

Interactive comment on “Climate and music (Toward development of the interdisciplinary climate and cultural understanding education of ESD with special attention to the seasonal cycle and “seasonal feeling” around Japan and Europe)” by Kuranoshin Kato et al.

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General comments.

This paper explores the fusion of climate science and art (music and visual arts) as means to promote ESD (education of sustainable development) literacy, as well as to further the understanding of different regional climates and cultures. They present an overview of educational activities (previously reported in several Japanese books and

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papers) in which students are presented with seasonal climate features of Japan, N. Europe and Germany, and have to reflect on these using visual arts and music. The authors reflect on and highlight differences between the three region's climate features. The paper tackles the very essential topic of climate education, especially in these times of changing climate. I particularly enjoyed reading about the educational activities carried out by the authors and learning about some key climate features in Japan and Europe. In my opinion this paper is more than suitable for publication in Geoscience Communication, for the special issue's theme of 'Five years of Earth sciences and art at the EGU (2015–2019)' after revision. Please find below a collection of comments that I would like to raise, and which I would encourage the editor and the author to consider prior to publication:

- I think that the main point of this paper is watered down and the paper would benefit from clarifying this: climate features are difficult to communicate to promote ESD literacy without the use of art, narratives and references to individual and cultural feelings. Additionally, the paper is centered around two main aims: 1) to promote ESD (education of sustainable development) literacy, and 2) to further the "Understanding of Heterogeneous others". This needs to be clarified throughout the paper and should be used as a basis to discuss the results in the Discussion section.

- While the paper mentions music very clearly, the use of visual arts in the activities is not acknowledged. Please consider adding some literature on visual arts and science in the introduction and mentioning the use of visual arts in the abstract and Discussion.

- Title. In my opinion the title is too long and therefore loses in catchiness. I didn't know what ESD meant before reading this paper, and this might need to be spelled out in the title. Education of ESD seems to be repetitive. Consider using a colon instead of the parentheses, as this is rather unusual for titles.

- Abstract. The abstract could benefit from a few clarifications: Why is this work important? I understand why it is but think you need to clarify the aims/importance of your

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work with regards to these points/the wider context. What does this paper investigate and show? Please also highlight some of the results of this paper here.

- Introduction. 1) The introduction needs to give a wider overview of the context in which your work situates itself and acknowledge other works on similar topics (this will be particularly helpful for readers like me who are not very familiar with the literature in this field). While some parts are in my opinion too detailed and distract from the main message (e.g. P2 L54-73, P3 L74-82). Here are some guiding questions which will hopefully be helpful to the authors to clarify the framing of the introduction: What is ESD and why is it important? What are the benefits of linking music and climate science? (In other words, what are some challenges that the fusion of music and climate science can help tackle?) How can their fusion help improve ESD literacy in different regions and for different seasons? What are you proposing to do in this paper to tackle these challenges? 2) Please also introduce some of the keywords used throughout your paper in the introduction, such as “seasonal feeling”. 3) Please explain briefly here why you have chosen to focus on Japan, N. Europe and Germany.

- Results. 1) Your paper could gain in clarity by following a more rigorous structure, as also mentioned by reviewer Emilia Gomez. Please consider moving these sections to an overarching section 2, as well as splitting results for N. Europe and Germany. 2) Your results would benefit from additional explanations of some of the music concepts you for example mention briefly on P10 L311-312 (“changing loudness”, “tone of the sounds”) and a description of the instruments used (which I am for the most part not familiar with), as well as some of the climate keywords (e.g. sensible vs latent heat). Additionally, your results need further explanations and analyses of the links made by students between colours - music instruments and concepts (e.g. tone - climate features. For example, I found your analysis of the results of activity 2 in section 2.2.2 great, but the analyses of results for Germany and N. Europe are rather light. Did most students use the same instruments/colours/. . . to convey the same feature? What does this choice translate in their understanding? If they used different

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instruments/colours/... , why could that be? For example, could you please illustrate the point you make on P7 L194-198 with activity outputs? 3) Please also clarify the methods used (Johannes Itten's exercise and the "graphic notation" from Morton Feldman). 4) Was there any time to discuss the activity results with the students, or is your analysis of the results only based on your personal observations? Please clarify this in the paper. 5) I found it difficult to jump between the different figures you mention in section 3.1 and 3.2. 6) While reading through more and more of the results, I found it hard to remember which climate features you had used for each region. It might be helpful to make a table of key climate features per region (Japan, Germany and N. Europe) that the readers can refer to throughout the paper. 7) Why are the results of activities 3 not presented for Germany and N. Europe? I found these very interesting for Japan. Mention that you are focusing on the music activities if that is indeed the case.

- Discussion. The discussion could benefit from: tying your results back with some of the wider context literature you (will) mention in the Introduction, and further reflections on the two main points of your work: how have these activities helped with ESD literacy and with "Understanding of Heterogeneous others"? Here are a few more specific questions (as well as a couple more in the specific comments) which it would be great to see discussed here: how transparent is art to the changing climate we are observing/feeling? (e.g. Have you seen a change in music about climate through time which could at least partly reflect climate change? How could art help in these challenging changing times?) Can the activities outputs indeed communicate seasonal feelings to people who have no prior knowledge of the regional climate features at stake? How successful were these activities according to you? (e.g. What were some of the challenges? What would you improve on/do differently for future implementations?)

Specific comments.

- P1 L9-12: This part of the abstract is a repetition word for word of the introduction P1 L25-28. Please rephrase.

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- P1 L9-11 and L25-27: Are these results based on an analysis you carried out in the paper/found in other published material? You need some material to back this up I think. Please consider rephrasing and adding references.
- P1 L12 and L28: Please clarify what you mean by “the other background”.
- P1-2 L28-30: I understand what you mean but it is not very clearly worded. Please consider clarifying.
- Fig. 1: The collaboration is what you focus on? This needs to be said explicitly in the introduction.
- P2 L32-33: It is not clear to me why cultural understanding is a part of climate education. Is that a point you are trying to make in this paper, or that you have made in other published materials? Please clarify.
- P2 L35: Where is the term “Fundamental ESD Literacy” from (add reference) and what does it mean exactly? Same with “Understanding of Heterogeneous others” on P2 L37.
- P2 L43-44: Could you please add at least one reference for this statement.
- P2 L54-55: Please rephrase, I am not sure to understand the meaning of this sentence.
- P3 L69-73: I would move this to the Discussion section and explore it further there. Has it indeed helped with ESD literacy with regards to these climate features? In what ways?
- P3 L92-96: This distracts from the main points of the Introduction. I would remove these and instead say that your paper’s structure follows that of Kato & Kato (2019).
- P4 L99-101: Before introducing the structure of your paper, please say that you focus on a selection of climate features in these activities. Please clarify in which paper sections these 3 parts are discussed.

- P4 L103-107: I suggest to move this paragraph to the relevant section 2.
- P4 L112-113: This is however not observed in the left panel, which is a bit confusing. Please clarify that they show the temperature observed at different altitudes.
- P4: I found Fig. 5 and 6 complicated to read. It would be great if you could guide the readers through these in the text.
- P5 L147: Did you organize this activity in a different season than the one explored during the activity on purpose? It would be interesting to read your reflections on the choice of the activity date in the Discussion. In your opinion, would it have impacted the results/success of the activity if run during another season?
- P5 L155-156: Please clarify what ages these grades correspond to (also for the other sections).
- P5 L160: Please clarify what “96 coloured papers” refers to. Did you offer the students an array of 96 different colours to choose from? Why is it 93 on P6 L164?
- P6 L164: What do you mean by “which color combination is best”? Do you mean the combination which most accurately represents this climate feature for the student? I am wary that it may come across as: which colour combination is the most aesthetically pleasing, which isn't the result you are looking for here.
- P6 L179: Please give examples of “cool colors” for readers less familiar with this concept.
- P7 L199-201: Please clarify.
- P7 L202-204: Link this observation with the outputs of Fig. 9, where there are clearly different personal emotions at play as not all outputs are the same.
- P7 L208-210: That would be an interesting follow up of this work and might be good to add and discuss in the Discussion section.

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- P7 L211-215: I would shorten this paragraph and remove Fig. 13 as you already have a lot of figures.
- P8 L232: Is “Wien” used as a proxy for Germany in Fig. 14 (and others)? Please clarify in the text and figures captions if so.
- P8 L237: Which panel number are you referring to on Fig. 16. Please clarify in the text and provide labels for panel numbers in the caption.
- P8 L237 and L247: Please clarify which location “there” refers to here.
- P8 L238-239: I find this hard to see in Fig. 15. It might help if you could quantify the maximum summer day-to-day variations.
- P8 L243-247: This is a very interesting contrast. Did you explore this with the music activity?
- P8 L247-248: Please clarify.
- P9 L259-261: I find this hard to see in Fig. 14.
- P9 L263-264: I find this hard to see in Fig. 15.
- P9 L266-267: Do you mean by this the day to day variations?
- P11 L343-347: Please add the figure numbers relating to the titles for which they are available. Where is ex1 situated amongst these two categories?
- P12 L368-370: Could you please illustrate this statement with an output of one of the activities?
- P13 L401-410: Please clarify this paragraph and illustrate with specific examples from your results.

Technical corrections.

- P1 L12: “inversely” doesn’t fit here.

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- P1 L14 and other instances: I would suggest changing “By the way” to another more formal term.
- P2 L29 and multiple other instances: change “and so an” to “etc.” or “among others”.
- P2 L41-42: please clarify what you mean by “as if they have been there since before”.
- P2 L46: “called”.
- P3 L89: “were obtained” instead of “were got”.
- P4 L99 and other instances: What do you mean by “The asymmetric seasonal march”? The transition?
- P5 L139 and multiple other instances: I am not familiar with the term “lesson practice” and would suggest changing this to, for example, “activity”.
- P6 L240: “the month of May”.
- P6 L256: “have done many things”.
- P9 L258: “dance together throughout the night”.
- P10 L289: “explanations of the works given by the student”.
- P10 L297: “the sky has completely fallen down”.
- P10 L298: “the lively coming spring”.
- P11 L346: “this category are”.
- P12 L355: What do you mean by “Mokokku”, “flogs” and “mysterious singing ball”?

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