

Response to Editor - August 2025

Comments and edits:

(1) Remove location coordinates and the abbreviation STEM and E&O from abstract since you mention them in the text already.

Removed.

(2) Add 2-3 sentences at the end of the abstract about your core findings and the relevance of your findings to outside of the Arctic region.

The key findings have now been added. We have increased the focus on the Arctic, as one of the reviewers did not know that the programs were based inside the Arctic during previous edits. However, I have amended a sentence and set the final sentence into a broader relevance.

(3) Line 40: the authors refer to 'studies' but reference only one. Please add a few more references here.

We have included more studies, and also included additional sentences at line 53 and in the discussion section to reflect this additional literature.

(4) Line 51: non-academic research dissemination?

Changed.

(5) Line 62: Why ages between 5 and 35? Why is this significant? If it is not, why is it in the title and mentioned in the text?

It is significant due to the programs spanning such a large age range – most E&O activities are for one age group or school year, but our approach covers multiple ages, up to 35. This has now been clarified from line 76 to 80.

(6) Line 96: Please add a few references for "curriculum and pedagogy approach".

Both of the sentences in line 103 to 106 are from Rousell & Cutter-Mackenzie-Knowles, 2019 – so I have include this again. This is also stated in the Table 1 description.

(7) Why not delete 'elementary school' from Fig 1 since there is no program shown under it? Can you also add a program timeline?

We haven't amended this figure, as it is important in the international context to show that there is a gap between kindergarten and secondary school. As all four programs have different timelines

throughout the year, it is too messy to add to this figure. In addition, this information was removed from the program descriptions due to several reviewers wanting less information on the programs. Figure S5 in supplement now includes this information.

(8) Line 132: no need for the second mention of Figure 2.

Done.

(9) For section 3 (data and methods) - Can you add a table here with the following potential fields: program name, data type, timeline, participant numbers, data collection challenges, etc.? This way, the reader will immediately know what type of quantitative data are available, collected over what time, and how much of it. This can be done for both qualitative and quantitative data as one or two separate tables.

The table has now been added, in addition to the timeline graphic in the supplement. With the high number of tables and figures, we have made just one table.

(10) What about analysis of quantitative data? There's no section for it.

The reviewers and editors have made significant modifications to the structure, including removing this analysis as its own section and instead formatting the results as they are now – with both sets of data answering the three research questions. E.g figure 3 is from quantitative data. The combination of quantitative data and qualitative data to answer the research questions is the best way to analyze the aims of the programs.

(11) In section 3.3, could you explain why you use this method in relation to your research questions (as you did for your results)?

This has been added now – thank you.

(12) Line 385: It is not clear what 'greater understanding' and 'clear connection' mean - I think it's a stretch especially when the statement is based on 1 or 2 quotes.

The quotes provided in the tables are just examples, we have included all quotes in the supplement. There is just an example provided for this sentence. I've changed 'greater' to 'increased' and removed 'clear'

(13) Line 452: The authors mention 'a number of studies' but only reference one, please add a few more references.

More references included.

(14) Please remove informal language (e.g., 'don't' in line 508).

Changed.

(15) Line 509: "analysis of other indicators" - what indicators? Could you list a few for example?

These are the indicators we have looked at – so I have included the sentiment of participants as an example.

(16) Line 510: What does "many participants" mean? Please insert a number in parenthesis. Otherwise, this is very subjective. Same for anywhere else in the text where similar terms such as 'many children', 'many students', 'some students', etc. appear

These appear when we have referenced the supplementary quotes but not provided a direct number. As stated in the limitations, we have not gathered information from the surveys to directly answer these research questions, so therefore the quotes do not always relate to the specific part of the paper. By writing something like Four students reflected... it would read like we have specifically asked this question but only a few students responded, and would look like we have significantly fewer students included in the qualitative surveys. Similarly, we can't say that all students were positively impacted by our programs, because not all students responded, and not all of them gave a quote which reflects this. Therefore, there is some aspect of subjectivity in the qualitative data. This sort of writing appears most in the discussion, which is to put our findings into context with other studies, so we also don't want to repeat the results by stating 'quote 1 shows...'. I've re-written some aspects and tried to be more concrete where possible.