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Peer review history for:

Dempster ER. Selection, sequencing and progression of content in biology in four diverse jurisdictions. *S Afr J Sci.* 2024;120(3/4), Art. #16059. <https://doi.org/10.17159/sajs.2024/16059>

HOW TO CITE:

Selection, sequencing and progression of content in biology in four diverse jurisdictions [peer review history]. *S Afr J Sci.* 2024;120(3/4), Art. #16059.

<https://doi.org/10.17159/sajs.2024/16059/peerreview>

Reviewer A: Round 1

Date completed: 20 July 2023

Recommendation: Revisions required

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

Do you believe somebody with more methodological expertise (in the area of this study) than yourself needs to review this?

Yes/No

If yes, can you suggest the type of expertise needed

Not applicable

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

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Too few/Adequate/Too many/Not applicable

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Is the supplementary material relevant and separated appropriately from the main document?
Yes/No/Not applicable

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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

Select a recommendation:
Accept / **Revisions required** / Resubmit for review / Decline

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:

Overall comments

This is a well-written, clearly structured paper on an interesting topic. The data are clearly mapped out and clearly presented. A curriculum comparison is a worthwhile task. I would suggest that the paper focuses on how the different countries focus on the 'big ideas' and the connection of ideas.

However, I don't think it warrants any claim regarding the relationship between curriculum structure and learner achievement/ societal wealth. I think this aspect should be removed from the paper.

The assumptions made regarding the relationship between the intended curriculum and learner achievement and social equality are not founded in the literature on the roles that schools can play in creating a more socially just society.

Line 29 - I would say that the study provides no evidence, not mixed evidence. I think the assumption that there would be a relationship worth looking for is faulty.

I would suggest that for this audience (that is, scientists rather than educational researchers) more engagement with the concepts of social realism and modest realism may be necessary.

The Introduction is very long and comprises many different aspects. I'm not sure if this is the structure required by the Journal. I would suggest some sub headings to guide the reader.

Lines 57 - 59 Recent curricula in countries such as the United Kingdom, South Africa, some Australian states, some Latin American and European countries and the Organisation for Economic Cooperation and Development (OECD) have reinstated knowledge as the prime organizer.

I think this claim needs to be modified or needs more evidence. SA is planning to return to a competency-based curriculum; Hughson and Wood argue that OECD framework does not focus on powerful knowledge but sees knowledge in reductive and utilitarian ways; Kenya and British Columbia have embraced competency frameworks... <https://curriculum.gov.bc.ca/competencies>
<https://cardinalelementary.com/7-core-competencies-of-kenya-competency-based-curriculum/>

Line 63 and 64 The social realist position, also termed 'knowledge for its own end', enables access to powerful knowledge which provides reliable explanations and new ways of thinking.

I suggest you need some more evidence to support this claim. I'm not sure that the social realist position is solely about knowledge for its own end, but for the development of ways of thinking the 'unthinkable'. It also would argue that it represent what we currently know as the most reliable knowledge.

Line 85 Studies demonstrating that a curriculum based on powerful knowledge enhances social equity are rare.

Would it not be necessary here to comment that it is simply not possible to prove this causal relationship because the curriculum is not the main driver of social inequality? Many studies argue that schooling acts to reproduce inequality, or at least has little interest in disrupting it.

In this paragraph, you mention that many factors impact on academic achievement, which is true, but it also seems you are conflating academic achievement with social equity or suggesting that academic achievement can lead to social equity (or equality?). The sociological literature suggests that this is not true. Perhaps re-look at this paragraph.

Line 98 - Reconsider the term "generic" disciplinary knowledge

Line 208 - if the original study was done with 2014 curriculum documents, clarify that these are still the documents in use.

Line 252 Does knowledge selection and organisation relate to socioeconomic status and/or academic competence of each jurisdiction?

I have some concerns about this third research question. I don't think the sample warrants this kind of causal study. I think it is problematic to take the TIMMS/ international tests as an unproblematic proxy for 'Academic competence'.

In the methods section, the first part is a description of the syllabus documents - it's not clear that this fits under methods. Who did the mapping - the author only or was there any cross-checking?

Line 422 - 425 They experience the biology content as isolated topics thereby losing its potency to fit those facts into broader concepts of the discipline. Nevertheless, Singapore has been successful in achieving high levels of scientific literacy and individual wealth.

This finding leads one to question whether progression towards broad generalisations in the discipline is necessarily associated with academic and socioeconomic success.

I would strongly suggest that the author does not follow this question on the relationship between curriculum structure and learner achievement/ societal wealth. There is a huge body of sociological literature in this field, which is complex and messy. Learner achievement is strongly influenced by SES and parent educational levels. Achievement is strongly influenced by the nature and the status of the assessment tasks and pedagogy. The intended curriculum is often skewed toward assessment demands. There are just too many variables!

I think the paper has sufficient interesting data to focus on the questions of the big ideas and how these may influence what learners learn about biology and how they come to understand the natural world.

Lines 465 - 467 The syllabus is not future-oriented, nor does it fully cultivate human powers in the same way as deep engagement with disciplinary knowledge can do. Nevertheless, Kenya is achieving academic

success in the foundational skills of reading and numeracy surpassing that of South Africa.

I don't think you can make any reasonable link between the structure of the biology syllabus and the reading and writing results in an international test. These are two very different phenomena.

Line 481 - Cognitive challenge is a new idea - how does this link to the "Big ideas"?

Author response to Reviewer A: Round 1

This is a well-written, clearly structured paper on an interesting topic. The data are clearly mapped out and clearly presented. A curriculum comparison is a worthwhile task.

AUTHOR: Thank you for the positive comments.

I would suggest that the paper focuses on how the different countries focus on the 'big ideas' and the connection of ideas.

AUTHOR: See also Reviewer D.

However, I don't think it warrants any claim regarding the relationship between curriculum structure and learner achievement/ societal wealth. I think this aspect should be removed from the paper.

The assumptions made regarding the relationship between the intended curriculum and learner achievement and social equality are not founded in the literature on the roles that schools can play in creating a more socially just society.

AUTHOR: These claims have been downplayed in the paper. Please see particularly references 4, 6 and 8 in which claims are made for a link between curriculum, types of knowledge and social justice. Please see sentences added to the para beginning "The social realist position, termed"

Line 29 - I would say that the study provides no evidence, not mixed evidence. I think the assumption that there would be a relationship worth looking for is faulty.

AUTHOR: The Significance of Findings has been edited.

I would suggest that for this audience (that is, scientists rather than educational researchers) more engagement with the concepts of social realism and modest realism may be necessary.

AUTHOR: The journal restriction of 6000 words makes it difficult to add more to the paper. Lines 52-57 provide a description of social realism and modest realism – please advise if this is insufficient.

The Introduction is very long and comprises many different aspects. I'm not sure if this is the structure required by the Journal. I would suggest some subheadings to guide the reader.

AUTHOR: SAJS does not allow subheadings.

Lines 57 - 59 Recent curricula in countries such as the United Kingdom, South Africa, some Australian states, some Latin American and European countries and the Organisation for Economic Cooperation and Development (OECD) have reinstated knowledge as the prime organizer.

I think this claim needs to be modified or needs more evidence. SA is planning to return to a competency-based curriculum; Hughson and Wood argue that OECD framework does not focus on powerful knowledge but sees knowledge in reductive and utilitarian ways; Kenya and British Columbia have embraced competency frameworks... <https://curriculum.gov.bc.ca/competencies>
<https://cardinalelementary.com/7-core-competencies-of-kenya-competency-based-curriculum/>

AUTHOR: See additional sentence. A competence-based curriculum does not preclude powerful knowledge. It depends on how the competences are written.

Line 63 and 64 The social realist position, also termed 'knowledge for its own end', enables access to powerful knowledge which provides reliable explanations and new ways of thinking.

I suggest you need some more evidence to support this claim. I'm not sure that the social realist position is solely about knowledge for its own end, but for the development of ways of thinking the 'unthinkable'. It also would argue that it represent what we currently know as the most reliable knowledge.

AUTHOR: Sentence re-worded.

Line 85 Studies demonstrating that a curriculum based on powerful knowledge enhances social equity are rare.

Would it not be necessary here to comment that it is simply not possible to prove this causal relationship because the curriculum is not the main driver of social inequality? Many studies argue that schooling acts to reproduce inequality, or at least has little interest in disrupting it.

In this paragraph, you mention that many factors impact on academic achievement, which is true, but it also seems you are conflating academic achievement with social equity or suggesting that academic achievement can lead to social equity (or equality?). The sociological literature suggests that this is not true. Perhaps re-look at this paragraph.

AUTHOR: The paragraph has been revised.

Line 98 - Reconsider the term "generic" disciplinary knowledge

AUTHOR: Re-worded.

Line 208 - if the original study was done with 2014 curriculum documents, clarify that these are still the documents in use.

AUTHOR: "The original work was conducted in 2014, using syllabus documents in use at the time". Lines 470-485 in the Discussion clarify which documents have been revised subsequently.

Line 252 Does knowledge selection and organisation relate to socioeconomic status and/or academic competence of each jurisdiction?

I have some concerns about this third research question. I don't think the sample warrants this kind of causal study. I think it is problematic to take the TIMMS/ international tests as an unproblematic proxy for 'Academic competence'.

AUTHOR: Third research question has been removed and RQ2 re-worded.

In the methods section, the first part is a description of the syllabus documents - it's not clear that this fits under methods. Who did the mapping - the author only or was there any cross-checking?

AUTHOR: Author only did the mapping. Phrase added to highlight how intra-rater reliability was ensured.

Line 422 - 425 They experience the biology content as isolated topics thereby losing its potency to fit those facts into broader concepts of the discipline. Nevertheless, Singapore has been successful in achieving high levels of scientific literacy and individual wealth.

This finding leads one to question whether progression towards broad generalisations in the discipline is necessarily associated with academic and socioeconomic success.

I would strongly suggest that the author does not follow this question on the relationship between curriculum structure and learner achievement/ societal wealth. There is a huge body of sociological literature in this field, which is complex and messy. Learner achievement is strongly influenced by SES and parent educational levels. Achievement is strongly influenced by the nature and the status of the assessment tasks and pedagogy. The intended curriculum is often skewed toward assessment demands. There are just too many variables!

I think the paper has sufficient interesting data to focus on the questions of the big ideas and how these may influence what learners learn about biology and how they come to understand the natural world

AUTHOR: This paragraph has been revised and relationship of curriculum to socioeconomic context has been reduced. However, the relationship to scientific literacy is pertinent because biology constitutes 35% of TIMSS questions and achievement in international studies of science literacy provides an interesting rationale for the choice of jurisdictions and evaluation of their curricula in terms of access to powerful knowledge. If this is omitted, the paper must be re-titled, because at present it is "Does powerful knowledge matter?" The existence of many variables is acknowledged in the final paragraph of the discussion.

Lines 465 - 467 The syllabus is not future-oriented, nor does it fully cultivate human powers in the same way as deep engagement with disciplinary knowledge can do. Nevertheless, Kenya is achieving academic

success in the foundational skills of reading and numeracy surpassing that of South Africa.

I don't think you can make any reasonable link between the structure of the biology syllabus and the reading and writing results in an international test. These are two very different phenomena.

AUTHOR: Lines have been re-worded. Reading and numeracy are foundational skills of science, therefore I would argue that they may well be related to good performance in science.

Line 481 - Cognitive challenge is a new idea - how does this link to the "Big ideas"?

AUTHOR: Changed to depth, since this term has been used previously.

Reviewer B: Round 1

Date completed: 21 July 2023

Recommendation: Accept

Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?

Yes/No

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Yes/No

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Yes/No

If yes, can you suggest the type of expertise needed

Not applicable

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Yes/No

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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

Select a recommendation:
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Yes/No

Comments to the Author:
This is a well-crafted and insightful article. I really enjoyed reading it. The title is beautifully aligned to the contents of the article. The abstract is well-written and succinct. However, it would have been useful if key words were provided towards the end of the abstract if this is acceptable to SAJS style. The significance of the study is clear and resonates so well with the tensions between the intended, enacted and attained curriculum we are currently faced with in South Africa. However, it would have been useful for the author(s) to explain what is meant by powerful knowledge, something which has been explained later in the article. It would be interesting to know too how to strike the balance between generic disciplinary knowledge and context-bound knowledge. In terms of the South African context, in the CAPS document Biology is now referred to as Life Sciences. Research the research questions, I bemoan the fact that research questions 2 and 3 are YES or NO research questions and it would be great the author(s) could improve on this. The discussion of findings is of high quality and I would like to commend the author(s) for this. There is a minor error in the second paragraph in this section, that is, pant organ-systems...should be plant organ-systems...

Author response to Reviewer B: Round 1

This is a well-crafted and insightful article. I really enjoyed reading it. The title is beautifully aligned to the contents of the article. The abstract is well-written and succinct. However, it would have been useful if key words were provided towards the end of the abstract if this is acceptable to SAJS style. The significance of the study is clear and resonates so well with the tensions between the intended, enacted and attained curriculum we are currently faced with in South Africa.

AUTHOR: Thank you for the positive comments.

However, it would have been useful for the author(s) to explain what is meant by powerful knowledge, something which has been explained later in the article.

AUTHOR: The second sentence of the Introduction defines powerful knowledge and is expanded in para. 3 of the intro.

It would be interesting to know too how to strike the balance between generic disciplinary knowledge and context-bound knowledge.

AUTHOR: Sentence added.

In terms of the South African context, in the CAPS document Biology is now referred to as Life Sciences

AUTHOR: Life Sciences is used for CAPS for FET in South Africa, whereas this paper analyses the biology component of the subject Natural Sciences in the Senior Phase of GET. The biological component of Natural Sciences is identified as "Life and Living".

Research the research questions, I bemoan the fact that research questions 2 and 3 are YES or NO research questions and it would be great the author(s) could improve on this.

AUTHOR: Research question 3 has been removed and research question 2 re-phrased.

The discussion of findings is of high quality and I would like to commend the author(s) for this. There is a minor error in the second paragraph in this section, that is, pant organ-systems...should be plant organ-systems.

AUTHOR: Error corrected.

Reviewer D: Round 1

Date completed: 24 June 2023

Recommendation: Revisions required

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

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Yes/No

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Yes/No

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Yes/No

Is the statistical treatment appropriate?

Yes/No/Not applicable/Not qualified to judge

Do you believe somebody with more methodological expertise (in the area of this study) than yourself needs to review this?

Yes/No

If yes, can you suggest the type of expertise needed

Not applicable

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

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Yes/No

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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

Select a recommendation:

Accept / **Revisions required** / Resubmit for review / Decline

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Yes/No

Comments to the Author:

This is an interesting paper. The language and scope are appropriate for scholars in the field.

This is a nascent field and this manuscript provides significant insights into curricula at a particular level of schooling. The abstract represents a synopsis of the manuscript. The literature is recent and relevant. The style and presentation are suitable and coherent.

The following suggestions could strengthen the rigour of results and conclusions:

- This paper seems to explore multiple areas of inquiry, namely, (i) does selection of content enable progression to inclusive generalisations, and, (ii) how does this link to socio-economic status and academic competence. Adequate data is presented and analysed for the first part of the inquiry. The second part is not addressed rigorously- there is little data presented, and convincing arguments which link (i) to (ii) are absent.
- Line 10: Indicate that 7th and 8th years refer to the schooling period.
- Lines 176-177: What does SD mean? Should it be SDG?
- Refer to the following: Lines 168-169: "Applications of science often have ethical, social, economic and political implications (including positive consequences, e.g. increased human life expectancy due to clean water, adequate food, improved medicine". Critically evaluate these views in lines 168-169 since these positive consequences are seldom experienced in the lives of large proportions of populations in global South settings.
- Perhaps the author(s) could consider not using terms such as first and third world- these are offensive and deepen stigmatisation of poor people who live in challenging, developing settings.
- Line 210: Perhaps indicate that these 7th and 8th years are referred to as grades 7 and 8 in South Africa and are part of the Senior Phase band. This could be useful given that the study was commissioned in South Africa.
- Consider referring to the broad generalisations as unifying themes.
- The author(s) indicate the absence of certain content statements in the curriculum, but the following are present:
 - Lines 323 and 324: Reproductive systems in angiosperms and human reproduction are included in the South African CAPS curriculum for Natural Sciences.
 - Line 370: HIV is mentioned in CAPS (Natural Science policy document (Department of Basic Education, 2011, p. 20) in South Africa
 - It was unclear why climate change was privileged. See Line 373: Is SDG2 being referred to, that is, Zero hunger? If so, clarify why climate change is privileged? Climate change is not included directly in the six targets of SDG2.
 - Line 392: The theories should be integrated with findings in greater detail. The theoretical contribution of this study needs to be strengthened.
 - Line 436: Data (secondary) should be presented explicitly to support this claim

Author response to Reviewer D: Round 1

This is an interesting paper. The language and scope are appropriate for scholars in the field.

This is a nascent field and this manuscript provides significant insights into curricula at a particular level of schooling. The abstract represents a synopsis of the manuscript. The literature is recent and relevant. The style and presentation are suitable and coherent.

AUTHOR: Thank you for the positive comments.

The following suggestions could strengthen the rigour of results and conclusions:

This paper seems to explore multiple areas of inquiry, namely, (i) does selection of content enable progression to inclusive generalisations, and, (ii) how does this link to socio-economic status and academic competence. Adequate data is presented and analysed for the first part of the inquiry. The second part is not addressed rigorously- there is little data presented, and convincing arguments which link (i) to (ii) are absent.

AUTHOR: See also comments from Reviewers 1 and 2. Research question 3 has been removed and research question 2 re-phrased.

Line 10: Indicate that 7th and 8th years refer to the schooling period.

AUTHOR: "of schooling" added.

Lines 176-177: What does SD mean? Should it be SDG?

AUTHOR: Changed to SDG. Acronym added to first time "sustainable development goals" are mentioned.

Refer to the following: Lines 168-169: "Applications of science often have ethical, social, economic and political implications (including positive consequences, e.g. increased human life expectancy due to clean water, adequate food, improved medicine". Critically evaluate these views in lines 168-169 since these positive consequences are seldom experienced in the lives of large proportions of populations in global South settings.

AUTHOR: Please see lines 198-199 where Harlen's big ideas are critiqued because they emanate from developed countries and may not be appropriate for developing contexts.

Perhaps the author(s) could consider not using terms such as first and third world- these are offensive and deepen stigmatisation of poor people who live in challenging, developing settings.

AUTHOR: Removed references to first and third-world; replaced with "developed" and "developing".

Line 210: Perhaps indicate that these 7th and 8th years are referred to as grades 7 and 8 in South Africa and are part of the Senior Phase band. This could be useful given that the study was commissioned in South Africa.

AUTHOR: Added.

Consider referring to the broad generalisations as unifying themes.

AUTHOR: 'broad generalisations' changed to 'unifying themes', but this terminology does not capture the hierarchical nature of knowledge. I have retained 'inclusive generalisations' in places.

The author(s) indicate the absence of certain content statements in the curriculum, but the following are present:

Lines 323 and 324: Reproductive systems in angiosperms and human reproduction are included in the South African CAPS curriculum for Natural Sciences.

AUTHOR: Reproduction and reproductive systems are recorded in Table 4. Wording changed.

Line 370: HIV is mentioned in CAPS (Natural Science policy document (Department of Basic Education, 2011, p. 20) in South Africa

AUTHOR: Wording changed.

It was unclear why climate change was privileged. See Line 373: Is SDG2 being referred to, that is, Zero hunger? If so, clarify why climate change is privileged? Climate change is not included directly in the six targets of SDG2.

AUTHOR: As explained in original lines 143-146, only two SDGs were selected as pertinent to school biology. SDG 2 in the present paper refers to climate change.

Line 392: The theories should be integrated with findings in greater detail. The theoretical contribution of this study needs to be strengthened.

AUTHOR: This section has been revised.

Line 436: Data (secondary) should be presented explicitly to support this claim

AUTHOR: The references 8 and 17 support this statement. SAJS limits the number of words to 6000.

Reviewer A: Round 2

Date completed: 10 October 2023

Recommendation: Accept

Conflicts of interest: None

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Yes/No

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Yes/Partly/No

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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

Select a recommendation:

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Yes/No

Did you mentor someone during this peer review?

Yes/No

Comments to the Author:

Thank you to the author for a detailed response on how the reviewer's comments were addressed. This was comprehensive and it was easy to see how you have engaged with the recommendations. The revision of the research questions and the omission of RQ3 has made the paper more focused and the conclusions are well-supported with evidence.

I am happy that you have addressed the comments and can recommend that the paper is now published.

Reviewer D: Round 2

Date completed: 10 October 2023

Recommendation: Accept

Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?

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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?
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Comments to the Author:

Thank you for revising this work.

I accept all the revisions except one. The insistence of the author(s) despite my previous comment, to depict SDGs as follows, is troubling.
"SDG1 Ensure healthy lives and promote well-being for all at all ages
SDG2 Take urgent action to combat climate change and its impact"

Names and the numbers allocated to each SDG under the United Nations are a matter of global consensus. It is unacceptable for an author to append his/her own understanding of SDG1 and 2. One cannot use the numbers 1 and 2 to denote sequence of SDGs which are selected by the author- it betrays the author's lack of understanding of SDGs, in my view.

Author response to Reviewer D: Round 2

Thank you for revising this work.

I accept all the revisions except one. The insistence of the author(s) despite my previous comment, to depict SDGs as follows, is troubling.

"SDG1 Ensure healthy lives and promote well-being for all at all ages
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Names and the numbers allocated to each SDG under the United Nations are a matter of global consensus. It is unacceptable for an author to append his/her own understanding of SDG1 and 2. One cannot use the numbers 1 and 2 to denote sequence of SDGs which are selected by the author- it betrays the author's lack of understanding of SDGs, in my view.

AUTHOR: Thank you for noticing this problem. I have corrected the SDG numbers in the text and in the tables.
