Peer review history for:

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HOW TO CITE:
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The original manuscript for review is appended below.

Reviewer 1: Round 1
Date completed: 14 August 2024
Recommendation: Accept / **Revisions required** / Resubmit for review / Resubmit elsewhere / Decline / See comments
Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?
Yes/No
Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?
Yes/No
Does the manuscript contain sufficient novel and significant information to justify publication?
Yes/No
Do the Title and Abstract clearly and accurately reflect the content of the manuscript?
Yes/No
Is the research problem significant and concisely stated?
Yes/No
Are the methods described comprehensively?
Yes/No
Is the statistical treatment appropriate?
Yes/No/**Not applicable**/Not qualified to judge
Are the interpretations and conclusions justified by the research results?
Yes/Partly/No
Please rate the manuscript on overall contribution to the field
Excellent/**Good**/Average/Below average/Poor
Please rate the manuscript on language, grammar and tone
Excellent/**Good**/Average/Below average/Poor
Is the manuscript succinct and free of repetition and redundancies?
Yes/No
Are the results and discussion confined to relevance to the objective(s)?
Yes/No
The number of tables in the manuscript is
Too few/**Adequate**/Too many/Not applicable
The number of figures in the manuscript is
Too few/**Adequate**/Too many/Not applicable
Is the supplementary material relevant and separated appropriately from the main document?
Yes/No/Not applicable

Please rate the manuscript on overall quality

Excellent/**Good**/Average/Below average/Poor

Is appropriate and adequate reference made to other work in the field?

Yes/No

Is it stated that ethical approval was granted by an institutional ethics committee for studies involving human subjects and non-human vertebrates?

Yes/No/**Not applicable**

If accepted, would you recommend that the article receives priority publication?

Yes/**No**

Are you willing to review a revision of this manuscript?

Yes/No

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Yes/No

Comments to the Author:

Overall a useful analysis of the biology curricula for school leaving certificates across 7 countries in Sub-Saharan Africa. The paper uses a simple method which allows for a descriptive analysis of the curricular which affords a means to compare them in a meaningful way. It sufficiently illuminates the missed opportunities to use local examples which is a very important component in the decolonisation of the natural sciences. There are two suggestions I have to strengthen the paper - both require engagement with Blackie's work. Firstly, I think it is important to make a distinction between indigenous knowledge and the use of local examples. Secondly, to indicate that there are meaningful overlaps between indigenous knowledge and western science. (for more on both of these see particular comments below).

Overall I think the paper is a useful addition to the emerging work on decolonisation and science education. The missed opportunities illuminated in this paper give a clear way forward to textbook writers and curriculum developers.

On pg 4 and 5 where you write about the teaching IK alongside western science it would be good engage with Blackie's recent paper in this journal on IK and science https://sajs.co.za/article/view/16860 . Her position is a counterpoint to the 'two-eyed seeing' model and gives both students and teachers more of a handle on where IK and western science intersect and diverge.

Pg 10 – Section on missed opportunities
Is incorporation of indigenous knowledge the same as using local examples? Is the only way to decolonize to use indigenous knowledge? Again I point you to Blackie's work
https://www.scienceopen.com/document_file/5d2d780b-73b4-4095-8ef5-bcdda90cd394/ScienceOpen/IJCDS_4_2_Blackie.pdf Blackie 2021 International Journal of Critical Diversity Studies.
What you are discussing in this section is simply using locally relevant examples.

Minor point which should be elaborated on...
Pg 7 'Finer-grained analysis of similarity between each syllabus and the reference list is shown by the percentage of matches scored at levels 1, 2 and 3.' – you need to explain what levels 1, 2 and 3 are. I have no idea what these refer to.

Author response to Reviewer 1: Round 1

Firstly, I think it is important to make a distinction between indigenous knowledge and the use of local examples.

Author: Thank you for identifying this problem which caused me to re-think the conceptual framework of the paper. Please see the para that follows the 5 adaption guidance principles. Sentence edited on p. 5: "In

this paper, relevance has three dimensions: choice of local contexts to illustrate ecological principles, ecosystems and environmental issues, inclusion of indigenous worldviews, and use of IK in the syllabus."

Secondly, to indicate that there are meaningful overlaps between indigenous knowledge and western science.

Author: See new para on p. 3 "An alternative to hybrid science ….."

On pg 4 and 5 where you write about the teaching IK alongside western science it would be good to engage with Blackie's recent paper in this journal on IK and science. Her position is a counterpoint to the 'two-eyed seeing' model and gives both students and teachers more of a handle on where IK and western science intersect and diverge.

Author: See new para on p. 3 "An alternative to hybrid science …"

Pg 10 Is incorporation of indigenous knowledge the same as using local examples? Is the only way to decolonize to use indigenous knowledge? Again I point you to Blackie's work [link]. What you are discussing in this section is simply using locally relevant examples.

Author: Please see the ff text on p. 3 "…seeks evidence of decolonisation by inclusion of African epistemology, locally relevant content and IK in the syllabi." This idea recurs in the paper.

p. 8: "Three aspects derived from CIE adaption guidelines indicate that a syllabus was relevant to a country: 1. Including African worldviews pertaining to ecology and environmental issues. 2. Referencing local IK. 3. Referencing local ecosystems and environmental issues."

On p. 9, I have changed the heading to "Inclusion of African worldviews, IK and relevant content" and added to the first paragraph "Local IK is specifically mentioned once in the South African syllabus only".

Pg 7 'Finer-grained analysis of similarity between each syllabus and the reference list is shown by the percentage of matches scored at levels 1, 2 and 3.'. -you need to explain what levels 1, 2 and 3 are. I have no idea what these refer to.

Author: Please see ff. text "Similarity was coded on a scale of 1-3 using the following descriptors..". I have added the coding scheme to the title for Figure 1.

Reviewer 1: Round 2

Date completed: 12 November 2024

Recommendation: Accept / Revisions required / Resubmit for review / Resubmit elsewhere / Decline / See comments

Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?

Yes/No

Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?

Yes/No

Does the manuscript contain sufficient novel and significant information to justify publication?

Yes/No

Do the Title and Abstract clearly and accurately reflect the content of the manuscript?

Yes/No

Is the research problem significant and concisely stated?

Yes/No

Are the methods described comprehensively?

Yes/No

Is the statistical treatment appropriate?

Yes/No/**Not applicable**/Not qualified to judge

Are the interpretations and conclusions justified by the research results?

Yes/Partly/No

Please rate the manuscript on overall contribution to the field

Excellent/**Good**/Average/Below average/Poor

Please rate the manuscript on language, grammar and tone

Excellent/Good/Average/Below average/Poor

Is the manuscript succinct and free of repetition and redundancies?

Yes/No

Are the results and discussion confined to relevance to the objective(s)?

Yes/No

The number of tables in the manuscript is

Too few/**Adequate**/Too many/Not applicable

The number of figures in the manuscript is

Too few/Adequate/Too many/**Not applicable**

Is the supplementary material relevant and separated appropriately from the main document?

Yes/No/**Not applicable**

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Is appropriate and adequate reference made to other work in the field?

Yes/No

Is it stated that ethical approval was granted by an institutional ethics committee for studies involving human subjects and non-human vertebrates?

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If accepted, would you recommend that the article receives priority publication?

Yes/**No**

Are you willing to review a revision of this manuscript?

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Yes/No

Comments to the Author:

This paper is a valuable contribution to secondary science education.

Reviewer 2: Round 2

Date completed: 25 January 2025

Recommendation: Accept / Revisions required / Resubmit for review / Resubmit elsewhere / Decline / See comments

Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?

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Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?

Yes/No

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Are the methods described comprehensively?

Yes/**No**

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If accepted, would you recommend that the article receives priority publication?
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Yes/No
With regard to our policy on 'Publishing peer review reports', do you give us permission to publish your anonymised peer review report alongside the authors' response, as a supplementary file to the published article? Publication is voluntary and only with permission from both yourself and the author.
Yes/No

Comments to the Author:

Introduction

Use authoritative sources to support that there are calls African university students to decolonise the curriculum. Refer to a book chapter by:

> Ngakane, B. and Madlela, B. (2024). A Transformative Framework for the Incorporation of Indigenous Knowledge Systems into the Curriculum in South Africa's Higher Education Institutions: How do we Centre Historically Marginalised Knowers and Knowledge? DOI: 10.36615/9781776490073-09 in a book entitled Transforming Higher Education Scholarship after Covid-19 and in the Context of the 4th Industrial Revolution

The chapter has information on university students' call for the decolonisation of the curriculum.

Strengthen your introduction by bringing views from other researcher who have written about Cambridge International Education and those who have written about calls to decolonise the curriculum in Africa. Doing so will assist you to identify the gap that you intend to address. It will also make the problem of your study to be clear to your reader.

Relevance of the study

The study addresses current and contentious issues in Africa's education systems. The study came at the right time when Africa is advocating for quality and decolonised education based on African indigenous knowledge systems. The study will inform curriculum developers in the continent and make them aware that it is essential to incorporate African knowledge systems in the curriculum.

Methodology

Explain the methods that you used and justify why they were suitable for your study. Support your justification with authoritative sources.

Figures and tables

Are figures and tables not supposed to be inserted and analysed in the content to help the reader to have a better understanding of the arguments and message being conveyed.

Discussions

It is advisable to present findings in paragraphs than in bullets.

Areas for further research

Suggest areas for further research that other researchers can focus on to address the problem that you have identified. You identified a contentious issue that other researchers should contribute towards its solution hence the need to identify areas for further research.

Appendix 1: Original manuscript for review

Influence of Cambridge International Education on environmental content in seven African syllabi

Abstract

Cambridge International Education (CIE) has influenced the curriculum and examinations in ex-British colonies in Africa, presenting a western science-based generic syllabus for use in foreign countries. Amid calls to decolonize the curriculum, this study investigates the extent to which seven African biology syllabi have decolonized their ecological and environmental content by departing from CIE. Decolonisation entails infusing African epistemology into the syllabus to reduce the alienation claimed by students when they encounter western science. A decolonized syllabus incorporates indigenous knowledge (IK) and relevant examples of scientific concepts drawn from the local environment. The seven African biology syllabi presented a western science perspective, with five syllabi exhibiting CIE influence ranging from very close similarity (Namibia and Lesotho) through somewhat similar (Rwanda and Botswana) to mostly dissimilar (Malawi). Uganda and South Africa displayed little CIE influence and incorporated more relevant content than other countries. Countries other than Botswana, Uganda and South Africa chose inappropriate examples to illustrate concepts and neglected the local environment and valuable local IK. Although all seven countries developed their own syllabi, sometimes in collaboration with CIE, they have not decolonized nor contextualized their biology syllabi.

Significance of findings

This paper shows that seven African countries have adopted western science epistemology for the ecology and environment sections of their biology syllabi, some follow CIE syllabi closely, and few include indigenous knowledge and content relevant to local context. I conclude that all seven countries have not decolonized their syllabi.

Keywords

decolonisation; indigenous knowledge; ecology; environmental issues

Tables and figures inserted at bottom of document

Introduction

This study was precipitated by my experience as an author of secondary school biology textbooks in African countries, which required close engagement with the official national syllabus for each country. Many of these syllabi resembled Cambridge International Education (CIE), western science-based syllabi for Biology. In a time when African students are calling to decolonise the curriculum, I ask to what African biology syllabi have been decolonised from western science and CIE? I also ask to what extent African biology syllabi are relevant to local ecosystems and environmental issues?

Cambridge International Education (CIE)

CIE originated from the University of Cambridge Local Examinations Syndicate (UCLES) which administered examinations in British colonies from 1864[1]. After attaining political independence, many previous colonies continued to import curriculum and examinations from outside countries including Cambridge qualifications such as Cambridge Overseas School Certificate, Cambridge Overseas Higher School Certificate, International O-Level and International A-Level[2,3].

Many African countries later opted to develop national curricula for their public schools with or without assistance from outside agencies, including Cambridge Assessment Group[2,3]. 'Public schools' exclude 'international schools' which offer qualifications emanating from the global North including CIE[4]. UCLES offered an advisory service to ex-colonies to run their own examinations following the Cambridge model. The West African Examinations Council, established in 1952, was the first of such partnerships[5]. Cambridge Partnership for Education aims to partner with governments to transform societies through quality education. It assists countries to design, establish and implement curriculum and assessment that will work best for the country[6].

Curriculum design can take one of three forms: a bespoke curriculum designed by CIE; co-development of a curriculum by CIE with curriculum developers from the commissioning country; or adaption of a Cambridge curriculum to suit the country's context[6]. The Learning Passport provides guidance for adaption using five principles[7] which apply in any situation where local experts are developing a national curriculum[8]. The adaption guidance principles are:

1. Take account of the country's curriculum and education policies;
2. Select an appropriate language of instruction;
3. Frame selected content so that it is culturally relevant;
4. Incorporate indigenous knowledge;

5. Support learner well-being, inclusion and success[7,8].

Guidance principles 3 and 4 are relevant to the present study. Guidance principle 3 includes choosing content and examples that are familiar to students such as local plants and animals, ecosystems and environmental issues[8]. Culturally relevant content equips students with skills that are useful in their everyday lives and accommodates the worldview prevailing in the target community[3,9,10]. Guidance principle 4 recommends including local indigenous knowledge (IK) in the curriculum, thereby affirming people's traditional knowledge of their environment, and promoting students' interest and motivation[8,11].

Guidance principles 1-5 enable CIE and its partners to adapt their generic, western science-based curricula to different contexts[7]. The present study investigates the extent to which CIE influences biology syllabus in seven African ex-colonies. It seeks evidence of decolonisation by inclusion of African epistemology, locally relevant content and IK in the syllabi.

Worldviews, indigenous knowledge and decolonising the curriculum

Western science is believed to occupy a privileged status above the worldviews of non-dominant groups in current science curricula[10,12,13]. African IK and its worldviews are defined as 'culturally-specific knowledge systems that relate to the knowledge of Africa, their oral culture and traditional ecological knowledge, as affected by their worldview; the knowledge that incorporates their social and natural wellbeing, their cosmos and their spiritual world'[3(p.28)]. It is important to distinguish between worldview, defined as a way of understanding the natural world, and IK, defined as knowledge that informs actions in everyday life. African indigenous worldviews hold that a vital force connects all natural phenomena into a unity of being. African cosmology interwoven with traditional religion teaches that all living and non-living things possess spiritual powers which emanate from god and exist in decreasing amounts through the ancestors, living people. animals, plants, rocks and soil, mountains, streams and the earth itself. Knowledge is collectively owned and transmitted from the ancestors through the elders by means of story-telling, games, songs, rituals and cultural practices[9,14].

Worldwide, indigenous groups share a worldview of spirits interconnecting all of nature and all humanity, creating a pluriverse of onto-epistemologies. Such worldviews make communities responsible and accountable for their actions in the natural environment, centring community goals over individual and economic gains[12,15]. Indigenous worldviews and IK have been infused into school science curricula in nations such as Canada, New Zealand, Australia, some jurisdictions in the USA[16], and some Central American and Latin American countries[17]. IK offers rich, relevant and authentic contexts for science learning,

particularly about the environment and sustainable use thereof. It also provides opportunities for students to develop more balanced and holistic worldviews characteristic of indigenous knowledge systems but not western science[15].

While supporting calls to recognise African IK in school science curriculum, African scholars acknowledge that western science and technology benefit society and the ecological environment. Science curriculum should be relevant to students' 'cultural attitudes towards, and local knowledge about, their environment'[14(p.17)], including knowledge of local ecosystems and sustainable use thereof for survival[3,18]. While African students need to learn about their worldview and IK for their identity formation, scholars recommend that they learn western science in a hybrid subject integrating IK and western science[3,19,20]. Hybrid science improves student interest and motivation[16,20] and could lead to improved performance in science, although evidence supporting this is limited[10,11,13]. It is a 'two-eyed seeing' model of learning which draws examples from IK to illustrate Western scientific concepts[10], thereby reducing the alienation felt by African students in science classes[3,13].

Violent student protests on South African university campuses in 2015-16 included calls for decolonisation of curricula, citing alienation, exclusion and racism experienced by (mostly) black students in universities dominated by (mostly) white academics[19]. The protests revealed that university lecturers and administrators were unaware of the lived experiences of students and their cultural knowledge was not legitimised[19]. To overcome the perceived alienation, Jegede[14] recommended that science teaching in Africa should begin with the traditional worldviews of students and progress towards imbibing scientific culture. Students then perceive science as relevant to their culture, while inculcating scientific culture. Induction of African students into western science is best achieved by using a conceptual ecocultural paradigm in which an individual's perception of knowledge grows and develops from their sociocultural environment[14]. Relevance is of primary importance in Jegede's argument for African science[14]. In this paper, relevance includes choice of local contexts to illustrate ecological principles, ecosystems and environmental issues as well as inclusion of indigenous worldviews and IK in the syllabus.

Researchers who promote the concept of powerful knowledge[21] which best prepares students for future life[22] argue against including indigenous epistemologies and IK in the curriculum. Powerful knowledge inducts students into conceptual organisation of isolated facts into generalizable principles[21]. A curriculum constructed around students' life experiences does not develop their human powers of reasoning nor prepare them for a technological future as western science does[14,21,22]. Most powerful scientific knowledge is counter-intuitive and generic, unlike IK. As stated by Young and Muller, 'The structure of

local knowledge is designed to relate to the particular; it cannot provide the basis for any generalizable principles'[21(p.113)]. Proponents of powerful knowledge would agree that IK can set the context for scientific knowledge, but they reject appeals for African students to learn only things that are important for everyday life and living[21,22].

Philosophers of science regard faith-based or spiritual worldviews as incompatible with science. Western scientists seek rational explanations for natural phenomena, excluding spiritual or supernatural causes[23]. Science presupposes that natural mechanisms and entities explain or potentially can explain all natural phenomena. Science does not rule out supernatural intervention but separates supernatural from natural explanations because it is concerned with material objects of study that obey natural laws and are open to scrutiny[23,24].

Caution is urged to avoid romanticising indigenous epistemologies and IK[25]. Contrary to claims, indigenous peoples do not all live in harmony with nature, respecting the living and non-living world and behaving for the good of the community[15,16]. For example, medicinal plants were harvested sustainably in the past but this has changed as plant trade became a competitive trade business[26]. Africa's environmental challenges include air pollution, unsustainable land management practices, waste and littering, overpopulation and rapid urbanization[27]. The continent's rich biodiversity faces threats from illegal trade in plants and animals, mono-cropping, deforestation, climate change and invasive alien species[18]. These realities contradict claims of harmonious coexistence for indigenous communities[15,16].

Influence of CIE and relevance of African syllabi to local contexts

CIE syllabi are intended for use in many different countries and present a generic western science-oriented worldview. Where CIE has collaborated with a foreign country to develop its own curriculum, one expects to find content that is locally relevant, including local IK and acknowledging indigenous worldviews. Even if formal collaboration did not take place, CIE's influence may be revealed through similar content selection and wording of learning outcomes. The first research question investigates the influence of CIE on African syllabi through two avenues:

a) How closely does the content selected in seven African biology syllabi match the content in equivalent CIE syllabi?

b) How closely does the wording of learning outcomes match the wording in CIE syllabi?

The second research question investigates relevance of African syllabi to local ecosystems, indigenous worldviews and IK. Ecology and environmental issues are relevant to African worldviews, IK about local ecosystems and local environmental concerns[19]. Questions asked here are:

a) What proportion of each syllabus is locally relevant?

b) What opportunities to contextualise the syllabus have been missed?

Seven African countries selected were based on curriculum documents available to me. Countries previously colonised by Great Britain and their years of attaining independence were South Africa (self-governing dominion until 1961), Uganda (1962), Malawi (1964), Botswana (1966) and Lesotho (1966). Rwanda obtained independence from Belgium in 1962. Namibia was governed by South Africa from 1915 until independence in 1990[28].

Methods

Constructing a reference list

I used CIE Biology syllabi 0970 for IGCSE[29] and 9700 for AS and A Level[30] to construct a reference list of generic western science content related to ecology and environmental issues. The reference list contained both core and supplement learning outcomes from IGCSE Topic 19 (Organisms and their environment) and Topic 21 (Human influences on ecosystems)[29], supplemented with a few relevant outcomes from AS & A Level Topic 18 (Classification, biodiversity and conservation)[30]. The final reference list had two topics, eight sub-topics and 71 learning outcomes[29,30], shown in Table 1.

[Table 1 here]

Some CIE learning outcomes were subdivided but were counted as a single outcome. For example, an outcome relating to the nitrogen cycle has eight subdivisions, but it is counted as one outcome.

Matching African syllabi with CIE reference list

Documents analysed and the years of study to which they apply are shown in Table 2.

[Table 2 here]

Namibia[31], Lesotho[33] and Uganda[36] acknowledge assistance from CIE in their curriculum development.

Identifying content in African syllabi.

Content was organised differently in the different syllabi necessitating considering the whole syllabus in each country. Headings from which content was extracted were ‘Ecology’ in Botswana[35(pp.25-26)]; ‘Relationships of organisms with one another and with their environment’ in Namibia,[31(pp.31-34)]; ‘‘Environment’ in Malawi[37(pp.19-25)]; ‘Relationships of organisms with one

another and with their environment' in Lesotho'[33(pp.6-11)]; 'Environmental Studies' in South Africa[34,pp.33-34,51-55]; 'Soil'[36,pp.22-23] and 'Interrelationships' in Uganda'[36,pp.45-48]; 'Ecology and conservation' in Rwanda[32,pp.51-52,82-90] . Statements in each syllabus were grouped to form conceptually coherent units, which were counted only once if they recurred in another column or under another heading. For example, five statements listed in Rwanda's Unit 5: 'Conservation and sustainability' were repeated from Unit 4: 'Effects of human activities on ecosystems' and were not counted as new units. The complete spreadsheet showing reference list outcomes and units from each syllabus is available as supplementary material.

CIE influence on content selection

Content units from African syllabi were assigned to reference list outcomes where a match was detected. In many cases, a unit matched more than one reference outcome, meaning that the number of matches could exceed the number of content units in a syllabus.

The wording of the content units provided finer-grained analysis, if similar wording indicates CIE influence. Similarity was coded on a scale of 1 - 3, using the following descriptors:

1 = similar idea, but wording does not match reference list.

2 = similar idea, wording somewhat matches reference list.

3 = wording closely matches reference list.

Table 3 shows an example of coding for similarity.

[Table 3 here]

Coding for relevance to each country's context

There are two aspects to contextualizing the syllabus:

1. Including African worldviews pertaining to ecology and environmental issues[3,19].

2. Referencing local ecosystems, environmental issues and/or local IK.

The list of units in each African syllabus was scrutinised for mention of African epistemologies with respect to ecology and environmental issue and coded for whether it was generic or relevant to the local context. To qualify as relevant, a unit had to explicitly mention a national/local ecosystem, issue or IK.

Table 4 summarizes how coding was carried out and the terms used throughout this paper.

[Table 4 here]

Findings

Influence of CIE on content selection

The number of content units per syllabus ranged from 13 in Botswana, 15 in Malawi, 21 in Uganda, 23 in South Africa, 38 in Lesotho, 46 in Namibia, 50 in Rwanda, and 71 in the reference list. Many units in African syllabi matched more than one outcome from the reference list. The proportion of the reference list matched varied from a high of 62% in Rwanda and 61% in Namibia to lows of 23% in Uganda and 20% in Malawi (Table 5). The percentage match indicates that Namibia and Rwanda were most similar to CIE in terms of broad content selected.

[Table 5 here]

All seven African syllabi selected content that matched both topics in the reference list. Namibia matched 68% of the outcomes in Topic 19, while Botswana matched only 18%. Botswana omitted the subtopic population size in Topic 19, while Malawi, South Africa and Uganda omitted the subtopic energy flow. Rwanda matched 64% of the outcomes in Topic 21, while Malawi matched only 12%. Lesotho, Malawi, and Uganda omitted the subtopic food supply and Malawi also omitted conservation. Apart from those omissions, every reference subtopic was represented by at least one unit in each syllabus.

Non-matching content indicates independence from CIE. Table 5 shows that 57% of Ugandan units did not match the reference list, followed by 52% in South Africa, 40% in Malawi and 39% in Rwanda. Botswana, Namibia, and Lesotho had very few units that did not match the reference list.

Rwanda and South Africa added the biosphere and biomes, while Rwanda, South Africa Uganda and Malawi included interspecific interactions such as predator-prey relations, competition and commensalism. CIE syllabi omit the abiotic factors of an ecosystem which are present in Rwanda, South Africa, Uganda and Malawi. Uganda emphasized the structure of soil, its importance in the environment and its conservation. Actions to promote conservation are included in six syllabi, the exception being Lesotho. Other non-matching units are diverse.

Finer-grained analysis of similarity between each syllabus and the reference list is shown by the percentage of matches scored at levels 1, 2 and 3.

[Figure 1 here]

Figure 1 shows that the Namibian syllabus had the highest proportion of level 3 matches, followed by Lesotho, Rwanda and Botswana. Malawi, Uganda and South Africa had no level

3 matches. Level 2 matches were highest in Botswana, followed by Malawi, Lesotho, Namibia and Rwanda. There were very few level 2 matches in Uganda and South Africa. South Africa, Uganda, Malawi and Botswana have mostly level 1 matches, followed by Rwanda, Lesotho and Namibia.

Inclusion of relevant content

The second research question addresses whether the African syllabi were contextualised for each country. All the African syllabi presented a western science perspective without mentioning African worldviews.

Figure 2 shows the percentage of units in each syllabus that are generic or relevant to the country. Clearly, South Africa and Uganda prioritised relevant content, where other countries had more generic than locally relevant content. Namibia, Lesotho and Malawi rarely mentioned local context, while Rwanda and Botswana had more than a quarter of their units relevant to the local context.

[Figure 2 here]

Table 6 explores the proportion of generic and relevant content by topic. In Namibia, Lesotho and Botswana, all units in Topic 19 were generic, while Malawi and Rwanda had more generic than relevant units. Uganda had about half of its units generic and half relevant, while South Africa had more relevant units than generic. In topic 21, Malawi had all generic units, while Namibia and Lesotho had mostly generic units. Rwanda had somewhat more generic than relevant units, while Botswana had half of its units generic and half relevant. Uganda and South Africa had far more relevant than generic units.

[Table 6 here]

Two examples of how units were generic or relevant to local context are shown below.

> Example 1:
>
> Reference list outcome 19.4.6 ‘Define ecosystem as a unit containing the community of organisms and their environment, interacting together, e.g. a decomposing log, or a lake’[28].
>
> Namibia[31] and Lesotho[33] closely matched the wording of outcome 19.4.6, including the decomposing log and lake as examples of ecosystems.
>
> Uganda contextualised the outcome as: ‘Look at a map showing the main physical features of East Africa and identify at least five ecosystems; stating their distinguishing features’[36(p.45)] and ‘Investigate an ecosystem close to the school’[36(p.33)].

Example 2:

Two reference list outcomes mention discarded waste :

Outcome 21.3.2: ‘State the sources and effects of pollution of water (rivers, lakes and the sea) by chemical waste, discarded rubbish, untreated sewage and fertilisers.’

Outcome 21.3.4*:* ‘Discuss the effects of non-biodegradable plastics in the environment, in both aquatic and terrestrial ecosystems*’.*

Botswana re-phrased outcome 21.3.2 generically as ‘describe the undesirable effects of water pollution by sewage and inorganic waste’[35(p. 26)].

South Africa contextualised water pollution, eutrophication, the effect of mining on water quality and thermal pollution by requiring students to observe an example of human influence on the local environment[34(p.51)].

Missed opportunities and inappropriate choice of examples

There are numerous missed opportunities in the African syllabi as well as inappropriate choice of examples. The decomposing log and lake are inappropriate examples of ecosystems for Namibia (an arid country) and Lesotho (a mountainous country), both of which have interesting and unique local ecosystems. Neither Rwanda nor Malawi prescribed study of a local ecosystem, which is a missed opportunity in both countries. South Africa and Uganda provided opportunities to investigate biomes and/or local ecosystems in their countries. Malawi chose non-local camels, polar bears and sharks to illustrate adaptations to various environments, thereby missing an opportunity to highlight local species. No country prescribed that countries should identify food chains and food webs in their local environment.

Pollution by waste and littering is identified as an environmental problem in southern African countries[27]. Lesotho and Botswana did not contextualise the outcome, while Namibia, Uganda and South Africa did so through activities.

The subtopic conservation provides opportunities to highlight endangered plants and animals and efforts to protect them in each country. Lesotho and Malawi did not identify endangered species in their own countries, while Rwanda prescribed that students research endangered species in Africa broadly. Botswana contextualised the concept by suggesting that students investigate local threatened species and the need to conserve them. Both Rwanda and Uganda omitted the threatened mountain gorilla populations in their countries, a missed opportunity for this charismatic species. Namibia and South Africa used local contexts by suggesting that students investigate rhinoceros poaching in their countries and

South Africa listed elephants in the Kruger National Park as an example of culling. Sustainable harvesting for food, building materials and traditional medicines should be included in each syllabus but is not.

Indigenous knowledge was rarely mentioned in any of the African syllabi. South Africa listed indigenous knowledge related to sustainable use of plants in the local environment, while Botswana had a statement relating to local knowledge about conservation: 'Find out from the local community which plants and animals have become scarce and why.'[35(p25)]. Uganda did not mention indigenous or traditional knowledge specifically but asked students to 'discuss what steps farmers and gardeners in their locality take to maintain the fertility of their soils'[36(p.23)]. Malawi asked students to Identify organisms using local and scientific names, giving the examples lion, leopard, cow, dog, mango, maize, housefly, cockroach, bees[37].

Discussion

Findings give the following interpretations of CIE influence on African curricula:

- Namibia and Lesotho were strongly influenced by CIE as indicated by a relatively high proportion of matches with the reference list, most of the matches being at levels 2 and 3, and a small number of non-matching units. Both countries had few units that are relevant to their context. They have reduced the breadth of CIE syllabi. The syllabi were co-developed with CIE[6] but very little adaption has taken place.
- Rwanda matches CIE's content selection, with a large proportion of its matches at levels 2 and 3. Many CIE outcomes are replicated almost verbatim. Departure from CIE is indicated by the large number of non-matching units. About a quarter of its units are relevant to the context, particularly the human influence topic. Rwanda's syllabus is an adaption of CIE syllabi to its context[6] but it also departs from CIE with additional units.
- Botswana has a much narrower syllabus than the reference list, but most of its units matched CIE outcomes with only one non-matching unit, indicating strong CIE influence on selection of content. It re-worded CIE outcomes, half of which are assigned to levels 2 and 3 and contextualised a significant proportion of the human influences topic. The Botswana syllabus adapts the CIE syllabus to its local context[6].
- Malawi has a much narrower syllabus than the reference list and 40% of its units do not match the reference list. Nevertheless, 36% of its 14 matches are at level 2, indicating some CIE influence. Most of its syllabus is generic. Despite some similarity to CIE syllabi, it does not appear to be an adaption of CIE syllabi, nor is it relevant to the local context.

- Uganda has few matches with the reference list and 57% of its units not matching. Very few of its matches are at level 2 and its content is mostly relevant to its context. Its syllabus appears independent of CIE influence, yet it acknowledges assistance from Cambridge Education and Curriculum Foundation[36]. It is consistent with co-development between CIE consultants and local curriculum developers.
- South Africa matches almost half of the reference list indicating similar selection of content to CIE. All but one match is at level 1, and South Africa adds a significant proportion of non-matching units. Most of its units are relevant to the country's context. South Africa's syllabus is independent of CIE influence.

None of the syllabi mention indigenous ways of understanding ecosystems[9,14,19]. All seven syllabi support western scientific epistemology, meaning that they have not decolonised. The continued influence of CIE in some African syllabi might be interpreted as neocolonialism[4] or a device to perpetuate cultural imperialism[38] and the privileged status of western science[3,10,13]. 'Neocolonial mind-snatching'[38] and 'curriculum epistemicide'[39] describe subtle processes which cause indigenous peoples to devalue their own epistemologies in favour of western science and may account for adherence to western science in African syllabi. The 'ghost of colonialism past' could account for CIE's influence in countries which followed Cambridge syllabi after independence (e.g. Lesotho and Botswana) but does not account for CIE influence in non-British colonies such as Rwanda and Namibia, nor departure from CIE in Uganda and Malawi.

Each syllabus included in this study was locally constructed by curriculum developers with or without assistance from CIE or other organisations from the global North. CIE cannot be assumed to have promoted western science at the expense of African epistemologies since its adaption principles promote relevance, meaningfulness, respect and responsiveness to students' culture and worldviews[8]. It is more likely that African countries willingly subscribe to western scientific worldviews which are incompatible with indigenous epistemologies[23], and which provide access to powerful knowledge. This accounts for the adoption of CIE-like syllabi in at least four of the seven African countries studied here. The silence regarding African epistemologies does not assist African students who claim to feel alienated from western science[3,19,40].

Guidance principle 4 recommends including local IK, as distinct from epistemology, in the curriculum[7]. Relevant IK could equip students with knowledge and appreciation of their natural environments, skills and attitudes to appreciate and improve sustainable use thereof. A relevant curriculum offers rich and authentic contexts for learning science[15] in a hybrid science syllabus[10,13,20]. However, there are very few examples of local IK and hybrid science

in the African syllabi analysed in this study. Difficulties with prescribing African IK include its local, culturally-specific, and orally transmitted nature[3] and its inaccessibility due to lack of written documents. Rapid urbanisation, modern medicines, materials and foods, the mingling of different cultures[26] and exponential advances in information technology have detached many African students from their traditional roots, rendering local IK obsolete in modern contexts[14]. Scientific research and technological development underpin future prosperity and quality living in African countries and western science is recognised as the vehicle to achieve economic development[3,10,14].

Guidance principle 3 advises that syllabi should include locally relevant examples[6,8]. Five of the seven African syllabi gave more attention to generic than to local contexts. South Africa leads the way, followed by Uganda, in using local, relevant examples to illustrate ecology and environmental issues. It is most unfortunate that so few countries teach students about their local environment and environmental issues.

None of the seven countries analysed here have decolonised their biology syllabus by incorporating African worldviews. Four syllabi show close affinity with CIE, supporting continued CIE influence in their curriculum development. Five syllabi mostly failed to heed Jegede's[14] call to teach science that is relevant to the sociocultural environment of the student. Learning about local contexts would encourage students to take informed custodianship of their natural environment, thereby addressing the environmental issues that threaten African countries[18]. It makes no sense for students to study non-local ecosystems when their own unique ecosystems are vulnerable, nor for students to study foreign plants and animals instead of threatened species in their own countries. Uganda and South Africa provide examples of how a locally relevant syllabus for ecology and the environment might be constructed.

References

[1]Cambridge University Press & Assessment. Introducing our new name and look [document on the Internet]. 2023 [Cited 2023 November 12]. Available from: https://www.cambridgeinternational.org/news/news-details/view/introducing-our-new-name-and-look-20231018/

[2]Tse E, Sahasrabudhe,U. Index of Secondary Credentials [document on the internet]. 2010. [cited 2023 November 14]. Available from: https://www.ierf.org/wp-content/uploads/2016/01/IERFOsandAs2010.pdf

[3]Shizha E.The interface of neoliberal globalization, science education and indigenous african knowledges in Africa. J Alt Perspect Soc Sci. 2010;*2*:27-58.

https://www.academia.edu/45143307/The_Interface_of_Neoliberal_Globalization_Science_Education_and_Indigenous_African_Knowledges_in_Africa

[4]Golding D, Kopsick K. The colonial governmentality of Cambridge Assessment International Education. Eur Educ Res J. 2022:1-26. DOI: 10.1177/14749041221125027

[5]West Africa Examinations Council. About us [document on the internet]. 2020 [cited 2023 November 14]. Available from: https://www.waecnigeria.org/about-us

[6]Cambridge University Press & Assessment. Partnership for Education: Curriculum Design and Development [document on the internet]. 2023 [cited 2024 February 15]. Available from: https://www.cambridge.org/partnership/services/curriculum

[7]University of Cambridge, Cambridge University Press & Cambridge Assessment. The Learning Passport: Curriculum Framework Adaption guidance. Transforming Societies through Education [document on the internet]. Undated [cited 2023 November 18]. Available from: https://www.cambridge.org/files/4415/8465/3367/The_Adaptation_Guidance.pdf.

[8]Fitzsimons S, Coleman V, Greatorex J, Salem H, Johnson M. Context matters – adaptation guidance for developing a local curriculum from an international curriculum framework. Research Matters. 2020;30:12-18. http://www.cambridgeassessment.org.uk/research-matters/

[9]Hewson MG. Embracing Indigenous Knowledge in Science and Medical Teaching. Dordrecht: Springer Science + Business Media; 2015. DOI: 10.1007/978-94-017-9300-1.

[10]Onwu GOM, Mufundirwa C. A two-eyed seeing context-based approach for incorporating indigenous knowledge into school science teaching. Afr J Res Math Sci Tech Educ. 2020; 24(2):229-240. DOI: 10.1080/18117295.2020.1816700

[11]Bennett,J, Lubben F, Hogarth S. Bringing science to life: A synthesis of the research evidence on the effects of context-based and STS approaches to science teaching. Sci Educ. 2007;91(3):347-370. https://doi.org/10.1002/sce.20186

[12]Kayumova S, Dou R. Equity and justice in science education: Towards a pluriverse of multiple identities and onto-epistemologies. Sci Educ. 2022;106(5):1097-1117. https://doi.org/10.1002/sce.21750

[13]Msimanga A, Shizha E. Indigenous knowledge and science education in South Africa. In: Shizha E, editor. Remapping Africa in the Global Space. Rotterdam: Sense Publishers; 2014. p.137-150. http://dx.doi.org/10.1007/978-94-6209-836-7_10

[14]Jegede OJ. School science and the development of scientific culture: a review of contemporary science education in Africa. Int J Sci Educ. 1997;19(1):1-20. DOI: 10.1080/0950069970190101

[15]Zidny R, Sjöström J, Eilks I. A multi-perspective reflection on how indigenous knowledge and related ideas can improve science education for sustainability. Sci & Educ. 2020;29:145-185. DOI: 10.1007/s11191-019-00100-x

[16]Desmarchelier R. Indigenous knowledges and science education: complexities, considerations and praxis. In: Steinberg SR & Down B, editors. The SAGE Handbook of Critical Pedagogies. Los Angeles: SAGE Publishing; 2020. p.642-657.

[17]Vergara TE, Albanese V. Science education and indigenous knowledge in a decolonial perspective: an Argentine case. Acta Sci. 2022;24(2):150-178. Doi: 10.17648/acta.scientiae.6852.

[18]United Nations Environment Programme. GEO-6 Regional Assessment for Africa. Nairobi, Kenya: United Nations Environment Programme [document on the internet]. 2016 [cited 2024 February 15]. Available from: https://wesr.unep.org/media/docs/assessments/GEO_6_Regional_Assessment_for_Africa_Final.pdf

[19] Le Grange L. Different voices on decolonising of the curriculum. In: De Beer J, editor. The decolonisation of the curriculum project: The affordances of indigenous knowledge for self-directed learning. Cape Town: AOSIS; 2019. p.25-47. https://doi.org/10.4102/aosis.2019.BK133.02

[20]De Beer J, Van Wyk B-E. Arguing for the inclusion of indigenous knowledge in the STEM curriculum: Possibilities and challenges. In de Beer J, editor. The decolonisation of the curriculum project: The affordances of indigenous knowledge for self-directed learning. Cape Town: AOSIS; 2019. p.117-142. https://doi.org/10.4102/aosis.2019.BK133.05

[21]Young M, Muller J. Curriculum and the specialization of knowledge. Oxford: Routledge; 2016.

[22]Deng Z. Powerful knowledge, educational potential and knowledge-rich curriculum: pushing the boundaries. J Curr Stud. 2022;54:599-617. https://doi.org/10.1080/00220272.2022.2089538

[23]Matthews MR. Science and Pseudoscience: Reaffirming the distinction. History, Philosophy and Science Teaching Newsletter, December. 2023. https://www.hpsst.com/uploads/6/2/9/3/62931075/hps_st_news__2023_december_.pdf

[24]Bunge M. Knowledge: genuine and bogus. Sci & Educ. 2010;20(5):411-438. DOI: 10.1007/s11191-009-9225-3.

[25]Lee JT Romanticizing decolonization and Asian epistemology: reflections on identity and space. Asia Pac Educ Rev. 2023;24:187-197. https://doi.org.za/10.1007/s12564-023-09835-3

[26]van Wyk AS, Prinsloo G. Medicinal plant harvesting, sustainability and cultivation in South Africa. Bio Con. 2018;227:335-342. https://doi.org/10.1016/j.biocon.2018.09.18

[27]Darkoh MBK (2009). An overview of environmental issues in Southern Africa. Afr J Ecol. 2009;47(1):93-98. DOI: 10.1111/j.1365-2028.2008.01054.x

[28]Kopsick K. The coloniality of Cambridge International in present-day Africa: An overview and call for research. J Crit Educ Policy Stud. 2021;19(1):372-391. http://www.jceps.com/wp-content/uploads/2021/05/19-1-13.pdf

[29]Cambridge International Examinations. Cambridge Secondary 2 Syllabus Biology 0970 Version 4 [document on the internet] 2016 [cited 2023 October 15]. Available from: www.cie.org.uk/igcse.

[30]Cambridge International Examinations. Syllabus Cambridge International AS & A Level Biology 9700 Version 2 [document on the internet]. 2016 [cited 2023 October 15]. Available from https://www.cambridgeinternational.org/Images/329527-2019-2021-syllabus.pdf

[31]National Institute for Educational Development. Namibia Senior Secondary Certificate Biology Syllabus Ordinary Level Grades 10-11. 2016. Okahandja: Ministry of Education, Arts and Culture. Available from http://www.nied.edu.na/assets/documents/02Syllabuses/05SeniorSecondary/Biology/NSSCO_BIOLOGY_SYLLABUS.pdf

[32]Rwanda Education Board. Ordinary Level Biology Syllabus (S1-S3). 2015. Kigali: Republic of Rwanda Ministry of Education.

[33]National Curriculum Development Centre in collaboration with Examinations Council of Lesotho. Lesotho General Certificate of Secondary Education Syllabus Biology 0181. undated. Maseru: Ministry of Education and Training.

[34]Department of Basic Education. National Curriculum Statement (NCS): Curriculum and assessment policy statement Life Sciences Grades 10, 11 and 12. 2011. Pretoria: Department of Basic Education. https://www.education.gov.za

[35]Botswana Examinations Council. Botswana General Certificate of Secondary Education Assessment Syllabus Biology Code 0573 [document on the internet] undated. [cited 2023

October 15]. Available from
http://www.bec.co.bw/images/2023/BGCSESyllabi/0573_Biology.pdf

[36]National Curriculum Development Centre, Uganda. Lower Secondary Curriculum Biology Syllabus. 2019. Kampala: National Curriculum Development Centre.www.ncdc.go.ug

[37]Malawi Institute of Education. Syllabus for Biology Forms 3 and 4. 2013. Domasi: Ministry of Education, Science and Technology.

[38]Rose E. Neocolonial mind snatching: Sylvia Wynter and the curriculum of *Man*. Curriculum Inq. 2019;49(1):25-43. DOI: 10.1080/03626784.2018.1554950

[39]Paraskeva JM (2016). *Curriculum Epistemicide: Towards an Itinerant Curriculum Theory*. New York: Routledge.

Figures

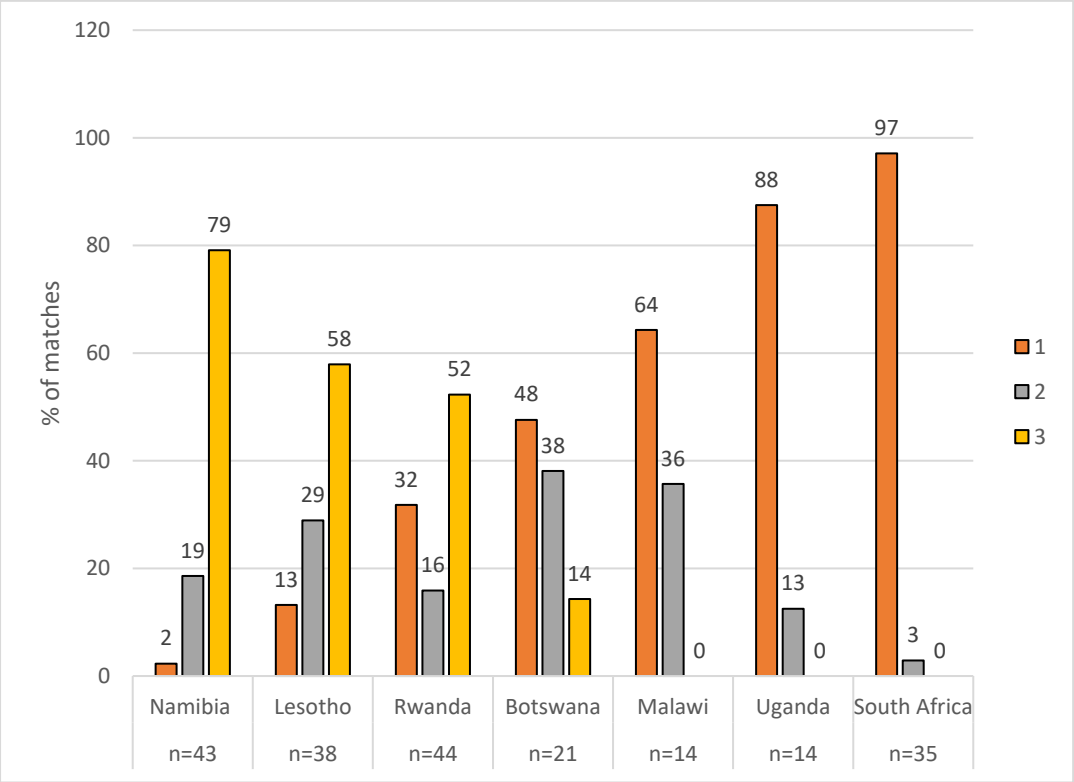

Figure 1: Percentage of matches in each African syllabus at similarity levels 1-3.

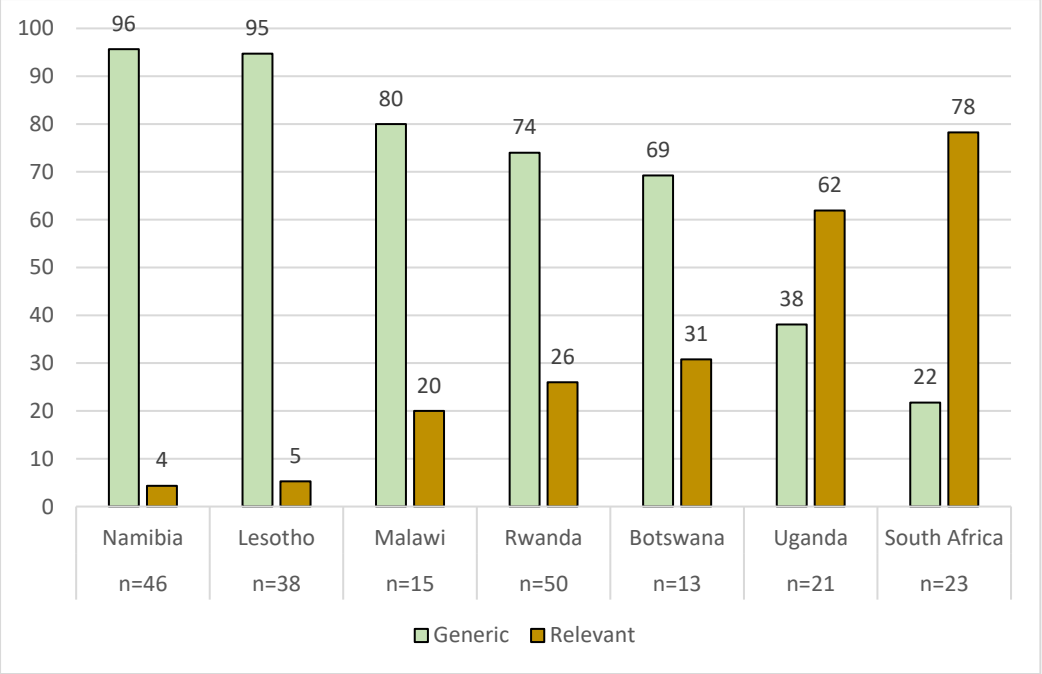

Figure 2: Percentage of content units that are generic or relevant in seven African syllabi. n= number of units per syllabus.

546 Table 1: CIE Reference list for ecology and the human impact on the environment.

Topic 19: Organisms and their environment	
	Number of learning outcomes
19.1 Energy flow	2
19.2 Food chains and food webs	21
19.3 Nutrient cycles	5
19.4 Population size (includes definitions of communities and ecosystems)	10
Topic 21 Human influences on ecosystems	
21.1 Food supply	5
21.2 Habitat destruction	4
21.3 Pollution	9
21.4 Conservation (includes sustainability)	15

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549 Table 2: Countries and syllabus documents analysed in this study.

Country	Syllabus	Years of schooling	Qualification	Years in which ecology and environmental issues are taught
Namibia	Namibia Senior Secondary Certificate (NSSC)[31]	9-11	NSSC O-Level	10 and 11
Rwanda	Rwanda O-Level[32]	7-9	Ordinary Level	8 and 9
Lesotho	Lesotho GCSE[33]	10-11	Cambridge GCE O-Level	10 and 11
South Africa	National Curriculum Statement[34]	10-12	National Senior Certificate	10 and 11
Botswana	Botswana General Certificate of Secondary Education[35]	11-12	Botswana GCSE	11 and 12
Uganda	Uganda Lower Secondary[36]	8-11	O-Level	9 and 11
Malawi	Malawi School Certificate of Education (MSCE)[37]	9-12	MSCE	11 and 12

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552 Table 3: Example of coding for similarity between CIE reference list and matching units from
553 African syllabi.

Syllabus	Matching outcomes/units	Similarity code
CIE reference list	**19.4 Identify and state the factors affecting the rate of population growth for a population of an organism, limited to food supply, predation and disease**[29(p.40)].	
Lesotho and Rwanda	State the factors affecting the rate of population growth for a population of an organism (limited to food supply, predation and disease), and describe their importance[32(p.84),33(p.23)]	3
Namibia	State the factors affecting the rate of population growth for a range of living organisms[30 (p.32)].	2
South Africa	Population size: immigration, emigration, mortality, births; fluctuations. Limiting factors and carrying capacity[33 (p.49)].	1

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Table 4: Example of coding and terminology used in the study. Highlighted text shows how matches were detected.

Content unit from an African syllabus	Number of units	Number of matches	Similarity index	Generic / relevant
Discuss how poor agricultural methods result in destruction of the ecosystem, e.g. monoculture, excessive use of fertilisers and pesticides, overstocking, deforestation[35,(p.26)].	1	4		Generic
Matching outcomes from reference list				
21.1.1 State how modern technology has resulted in increased food production in terms of: …chemical fertilisers to improve yields; insecticides to improve quality and yield; herbicides to reduce competition with weeds……			1	
21.1.2 Describe the negative impacts to an ecosystem of large-scale monocultures of crop plants			2	
21.1.3 Describe the negative impacts of intensive livestock production.			1	
21.2.4 Explain the undesirable effects of deforestation on the environment.			1	

560 Table 5: Number and percentage of matches between seven African syllabi and CIE
561 reference list.

	Namibia	Rwanda	Lesotho	South Africa	Botswana	Uganda	Malawi
Total matching reference list (n=71 outcomes)							
Number of matches	43	44	39	35	21	16	14
% of reference list matched	61%	62%	54%	49%	30%	23%	20%
Topic 19: Organisms and their environment (n=38 outcomes)							
Number of matches	26	23	27	18	7	9	10
% of reference list matched	68%	58%	34%	47%	18%	24%	26%
Topic 21: Human influences on ecosystems (n=33 outcomes)							
Number of matches	17	21	12	17	14	7	4
% of reference list matched	52%	64%	36%	52%	42%	21%	12%

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564 Table 6: Number and percentage of units that are generic and relevant per topic and
565 country.

	Namibia	Lesotho	Malawi	Rwanda	Botswana	Uganda	South Africa
Total number of units	46	38	15	50	13	21	23
Topic 19: Organisms and their environment							
Generic	27 (100%)	25 (100%)	7 (70%)	27 (82%)	5 (100%)	7 (47%)	5 (36%)
Relevant to context	0	0	3 (30%)	6 (18%)	0	8 (53%)	9 (64%)
Topic 21: Human influences on environment							
Generic	17 (85%)	11 (79%)	5 (100%)	10 (59%)	4 (50%)	1 (17%)	0
Relevant to context	2 (10%)	2 (14%)	0	7 (41%)	4 (50%)	5 (83%)	9 (100%)

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