broad sense of values," and "how the Constitution can be taught."

Theme 2: The strategies for instilling democratic values in young South Africans in the learning environment

Unlike the NCS, the MVED suggested 16 strategies for instilling democratic or Constitutional values in young South Africans as conveyed below.

Excerpt 5 (DoE, 2001, pp. 4–5)

- Strategy 1. Nurturing a culture of communication and participation in schools.
- Strategy 2. Role modelling: Promoting commitment as well as competence among educators.
- Strategy 3. Ensuring that every South African is able to read, write, count and think.
- Strategy 4. Infusing the classroom with a culture if human rights.
- Strategy 5. Making arts and culture part of the curriculum.
- Strategy 6. Putting history back into the curriculum.
- Strategy 7. Introducing religion education into schools.
- Strategy 8. Making multilingualism happen.
- Strategy 9. Using sport to shape social bonds and nurture nation building at schools.
- Strategy 10. Ensuring equal access to education.
- Strategy 11. Promoting anti-racism in schools.
- Strategy 12. Freeing the potential of girls as well as boys.
- Strategy 13. Dealing with HIV/AIDS and nurturing a culture of sexual and social responsibility.
- Strategy 14. Making schools safe to learn and teach and ensuring the rule of law.
- Strategy 15. Ethics and the environment.
- Strategy 16. Nurturing the new patriotism, or affirming our common citizenship.

Thus, having provided insight into what the curriculum philosophy denotes (Theme 1), the MVED also suggested 16 strategies for instilling democratic values in learners. This further enunciates my findings on how the MVED offered explanations of what the curriculum philosophy of equipping learners with values implies. To reiterate, the MVED not only offered better understanding of what the philosophy stipulates but also provided suggestions on strategies to achieve it.

Theme 3: How the curriculum philosophy could be conceptualised for integration into classroom teaching of life sciences concepts

The excerpts below provide examples using certain concepts, approved for teaching, and derived from the NCS/CAPS policy statements examined in the study.

Excerpt 6 (DBE, 2011a, p. 17)

> The biosphere content & concepts: The concept of the biosphere (biosphere, lithosphere, hydrosphere, and atmosphere); Requirements for sustaining life.

What values could be taught using the above concepts and explanations?

1. Social justice: The topic on biosphere presents values of social justice in that it provides a space for all forms of life or all living things (organisms). These living things include plants, animals, and microorganisms. The biosphere comprises the lithosphere (soil and rock), hydrosphere (water), and atmosphere (gases). Each living thing occupies and exists in any of these areas, thus indicating that the value of social justice is infused in the topic of biosphere. Moreover, all the forms of life are equal in the sense that they all carry out the same life processes of nutrition (feeding), growth, reproduction, respiration (energy production), excretion, sensitivity (to the environment), and movement. Consequently, the topic is integrated with the value of social justice and equity.

2. Existential: As explained above, the biosphere represents a space for all living things. Hence, the existence (or being) of all forms of life is facilitated by the spaces provided by the biosphere. That is, the being of all forms of life is dependent on the niche that each occupies in the different aspects of the biosphere (lithosphere, hydrosphere, and atmosphere). In essence, the topic of biosphere is infused with existential value, which underscores all the Constitutional values. In other words, without being or existence, none of the Constitutional values could be espoused.

3. Ubuntu: Given that the biosphere provides space within which all forms of life co-exist, it creates interdependence among all living things because no single one is autonomous. Moreover, non-living elements also impact the interdependence among all form of lives. The value of ubuntu can therefore be nurtured in learners through teaching the concept of biosphere.

Excerpt 7 (DBE, 2011b)

> Support systems in animals; Human skeleton—the axial skeleton and the appendicular skeleton (p. 30). Diseases that affect the skeleton: Rickets in children, osteoporosis, arthritis, etc. (p. 31). Applications of Indigenous knowledge systems e.g. traditional medicines and healers (p. 28).

What Constitutional values could be taught using the above concepts and explanations?

1. Equality/non-discrimination: The topic is infused with this value in the sense that there is need to accord dignity to individuals who suffer from musculoskeletal-related diseases. Hence, such individuals should be treated fairly and not discriminated against but given the help and assistance they need.

2. Responsibility/accountability: The topic promotes a sense of responsibility towards one's body and, specifically, the muscles, bones, ligaments, and tendons because there could be damage resulting from carelessness. For example, ensuring appropriate measures of vitamin D from the sun for kids to prevent a disease such as rickets, the consumption of calcium to reinforce bones against osteoporosis, and avoiding smoking as it might cause arthritis.

3. Respect: The topic of Indigenous knowledge and traditional medicine and healing espouses the value of respect for culture and Indigenous knowledge systems. This is the premise upon which 11 languages are enshrined in the South African Constitution.
4. Democracy: In view of the above, a democratic society is feasible where there is respect for each other's cultures (faith, beliefs, religion, language, etc.).

Discussions and conclusions

Curricula reforms are usually accompanied by "tensions and contradictions [which] often result in unintended consequences, especially when they are not carefully analysed and understood" (Alexander & Hjortsø, 2019, p. 302). Roblin et al. (2017) stated that critical curriculum features impact teachers' outcomes. Against the backdrop of a scarcity of such studies in the literature, this study analysed policy documents to shed more light on what the NCS's curriculum philosophy of equipping learners with values connotes, in view of its vagueness regarding what the curriculum philosophy stipulates. However, together with the clarity provided in the MVED (DoE, 2001), the curriculum philosophy does indicate how values enshrined in the Constitution of South Africa could be taught as part of curriculum during classroom teaching. Thus, I put forward that equipping learners with values means how learners can be taught about the fundamental values that are enshrined in the Constitution of South Africa (RSA, 1996). I argue that the philosophy does imply how the values promoted in the Constitution can brought to life in the classroom. And that through this, learners can be inculcated, or instilled, or nurtured with a broad sense of values that may "help [them] achieve higher levels of moral judgement" (DoE, 2001, p. 3). Thus, the curriculum philosophy is expressed in the MVED as a principle of teaching, instilling, seeding, nurturing, enriching, inculcating learners with the values enshrined in the South African Constitution. Moreover, awareness is promoted via the 16 strategies that the MVED proposed for equipping learners with values. Through use of these strategies, the curriculum philosophy requires that teachers should teach, instil, seed, nurture, enrich, and inculcate learners with South African Constitutional values using the content of subjects approved in curriculum.

Ultimately, in response to the dearth of studies in the literature, this study proposed how the aforementioned could be conceptualised in classroom life sciences teaching. Descriptions in Theme 3 above suggested how the selected topics are infused with certain values. The explanations showed how the teaching of the concepts could be used to equip learners with values during classroom teaching of the life sciences topics—how equipping learners with values can be conceptualised during classroom life sciences teaching of those topics. Accordingly, the life sciences concepts embedded in the topic "Support Systems in Animals," for example, can be taught in a manner that enables the teacher to equip learners with Constitutional values such as equality, responsibility/accountability, respect, and democracy.

Furthermore, according to Havnes (2010), human functioning is embedded in culture and history, and "cultural embeddedness implies that human action and interaction cannot be understood without including social and cultural context in the analysis" (p. 492). This

indicates the expediency of CHAT in the current study in identifying historical social interactions among multiple human activities (Igira & Gregory, 2009), and how previous activities could influence fresh ones (Yamagata-Lynch, 2010). Therefore, the concept of the activity system is not to only understand the embeddedness and interactions of humans within socio-cultural contexts but how they are impacted by their history and culture. Thus, the CHAT situates the policy curriculum documents in the postapartheid educational activity system (Engeström, 1987) of a larger South Africa with its cultural and historical perspectives. Influences of socio-cultural, historical, and political underpinnings on curriculum developments have also been reported in the literature (de Wet & Wolhuter, 2009).

In view of the above, the issues of culture and history become essential to micro- and macro-level elements of change involved in curriculum development and design (Priestley & Philippou, 2019; Rizvi & Lingard, 2009). Furthermore, using the CHAT as a theoretical lens, Alexander and Hjortsø (2019) have reported that critical tensions underlie curriculum development activity. In this respect, curriculum reforms or transformations are often associated with commonalities of uncertainties and chaos (Doll, 2008; Priestley & Philippou, 2019). Such influences within the South African social milieu have been values-driven (Chisholm, 2005; DoE, 2001; Dube, 2020; Ferreira & Schulze, 2014; Masango & Mfene, 2017; Rhodes & Roux, 2004). A similar trend is recorded globally (Wang, 2019; ACARA, 2012), and there are global trends of new curricula (Priestley & Biesta, 2013) characterised by critical features (Roblin et al., 2017). The curriculum philosophy of equipping learners with values is well stated in the NCS/CAPS policy statement as one of its underlying principles and stemmed from such aforementioned curricular features. Ultimately, the study did not only bring awareness to this curriculum philosophy but proposed how it might be conceptualised during classroom teaching of life sciences. Future research on how this could be done during classroom teaching of other subjects such as physics, chemistry, and mathematics is intended.

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