

SCOPE as per Editorial: *Geosciences Communications* Sam Illingworth et al (2018) Building Bridges, not walls. <https://www.geosci-commun.net/1/1/2018/>

- a. Qualitative and quantitative evidence – not solely anecdotal reporting = quantitative analysis of reach and impact.
- b. Find fresh ways to connect with mass popular culture through emergent digital communication channels open up exciting possibilities (Schäfer, 2012). Geoscience communications are thus scientific activities at multiple levels that aim at increasing attention to and public discussion of geoscientific results. Thereby they cover a wide variety of initiatives.
- c. All research articles should include an explicitly marked section that considers the ethics of the investigation and should also demonstrate how the research has received ethical clearance from their research institute or professional body.
- d. Integrate the practitioners from the different disciplines (e.g. artists, poets, social scientists) at the very start of the process, and not just tack them on at the end.
- e. Make use of online supplements to share materials (e.g. survey items, slide decks, videos, summaries for policymakers, or any other supporting information).
- f. Any limitations of the study, including sources of bias, should be clearly discussed. These might include limitations for when, where, and with whom the innovation is likely to work, or limitations of the instruments or metrics used in the evaluation.

Interactive comment on “Education and public engagement using an active research project: lessons and recipes from the SEA-SEIS North Atlantic Expedition’s programme for Irish schools” by Sergei Lebedev et al.

In the full review and interactive discussion, the referees and other interested members of the scientific community are asked to take into account all of the following aspects:

1. Does the paper address relevant scientific questions within the scope of GC?
Yes, the paper is relevant and clearly relates to Geoscience Communication and specifically the topic of Geoscience Education.
2. Does the paper present novel concepts, ideas, tools, or data?
I agree with Tony Lelliott’s comment that reference to “best practices” and “ideas that could be applicable to ours” (p.4, line 106-7 and line 109-10) need to be fleshed out. Although these are referenced, the authors don’t give examples or say why were they chosen or deemed to be applicable.
3. Are the scientific methods and assumptions valid and clearly outlined?
 - a. The GC scope requires that authors provide qualitative and quantitative evidence – not solely anecdotal reporting and provide quantitative analysis of reach and impact. Whilst the paper is an uplifting account of how the project was implemented, I agree with Tony that the paper is more show and tell and this primarily anecdotal: for example, in line 121, the authors note that “Having more time for the competition would have been beneficial”, but do not say why? What had they hoped to achieve? Would having had more time significantly have changed/ improved the results?
 - b. Lelliott indicates that the authors tend to make claims unsupported by any data – see e.g. p.6 line 194 – the assertion is that the girls in all-girl schools identify with female scientists as role models; this assertion is extended to include boys in the abstract (page 1 line 25, “both girls and boys...were presented with engaging role models”), and although teachers attested to the positive response of their pupils, the statements are anecdotal rather than substantiated with provable data. In line

199 also page 6, the authors refer to broadened “impact” of the event through pupils talking to their friends and parents about the experience – this certainly can be said to broaden the “reach” of the event, but should not be assumed to be indicative of impact unless that impact can be established and substantiated.

Further, at line 225, there is reference to the competition as having “increased the student’s interest in STEM” – again there is no data to prove this.

- c. An example where a conclusion can be linked to the project under discussion to avoid it reading as an unsubstantiated assumption, can be found on page 10, line 332: adding the words “We found that” to the sentence, “Inviting students to become co-creators gets them engaged with enthusiasm” and providing some examples to illustrate the claim, would substantiate the statement which otherwise should be referenced to be considered valid. Further, how do the authors gauge that “They [the students] are, then, motivated to learn more...” or that “This contributes to increasing the students’ interest in ST and STEM careers” (lines 338-39)?
4. Are the results sufficient to support the interpretations and conclusions?
 - a. Reference to sample size (numbers), where it is made, is imprecise – e.g. Reference is made in the abstract to “18 link-ups”, but in line 126 the authors state that “Around 20 schools... participated” – is this 18 -19 schools, 21 schools? The authors need to be consistent in stating the size of the sample set. Should it be the intention to use this paper as a benchmarking exercise for future engagements of this sort, it will be difficult to interrogate data and draw meaningful comparisons. I suggest they indicate exactly how many schools, how many pupils and how many teachers participated – they have provided a distribution map of the schools involved in the project which is useful, and obviously worked closely with teachers at the schools, so substantiated data should be really available.
 - b. Page 8, lines 251-254: In interpreting the results of the competitions, the authors refer to “many” students having “made an effort to research the subject” – again finite number should be available – this could provide useful comparative data for later competitions. On page 11, line 345-347, “the number of participating schools was lower than expected”, and “a proportion of entries showed little evidence of the students having researched...” – But, how do they confirm this is the case and if so what were the factors behind this? Investigating these questions could provide very valuable insights for geoscience education and communication going forward.
 - c. In ‘Conclusions’, Page 11, lines 367-68, the authors affirm that “Survey responses from the teachers confirmed that the engagement...has a lasting positive impact”: I would contend that a single survey with teachers only cannot be said to do this – a claim for “lasting...impact” needs to be measured over time through at least one follow-up survey conducted sometime after the engagement; firstly with pupils (to ascertain retention of knowledge and impact on their view/ understanding of geosciences) and teachers – with regard to how the engagement has supported or augmented their curriculum-based work in the classroom and influenced (especially in the case of high-school pupils) their performance and results. As far as the “researchers – both experienced and early career”, there are a number of considerations that could be used to generate conclusions regarding the success of the outreach:
 - i. E.g. On page 9, line 299, researchers’ communications skills are described as, “often not their greatest strength, to begin with”: As individuals, how confident were the researchers on this project about being involved in

geosciences engagement and communication before the project? Had this changed afterwards? Why? What are some of the take-home messages that other researchers undertaking engagement might find useful?

- ii. What were their expectations before the engagement? Did they feel these had been met? Where were the gaps? The authors answer this to some extent by mentioning that the programme should offer more activities (line 356) and broaden the target audience (lines 358-60) in order to achieve their aim (stated in line 353), but it would have been interesting to know how they are going about this – they mention that funding for expansion is “—being sought at the moment” (line 361), so they must feel that the programme was sufficiently successful to demonstrate the need. Who are the targeted funders? Motivating the need for enhanced and broader STEM awareness could be pitched to a variety of potential funders (government, the private sector, industry) but would need to address not only the educational but also societal and economic benefits. How does “the real impact” of the programme move beyond generating “enthusiasm” among researchers and address broader issues to which they can commit their energies and work with societal actors in order to provide answers?
5. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?
 - a. At line 159, the authors indicate they were “keen to use the available best practice” which is acknowledged and credited. However, the reader is not able to compare their approach with other examples as those examples aren’t articulated. Later, on p.12 line 382, they say that “No primary data sets were used in producing this article”. Some of the best practice examples may have provided a potential source for comparative data and there are enough statements of “fact”, or implied measures of comparison, in the article that could be supported by data.
 - b. Not having explained what, in their view, constitutes best practice earlier in the article (ref line 106-7), it is not clear why the project leaders decided to develop a template of their own – was this because there were no examples/reports of live video events available from the best practice examples they had chosen? This would provide an opportunity for them to discuss the implied gaps in the literature and how and why their approach is new, different and an innovative departure from established geoscience communication practice.
 6. Does the title clearly reflect the contents of the paper?
 - a. To an extent, but I’m not convinced that the content has fully articulated the “lessons and recipes” referred to in the title.
 - b. I agree with Tony Lelliott that the title is too long: Suggestion: “Ship to shore – live video involves Irish schools in an active geophysical research project in the North Atlantic.”
 7. Does the abstract provide a concise and complete summary?
 - a. Yes, but it should be edited to address some of the comments above: e.g. see ref to “boys and girls” being “presented with engaging role models”
 - b. I suggest some of the chosen adjectives in the abstract should be changed to avoid implied assumptions or bias: e.g.
 - i. ‘Profound’ impact (line 17) – the content doesn’t show that the impact of the project has been ‘profound’.

- ii. Line 20-21 – the relative pronoun ‘them’ in “...which got ‘them’ enthusiastically engaged” is unclear – who became enthusiastically engaged – the students or the researchers?
- 8. Is the overall presentation well-structured and clear?
Yes.
- 9. Is the language fluent and precise?
 - a. On the whole the article is well-written.
 - b. Some of the expression/idiom is unfamiliar to me – e.g. line 133 “curriculum-facing discussions” – are these curriculum-‘based’ or curriculum-‘relevant’? If the discussions are ‘relevant’ to the curriculum they could require some interpretation, critical thinking and application by the students; whereas curriculum-‘based’ discussion would be more guided and possibly require less application and critical thinking. What did the students learn from these discussions?
 - c. Tone: there are two instances where the ‘tone’ could be interpreted as indicating a ‘bias’ on the part of the authors:
 - i. On p.4 line 119, the use of the word “imaginative” in the context denotes a certain implied irony – whilst the intention may be to instil some humour, it falls flat. On the other hand it could be interpreted as a typographical error for “unimaginative”.
 - ii. On p. 5 line 136-37, the parenthetical reference to the deployment of “Charles” and “Harry”, “inevitably, in the UK waters”, whilst attempting humour, could be seen as inappropriate in a scholarly work. It assumes also that a global readership would understand and accept the ‘joke’.
 - d. Minor errors:
 - i. Line 370 – insert the word “can” after “research project” for the sentence from line 369 to read “The outcomes of an educational programme coupled with a research project **can** include...”
 - ii. Line 378 – “form” should read “from”.
- 10. Are the number and quality of references appropriate?
Yes. However, the formatting of the reference list is not reader-friendly and makes the references difficult to tell apart. I suggest that the second and following lines of the references are indented to set the references apart.
- 11. Additional comments:
 - a. I couldn’t find any reference to ethical clearance for the research as required by the scope of GC. As the authors are gathering data from schools, and teachers and pupils are case subjects, the research proposal should have received ethical clearance. Is this an oversight?
 - b. Protection of minors:
 - i. Is it acceptable to use photos of under age children on an online platform?