Benchmarking the intended Technology curricula of Botswana and South Africa: What can we learn?

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Abstract

Following a transformation of experience-based handicraft education, Technology education was introduced in Botswana and South Africa in 1990 and 1998, respectively, with the intention of developing technologically literate societies, as well as to develop learners' skills for the world of work. Despite these optimistic intentions, limited comparative research is available regarding the intended Technology curricula of these two SADC countries, specifically regarding strengths and potential areas for improvement. Framed in the 'curriculum evaluation as grading practice through process' theory, this study analysed the intended Technology education curricula in comparable high school phases of Botswana and South Africa for benchmarking purposes. The study identified information that could be utilised to strengthen the curriculum of each country. Document analysis was applied to analyse particular design elements and their contribution to the quality of the curriculum using a validated structured curriculum benchmarking instrument developed by Umalusi, the South African Council for Quality Assurance. The study revealed that both the Botswana and South African Technology curricula have several strengths, including explicit guidance for the preferred subject-specific assessment to be used, as well as extensive coverage of a number of similar topics. Areas for curriculum improvement also emerged from the study, in particular the avoidance of some irrelevant subject matter, modifying the emphasis away from preparation for continuing training in Technology education, the inclusion of enterpreneurial learning and increased subject-specific pedagogical guidance. Several of the strengths and areas for improvement identified were used to frame a set of recommendations for strengthening the quality of the two curricula. Through these recommendations, the study made an important contribution to the fulfilment of the original intentions for the subject, which are to develop technologically literate societies and help learners to prepare for the world of work.

Key words

Technology education, intended curriculum, benchmarking, high school subject, Botswana, South Africa

Background and introduction

The term 'technology' is used extensively, often in relation to information technology or electronic devices. Science and technology is also often used collectively and the fields are sometimes perceived as inseparable (Kahn, Mphahlele & Volmink, 2003). It is however important to note that this article reports on the school subject named Technology, which entails content underpinned by the design process. In this context, Technology is defined as "the use of knowledge, skills, values and resources to meet people's needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration" (Department of Basic Education (DBE, 2011, p. 8). Technology education in the South African and Botswana school curriculum aims to develop technologically literate societies, to stimulate learners to be innovative, critical and creative thinkers, to support optimal use of resources and to prepare learners for the world of work (DBE, 2011; Ministry of Education and Skills (MoESD) Republic of Botswana, 2008). While Technology education is offered at various phases of the school curriculum in both countries, this comparative study focusses on the final three years of ten years of compulsive schooling in the respective countries, specifically, that is the Senior Phase (Grades 7, 8 and 9) in South Africa and the Junior Secondary Level (Forms 1, 2 and 3) in Botswana.

Both countries are member states of the Southern African Development Community (SADC) sub-region. A study conducted by the Southern Africa Association for Educational Assessment (SAAEA, 2014), indicates that although all SADC countries offer Technical education in some form or other, including Technology education, substantial differences exist in those curricula, including in terms of policy guidelines and curriculum review. Kahn, Mphahlele and Volmink (2003) also note that Technology in the various countries differs regarding the subject's rationale, conceptualization and implementation strategies. As two SADC member states, it is imperative for Botswana and South Africa to collaborate to identify the potential strengths, and improve the quality, of each curriculum by implementing the strengths identified in the other. The SAAEA (2014, p. x) states that "… strengthening of … curricula is undoubtedly a worthy aim that will facilitate any notions of harmonization of regional education systems in future", emphasising the importance of such research.

The South African National Curriculum Statements Grade R-12 (NCS) was implemented from 2012. One of the issues explicitly stated for this curriculum is "Credibility, quality and efficiency", in other words, that it should provide "an education that is comparable in quality, breadth and depth to those of other countries" (DBE, 2011, p. 5). Comparing the South African curriculum with that of other countries is therefore expected as a means to contribute to its quality assurance.

Several subjects or learning areas form part of each country's curriculum framework. A subject-specific curriculum describes the learning required in a particular subject at various grades or stages (UNESCO, 2016). The subject-specific curriculum documents in the NCS are called the Curriculum and Assessment Policy Statements - referred to as the 'CAPS' in popular parlance. Subject-specific curricula are sometimes referred to as syllabi, as is the case for Botswana's curriculum for Design & Technology (D&T). For this report, the terms 'curriculum' and 'syllabus' are both used and refer to the document that describes the intended curriculum for the subjects Technology and D&T.

Schoonmaker (2010, p. 208) describes curriculum evaluation as a "process of placing value on a curriculum" that can focus on elements such as curriculum content, design, outcomes or implementation. The current study was intended to do more than curriculum evaluation. In addition, it intended to compare and add value to the curricula, which could be achieved through curriculum benchmarking. Benchmarking provides a pathway to move from an existing to a more desirable situation and contributes to the information needed for such a transformation or improvement (Moriarty, 2011; Tasopoulou & Tsiotras, 2017). Benchmarking is often utilised to define and improve the quality of curricula (Ellibee & Mason, 1997; Tasopoulou & Tsiotras, 2017).

The purpose of this study was to explore the current state and quality of the intended Technology and D&T curricula through curriculum analysis and benchmarking. Benchmarking is a continuous quality improvement process, using the identification of specific objectives, strengths and weaknesses, to reach a common understanding (Ellibee & Mason, 1997). Moriarty (2011) notes that the benchmarking process not only aims to identify points of dissimilarity, but also to construct those points in a meaningful way – to make sense thereof. In keeping with these descriptions of benchmarking, the objectives of this study were to identify strengths and potential weaknesses in both the South African and Botswana curricula that could be used to make recommendations to strengthen each curriculum and in doing so, contribute to the quality of the curriculum and education in these valuable subjects.

The research questions used for this study were:

1. What are the strengths and potential areas of improvement in the Technology curricula of Botswana and South Africa?
2. How do these curricula compare to the requirements stated for quality curricula by UNESCO-IBE (the benchmark)?
3. What can be done to improve the quality of each of these curricula?

Theoretical and conceptual framework

The research was situated within the theoretical framework of "curriculum evaluation as grading practice through process" (Du Preez, 2014). The curriculum evaluation process is a formative, evidence-based practice, which aims to give a progressive depiction of the quality of the curriculum, as well as the elements that it is composed of. Du Preez further explains that curriculum evaluation as grading practice through process is based on expertise judgement of the quality of the curriculum and its elements, with a purpose to advise and inform policy decision-makers. In situating this study within this framework, it was important to clarify what 'curriculum' is, what constitutes a 'good quality curriculum' and to identify the elements that contribute to such a curriculum. The description of benchmarking parallels the aims stated here and was therefore utilised as an underpinning guideline.

Curriculum

Numerous definitions exist to describe 'curriculum'. Overly simplified, curriculum is a description of principles, content and processes to support learning. It is sometimes described as what, why, how and when students should learn. Curriculum includes all the organized or planned and unplanned experiences utilised to attain learning outcomes (Ebert, Ebert & Bentley, 2013). Thijs and Van den Akker (2009) differentiate three forms of curricula, divided into six layers (Table 1): The *intended* curriculum, which is the ideal envisioned curriculum that is formalised 'on paper' as the curriculum document; the *implemented* curriculum, referring to how the intended curriculum is perceived and used in practice by teachers; and the *attained* curriculum, which encompasses the experiences and learning outcomes of the learners. According to Thijs and Van den Akker, the six layers of their model are particularly suitable for the analysis of curriculum processes and outcomes. The UNESCO-IBE (2016) suggests four main categories (Table 1) that should be utilised when judging the quality of a curriculum, which parallels most of the layers of curricula described by Thijs and Van den Akker (2009). The parallels between these two perspectives have been set out in Table 1.

Table 1: Parallels between Thijs and Van den Akker's (2009) and UNESCO-IBE's (2016) curriculum perspectives

Thijs and Van den Akker's three forms and six layers of curriculum		UNESCO's International Bureau of Education's four categories for judging curriculum
Intended curriculum	o Rationale for curriculum o Curriculum documents	• How and why the curriculum was developed • The curriculum itself
Implemented curriculum	o Curriculum interpreted by teachers o Actual process of teaching and learning	• How the curriculum is implemented in practice
Attained curriculum	o Learners' experiences o Learning outcomes achieved by learners	• How the curriculum is assessed – to measure if the intended learning was achieved

These correlating perspectives on curriculum were used as the point of departure for this study. Though one could not disregard the importance of the implemented or the attained curriculum, due to its scope the focus of this paper was the intended curriculum only. The description of curriculum as "a phenomenon which includes many dimensions of learning, including … aims, content, methods, … time, [and] assessment" (among other aspects) (UNESCO-IBE, 2016, p. 9) was used as criterion for this study. A good quality curriculum should contribute to quality education and adapt to the changing needs of the country (UNESCO-IBE, 2010). Once we determined these dimensions of curriculum as the measure we would use for 'curriculum evaluation', we explored what constituted a 'good quality curriculum' and the dimensions of learning that contributed to such a curriculum.

Quality curriculum

Judging the quality of a curriculum is a complex process. UNESCO compiled a detailed report to support their member states in identifying elements of quality curricula, in an effort to support holistic development and to enable quality teaching and learning (UNESCO-IBE, 2016). The UNESCO-IBE report described four categories used for judging curriculum quality but the current study focused on only one of these four categories – that being the intended curriculum. Within this category, the IBE used four sub-categories for judging a good quality curriculum, that it should: (1) include every child equally; (2) contain high quality content and support development of competencies; (3) be well structured and organised meaningfully; and (4) be based on a solid philosophy of how learners learn. Each of these sub-categories is subsequently described.

Good quality curricula that include and value every child equally contain explicit evidence of, and suggestions for, addressing inclusiveness and differentiation. High quality 'content' should be included and competencies required in the 21st century should be developed (UNESCO-IBE, 2016). Content used to refer only to learning content or 'facts', and in contemporary times 'content' should be up-to-date and reflect the expanding knowledge available to learners in a globalised world. Such content should also support learners in becoming competent in the life skills required in the 21st century (sometimes referred to as generic competencies), such as communication, collaboration, critical thinking, problem-solving, creativity, appreciation of diversity, and meta-cognition (Moalosi, Molokwane & Mothibedi, 2012). The content and competencies should be suitably challenging and be organised and sequenced appropriately and progressively, in relation to the developmental stage of the learners for whom it is intended (UNESCO-IBE, 2016). A good quality curriculum is effectively structured and well-organised.

The document(s) should be user-friendly with clear statements of intended learning, particularly regarding structure and purpose of these statements. Curriculum components should be aligned to one another and be articulated in consistent and coherent documents. Good quality curricula should be underpinned by a set of theoretical and philosophical viewpoints about how children learn, including their prior knowledge, motivation to learn and involvement in their own learning process (UNESCO-IBE, 2016).

These four sub-categories, identified and described by UNESCO-IBE (2016), were used as benchmarking standards within which the document analysis of the curricula of Botswana and South Africa were structured. The next section describes how the research was planned and executed.

Research methodology

The research methodology used involved a process of structured qualitative primary document analysis. The documents analysed were the subject-specific curricula for Senior Phase Technology in South Africa (DBE, 2011) and the Junior Secondary Level D&T syllabus in Botswana (MoESD, 2008). Ethical approval for the research was granted by the University of Botswana Institutional Review Board and permission for the study was requested from the relevant governmental bodies.

A purposely designed and previously validated curriculum analysis instrument, developed and used in several studies (Umalusi, 2014) was applied. This instrument was used to identify, analyse and evaluate particular elements of each curriculum. It is a carefully structured list of questions and descriptions based on literature and prior research, which explains the relevance of several curriculum elements and provides details for scaffolded curriculum analysis. The curriculum elements that are included in the instrument and were subsequently analysed in the curriculum analysis process, were (1) the overall design and objectives; (2) content specification, including the relative depth and breadth of coverage; (3) pacing (time) and progression, (4) pedagogical guidance provided for the teaching (methods) and (5) assessment of Technology. The analyses were carried out in stages, first each curriculum separately by experts in each country, and then combined by way of a comparative analysis. The analysis of the Senior Phase Technology CAPS was done in 2015 by a team of South African subject specialists, as part of Umalusi's analysis of the South African curriculum. The initial analysis of the Junior Secondary Level D&T in Botswana was done by a subject specialist in the country with years of teaching and research experience in this field. The data collected were predominantly qualitative in nature, and were derived directly from the documents that were analysed. The Umalusi instrument is precise and prescriptive regarding data variables. This bolstered the reliability and validity of the instrument, together with the staged analysis process. Data were analysed sequentially, using the pre-determined curriculum elements in the Umalusi instrument.

Subsequently, the findings from the curriculum analysis were qualitatively interpreted and compared to the four sub-categories described by UNESCO-IBE (2016) for judging quality curricula.

Findings and discussion

The findings are presented and discussed according to the pre-determined themes developed from the curriculum analysis instrument. These are (1) the overall curriculum design and objectives; (2) content specification and the relative depth, and breadth of coverage; (3) pacing and progression, (4) pedagogical guidance provided for teaching and (5) guidance for assessment of Technology. Finally, the sub-categories for judging the intended curriculum suggested by UNESCO-IBE (2016) were used to evaluate the quality of these two curricula.

Overall curriculum design and objectives

As part of the overall curriculum design, the following were considered: the number of documents; design or format; user-friendliness; and accessibility of the language. The D&T curriculum consists of two separate documents of 37 pages in total, while the subject-specific CAPS document is 88 pages. The two curricula were found to be user-friendly and use accessible language. The accessibility of language of curriculum documentation is essential in these two countries, since English is often a second or third language to the teachers who are the main users of the documents.

The CAPS states only three subject-specific aims, but expands on the purpose of the subject, as well as the "Unique features and scope" thereof. These three elements (subject-specific aims; purpose of the subject; and unique features and scope) were used to derive the objectives of Senior Phase Technology. The objectives, as derived from the three elements, are not closely aligned to the South African national aims for education, but reflect some of the general national educational principles, such as "facilitating the transition of learners from education institutions to the workplace" and "encouraging an active and critical approach to learning" (DBE, 2011).

The description of General Objectives and Specific Objectives for each topic clarifies the purpose of D&T and its learning content. The objectives for D&T are aligned to the aims of the Ten-year Basic Education programme of Botswana, though not explicitly so. The D&T objectives and those derived for the CAPS align well. The most notable differences are three objectives included in the D&T syllabus, but not in the CAPS. The first two of these three objectives deal with "understanding and appreciating workshop hazards" and "applying simple First Aid in the workshop" (MoESD, 2008). Objectives that involve safety and related first aid measures are indispensable in Technology, a subject which involves practical components and working with tools. The omission of these two objectives from the CAPS was therefore disquieting. The third omitted objective refers to developing marketing skills in learners. The aims for D&T explicitly include "developing entrepreneurial skills that they [learners] could apply in their day-to-day business transactions and to market their products effectively" (MoESD, 2008). Technology has great potential to support entrepreneurship education, particularly through the development of knowledge and its association with volitional activities (Ankiewicz, 2015) that could be applied in product development. Ruele and Mwendapole (2015) also mention the potential of D&T to contribute to Botswana's economic growth. In countries with high unemployment levels, subjects that could support the development of entrepreneurship skills should be fostered explicitly. For this reason, the omission of marketing (and entrepreneurship) as objectives for Technology in the CAPS was viewed as troubling.

The overall emphasis of both these curricula emerged to be the preparation of learners for subsequent Technology subjects at higher school levels. Judging by the structure of the school systems in both countries, subject preparation for higher school levels is not reasonable, as most of the learners would never have the chance to continue in this field due to limited access and pathways. Linking to the previous statement regarding high unemployment rates in both Botswana and South Africa, the current lack of emphasis on entrepreneurship in both curricula therefore needs reconsideration, to better align these subject curricula with the school systems and the needs of the respective countries. When comparing this finding with a statement by Ruele and Mwendapole (2015) that Design and Technology curricula should be relevant, contemporary and responsive to the socio-economic needs of the country, both these curricula could be improved regarding entrepreneurship development to contribute to addressing the needs of their respective countries.

Curriculum content: breadth, depth and specification of topics

Content coverage refers to the breadth and depth of topics and sub-topics, as well as particular or evident emphasis on certain content in the curricula. Breadth refers to the number of topics to which students would be exposed in each curriculum, presented in Table 2. Depth refers to the extent to which topics and sub-topics are dealt with in the curriculum. Although some of the sub-topics may be perceived as closer related to other subject disciplines (for example, *Marketing* in the D&T syllabus might be associated with Business Studies), the intended curricula were analysed as 'set documents', thus including the topics and sub-topics which the curriculum developers originally deemed suitable as contributing to Technology.

Table 2: Breadth of content in the curricula

	Botswana			**CAPS**		
	Form 1	Form 2	Form 3	Grade 7	Grade 8	Grade 9
Total number of topics per year / level	49	60	47	33	30	35
Total number of topics per phase	**156**			**98**		

The Botswana D&T syllabus covers more content than the CAPS. The D&T syllabus contains several topics that are not covered in the CAPS. These topics include: *Safety precautions; First aid; Adhesives; Abrasives; Fittings; Marketing; Produce model structure; Structures in design, Forms of motion; Mechanisms and speed; Energy; and Tools*. Although a list of comparable tools (used in a Technology classroom) is included in Annexure B of the CAPS (DBE, 2011, p. 55-58), only a drawing and the name of each tool appear, followed by a separate section labelled "Tools for different applications in Technology" (DBE, 2011, p. 59-62). The explicit and detailed inclusion of knowledge content and application skills for learners about tools in D&T was found more useful than the manner in which the same is included in the CAPS.

Although the breadth in the CAPS is less than that of the D&T syllabus, *Mechanical advantage* and *Hydraulic and pneumatic systems* are two topics found in the CAPS that do not appear in D&T. Both these topics were considered to be on a level above what should be expected of Grade 9 / Form 3 learners and were considered to be superfluous in the Technology curriculum at this level, and more appropriate to be included in the Natural Sciences curriculum at this level.

The depth of content coverage was determined by the proposed cognitive demand or complexity expected of learners in each sub-topic as described in the curriculum. To determine the total depth score per grade and for the Phase of each curriculum, a scale (coded 1 to 4) was utilised to code each topic and sub-topic in the curricula. Level 1 was allocated to introductory level content (such as definitions and descriptions) and level 4 was used in instances where in-depth knowledge of content (conceptually challenging; complex understanding of, and relationships between concepts or skills were identified), with two other levels in between. The findings regarding the depth of the content for each grade/form are shown in Table 3.

Table 3: Depth of content in each year								
	CAPS				Botswana			
	Gr7	Gr8	Gr9	Grades 7-9	F1	F2	F3	Form 1-3
Percentage of topics at level 1	0%	0%	0%	0%	35%	5%	0%	13%
Percentage of topics at level 2	24%	7%	0%	10%	31%	30%	6%	23%
Percentage of topics at level 3	30%	43%	20%	31%	10%	37%	23%	24%
Percentage of topics at level 4	45%	50%	80%	59%	24%	28%	70%	40%
Depth score	**3.21**	**3.43**	**3.80**	**3.49**	**2.24**	**2.88**	**3.64**	**2.91**

As indicated in Table 3, the combined depth per phase (across the three grades or forms) was 3.49 for the CAPS and 2.91 for D&T. The CAPS showed more depth than D&T in each of the three years, but particularly in Grade 7. Therefore, though the CAPS had fewer topics (less broad), the topics were covered in more depth than in D&T.

Indication of pacing and progression in the curricula

The teaching time allocated per week is two hours for Technology and two hours and forty minutes for D&T. Based on the experience of the evaluators, the pace at which learning takes place in the two curricula was rated as too fast. Often too much content is planned for too little time, especially when the application of practical skills is required. This was disconcerting since the curricula are scaffolded so that knowledge development is followed by skills development - where learners complete a project to indicate their mastery of acquired content and skills. What happens in practice [based on experience], is that there is so much knowledge content to cover (Table 2), that the practical project is done as a ‘rush job’ at the end of term or year, since not enough time is available to support deep application and skills development, particularly for D&T with its considerable breadth (Table 2).

Clear and strong progression is evident in the CAPS within each grade for the different topics (see Table 3). Progression is clear in terms of increasing complexity for content and skills, as evident from the depth score allocated to the different cognitive levels indicated in Table 3. One of several examples of such progression in the CAPS is evident in the topic “Mechanical systems and control”, which starts with *Simple mechanisms* in Grade 7, followed by *Simple mechanisms as components of more complex machines* in Grade 8, and progressing to *Interacting mechanical systems and sub-systems* in Grade 9 (DBE, 2011, pp. 52-53). In D&T progression is also evident, but at a lower overall level. Clear and strong progression enhances understanding of concepts and growth of learners in subjects (Heritage, 2008). It is therefore highly likely that at the end of the years of studying Technology, South African learners would be at a different (deeper) level of understanding than their Botswana counterparts.

Specification of pedagogical guidance

Pedagogical guidance refers to how explicit and detailed guidance regarding subject-specific or preferred pedagogy is included in the curriculum document for teachers’ use. The study explored the curricula to identify the preferred pedagogical approach for Technology in the CAPS and D&T, as well as to identify how explicitly it was included in the curriculum documents.

The preferred pedagogical approach for CAPS was identified as being problem-centred and project-based. Though not explicitly named as such, this is evident from the unambiguous description under a heading "Teaching methodology" (DBE, 2011), which includes the following statement:

> The Design Process ... forms the backbone of the subject and should be used to structure the delivery of all learning aims. Learners should be exposed to a problem ... as a starting point. They should then engage in a systematic process that allows them to develop solutions. (p. 12)

The study found the specification detail of the pedagogical approach for CAPS to be moderate in the planning tables (content and skills to be taught) and not containing as much detail as teachers might need to present standardised Technology education.

The preferred pedagogical approach for D&T is explicitly stated as learner-centred, but problem-centeredness is also identifiable from a statement that teaching methods should expose learners to the solving of real life problems (MoESD, 2008). Explicit pedagogical guidance is however not included or expanded upon in the Botswana curriculum. Even though the level of specification for pedagogical guidance was rated as low in D&T, there was agreement between the two curricula regarding the type of pedagogy preferred for teaching Technology.

Subject-specific assessment guidance

This section of the research process identified and analysed the subject-specific guidance for assessment included in the curriculum documents. The study found specification of assessment in both the CAPS and D&T to be very high. A whole section (DBE, 2011, pp. 38-47) in the curriculum document is dedicated to subject-specific assessment for CAPS, and a separate document, the JCE D&T Scheme of Assessment (Botswana Examinations Council, 2011) is dedicated to assessment for D&T. A notable difference is that assessment in the CAPS is evidently integrated into the instruction programme, with evidence that formative assessment forms an integral part of the teaching and learning process. Unlike the CAPS, the only assessment guidance that is specified and prescribed for D&T is the details provided for formal external examinations. The only assessment information provided in the D&T teaching and learning syllabus (MoESD, 2008) is that:

> Assessment should take cognisance of the rationale for D&T. It should test both acquisitions of knowledge and requisite skills that learners have acquired. A number of assessment tools can be used including objective tests, continuous assessment and through projects. Assessment should take cognisance of learners with special needs. (p. iii).

Apart from guidance for formal external assessment [which is summative in nature], school based assessment [which is formative] is left to the discretion of the schools in Botswana - the only curriculum guidance is the loose non-committal statement given above.

Quality of the curricula

After the comprehensive analysis the evaluators used their overall findings, together with qualitative interpretations, to investigate the materialisation of the four sub-categories suggested for judging a good quality curriculum by UNESCO-IBE (2016), in these two curricula.

The IBE's four suggested sub-categories for judging the quality of '*the curriculum itself*' or the intended curriculum are that it should (1) include every child equally; (2) contain high quality content and support development of competencies; (3) be well structured and organised meaningfully; and (4) be based on a solid philosophy of how learners learn. These sub-categories were used as benchmark for the quality of the Botswana D&T syllabus and the South African Technology CAPS curriculum. A sliding scale with three levels was used for the judgement:

- Yes, if clear, unambiguous evidence of the criterion was found in the curriculum;
- Conceivably, if only some or ambiguous evidence was found regarding the criterion; and
- No, if no evidence was found in the curriculum regarding the criterion.

Table 4: Findings regarding the quality of the Technology CAPS and D&T syllabus

Criteria for quality	South African CAPS	Botswana's D&T syllabus
Include every child equally	Yes	Yes
High quality content; support development of competencies	Yes	Yes
Well-structured documentation and organised meaningfully	Yes	Yes
Based on a solid philosophy of how learners learn	Yes	Yes

Based on the evaluators' analyses (Table 4), both intended curricula were rated as quality curricula, containing clear, unambiguous evidence of all four of the IBE's sub-categories required for quality curricula.

Quality requirement 1: Include every child equally

Inclusivity and addressing diversity (include every child equally) is part of the general aims of the South African curriculum as CAPS explicitly proclaims that the "National Curriculum Statement Grades R-12 is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors..." (DBE, 2011, p. 5). Therefore, it is clear that in the CAPS, every child matters.

Equally, there is clear evidence of inclusivity and regard for diversity in the Botswana curriculum. The D&T syllabus states that it is critical to the success of the Junior Secondary Programme to recognise individual talents, needs and learning styles. Also, the syllabus encourages teachers to provide a rich diverse learning environment, and it allows maximum flexibility to enable both teachers and learners to utilise it in a way that suits local contexts and the background and experiences of learners in different communities (MoESD, 2008, p. i).

Quality requirement 2: High quality content & support development of competencies

The evaluators determined that the content and skills in both curricula is broad and appropriately scaffolded in progressive levels of cognitive depth (see above). The requirement echoes another NCS principle, specifically "High knowledge and high skills" (DBE, 2011, p. 4). This principle states that the minimum standards of knowledge and skills that learners have to achieve in each grade have to be specified and should set high, achievable standards. Furthermore, the development and fostering of several competencies in learners, such as problem-solving, critical and creative thinking skills, teamwork, and effective communication, are explicitly stated in both curricula (DBE, 2011; MoESD, 2008). The development of quality content and competencies (and skills) is therefore supported in both curricula.

Quality requirement 3: Well-structured documentation organised meaningfully

The evaluators agreed that both curriculum documents are user-friendly, are organised into clear, cohesive and meaningful sections, utilise accessible language and contain the indispensable subject-specific information that a Technology teacher would need (see above). Hence, both curricula adhered to the quality requirement of being 'well-structured and organised meaningfully'.

Quality requirement 4: Based on solid philosophy of learners learn

The philosophy underpinning how learners (are supposed to) learn in Technology as a subject transpires in the CAPS explicitly and in several instances. A problem-centred project-based approach is utilised to achieve the learning aims and objectives of the subject (DBE, 2011). Active and critical learning, rather than rote learning of facts, is encouraged in the curriculum (DBE, 2011). Moreover, Technology as a subject is alleged to contribute to learners' acquisition of skills to manage time and material resources effectively, as well as providing opportunities for collaborative learning and teamwork (DBE, 2011). Mastering these skills would support the learning of learners in the subject.

A learner-centred pedagogy is also explicitly evident as the underpinning philosophy in the D&T syllabus. Emphasis is placed on process skills, problem solving skills and the acquisition of hands-on experience (MESD, 2008, p. iii), together with the development of critical competencies or life skills such as interpersonal skills and teamwork activities.

Conclusions

Benchmarked against the requirements of UNESCO-IBE for quality intended curricula, the Senior Phase Technology CAPS and Junior Secondary D&T syllabus emerged as quality curricula, each having several strengths. The overall curriculum design, the breadth and depth of knowledge and skills contained as part of the learning content, the high level of specification and guidance regarding Technology-specific assessment, explicit consideration of inclusivity and diversity, and a solid underpinning philosophy of how learning should transpire, were all determined as strengths that contributed to the quality of these curricula.

There are, however, some elements in both curricula that, when addressed, would further strengthen these curricula. These elements are the excessive breadth of content, which leads to the extremely fast pace of the learning expected in these curricula, the omission of some significant content, inappropriate emphasis, as well as the incomplete pedagogical guidance contained in the curricula.

In conclusion, we established that both Botswana and South Africa have Technology curricula of good quality, but that there are improvements to be made, should the opportunity arise to amend and update these curricula, which would further strengthen each of these curricula. Based on this conclusion, the following recommendations were developed for strengthening these Technology curricula.

- The subjects *Technology* and *Design and Technology* both hold enormous potential for developing **entrepreneurial learning** in an active, integrated and practical manner. In South Africa and Botswana, where poverty and unemployment are persistent problems, the inclusion of entrepreneurship education in a subject that encourages product development, would be advantageous. The explicit inclusion and merging of entrepreneurship education in both the Technology and the Design and Technology curricula is therefore recommended.
- The **emphasis** of these curricula on preparing learners for continued Technology education in subsequent school phases is inappropriate, since large numbers of learners in both

countries do not have opportunities to continue with the subject. The emphasis in both curricula needs to be reconsidered, perhaps bearing in mind the previously mentioned recommendation to include and emphasise entrepreneurial learning.

- The **breadth of knowledge content** in both curricula needs to be reduced, to allow more time for the appropriate development of skills and application of knowledge and skills. This might be achieved by reducing the number of repeated sub-topics across the phase, or reducing the amount of content that is not context specific. We acknowledge that previously listed recommendations call for the inclusion of additional content (entrepreneurship education). However, if the emphasis in the current curricula could be shifted from preparation for further education and training in Technology, and be replaced by entrepreneurship education content, the overall breadth of content could be reduced at the same time. Reduced breadth of content coverage results in reduced pace of work, which was found to be too fast for the level of learners at present.
- The level of **specification of pedagogical guidance** is moderate in the CAPS and low in the Junior Secondary Level syllabus. Increasing the subject-specific pedagogical guidance in both documents is likely to contribute to better standardisation of teaching in the subjects.

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