

Solid Earth Discuss., referee comment RC2  
<https://doi.org/10.5194/se-2021-89-RC2>, 2021  
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## Comment on se-2021-89

Anonymous Referee #2

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Referee comment on "Deep oceanic submarine fieldwork with undergraduate students: an immersive experience with the Minerve software" by Marianne Métois et al., Solid Earth Discuss., <https://doi.org/10.5194/se-2021-89-RC2>, 2021

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### General Comments

This manuscript presents virtual field exercises to teach practical skills to students as an alternative to 'long and expensive field-work sessions'. The authors describe several delivery methods, including one where the authors used a dedicated VR room and software that allows research collaboration in VR (an experiment described in a cited conference paper). The methods described allowed students to observe, explore and experience an otherwise inaccessible, exceptionally preserved surface fault rupture outcrop through virtual reality using a digital model that was created for research purposes, and use their observations to learn about earth processes.

This manuscript impressed me for several reason. The authors describe the decisions and reasoning, as well as the learning that they were trying to achieve, when designing their virtual experience. They list three formats of delivery, and comment on the benefits and drawbacks of each method, all while acknowledging their own shortcomings. The authors provide student feedback on their experience whilst learning and engaging with the content. And finally, the authors have chosen software that is free and open source, including the software that they developed themselves, as well as making all of their learning resources available through this special issue. This latter point means that it would be extremely simple to build on or attempt to replicate the author's experience.

My impression is that the authors present a balanced and honest view of their experiment of teaching with VR. At the moment, the quality of the paper does suffer from quite a few language and grammar errors that should be easily rectified. The paper might also benefit from a clearer collection methodology on the data used (the teacher reflection and student feedback). The discussion on the data could also use some grounding in relevant literature. The paper does not show (nor attempt to) any clear improvement on learning outcomes; however, it does highlight the enthusiasm that student had engaging with the content. Therefore, I believe readers will be encouraged to follow in the authors footsteps, use the authors resources, and experiment with VR in the classroom. I believe that after a

review of the comments, the manuscript will form an excellent complement to the Solid Earth special issue on virtual field experiences.

## **Specific Comments**

First, as highlighted before, the paper makes exclusive use of free and open-source software (FOSS), removing one major hurdle for colleagues wishing to replicate this experiment in their own setting. The other benefit of the use of FOSS is that students can easily take the skills learnt during this lab with them into their future careers once they leave university, without having to retrain using new software. I believe the authors could highlight this positive aspect of their work.

The authors have taken extra effort to provide to students with carefully curated course material, digital files and software settings (e.g., L96-98) to ensure little to no technical difficulties. Can the authors specify if plugins are required to be installed separately by students (L105), and if yes are students given guidance on how to install plugins? Are students given guidance on how to use the layout manager (L110), and if they are, how? Are students shown how to import a csv file into their project (L158-160)?

The authors have put effort into providing the context of the field area and how the data was collected for the student. For example, students are asked to put their field area in a global context as first exercise (L100). Students given context to how the digital models were built (L121), giving them the opportunity to appreciate the difference between the actual outcrop and the digital model.

One theme throughout the paper is the replication of 'real fieldwork' (L171, L203, L208). Are the authors really trying to approximate 'real fieldwork' with the VR experiment? I would encourage the authors to shift their thinking when it comes to virtual field experience from replicating real field work, to replicating learning outcomes that occur in the field. Some learning outcomes might prove to be achievable in virtual field experience (in fact some learning outcomes might be better in virtual experiences!), however some might not. E.g the authors highlight how this experience might have helped solve some accessibility issues for one student, who could never have gone to field if they wanted to (L236) due to a phobia (if this was possible..). I think it is important to think of virtual field experiences as one tool to achieve learning outcomes instead of as a replacement for in person field trips.

One particularly exciting feature of the virtual field method together in the field method is the ability of sharing the field experience with others, as we know that peer feedback helps increase understanding of concepts see refs.

Falchikov, N. (2001). *Learning together: Peer tutoring in higher education*. Psychology

Press.,or

Duret, D., Christley, R., Denny, P., & Senior, A. (2018). Collaborative learning with PeerWise. *Research in Learning Technology*, 26, 1-13.)

Another general suggestion would be that the manuscript would benefit from referring to relevant literature. For example in section 4.3 perspectives, the authors make a lot of excellent suggestions on improvements to their exercise, but their arguments would be much more convincing if there was literature that supports those suggestions. Some examples from that section would be: Why do it be an improvement to recognise avatars in VR? Why is slow teamwork a negative effect? These are just two small examples, however I would encourage the authors to tie all of their discussion back to relevant literature.

Other more specific comments:

L174 Was the participation in oral discussions part of the course assessment? How was their understanding of concept assessed in the remote strategy? In general, was there any assessment associated with this exercise? The assessment strategy might be of interest to readers.

L175 What type of issues are required to be troubleshooted? Are the issues related to the use of software, to remote working, to the innovative nature of this exercise?

L195 "they avoid common misinterpretations." What common misinterpretations?

L224 – Did you run out of time for the "together in the field" version only? Is there anything that can be done to use your time more efficiently, or is the time problem inherent in using VR as a teaching tool?

L229. Instead of saying "would probably help the student understanding", it might be more appropriate to say that "4<sup>th</sup> lab session could be designed around synthesising 3D and 2D data .." , the difference being that the latter is a learning design, and the former a prediction of learning achieved by students..

L242 are the quotes translated? It would be worth specifying that, also as there are some grammatical errors in the quotes that might have been introduced by the authors.

L298 What do you mean "not representative"? Not representative of a wider population of users' experience? I don't think it is necessary to mention the population size when concluding on the success of this experiment, I would just say that it worked well for your group. That means that you are not trying to generalise your results to a wider group.

### **Technical corrections**

title 'exceptional' what is exceptional, the immersion or the experience? A different phrasing might help.

L21. Citation required for the first statement, such as .,

Boyle, A., Maguire, S., Martin, A., Milsom, C., Nash, R., Rawlinson, S., ... & Conchie, S. (2007). Fieldwork is good: The student perception and the affective domain. *Journal of Geography in Higher Education*, 31(2), 299-317;

Lonergan, N., & Andresen, L. W. (1988). Field-based education: Some theoretical considerations. *Higher education research and development*, 7(1), 63-77

Petcovic, H. L., Stokes, A., & Caulkins, J. L. (2014). Geoscientists' perceptions of the value of undergraduate field education. *GSA Today*, 24(7), 4-10.

I.25 Ig 'that starts to be explored' which is being explored...?.

I.32 Ig 'work jointly' perhaps you mean collaborate?

I.52 Ig "inspect interactively structures"

I57 Ig "remotely meet" meet remotely?

L59 "license" is that a degree?, perhaps add quotes around the word?

L60 lg "Minerve sotware..." The Minerve software

L64 lg 'are usually fainted rapidly' usually disappear rapidly?

L66 lg 'fault mirror' do you mean fault plane?

L66 lg 'stick' stuck?

L67 lg 'discuss seismic' discuss the seismic

L68 why 'especially with undergraduate students'? Quite a long sentence too.

L74 lg "understand a tectonic" remove a

L78 lg "understanding of the tectonic" remove of

L82 ambiguous use of its in "its analysis".

L109 "they have to wonder about" do you mean the students are required to reflect on the nature of the relationship between structures...?

L112 "student are asked to.." Do the students hand in their answer, or is this a class discussion?

L113 "they have to remember that.." are students given this information in the lecture? If yes perhaps say "students are required to recall lecture material in order to.."

L119 "On the field:.." In the field?

L120 "on the field"

L165 "these objectives" what objectives?

L170 "both regarding GIS" regarding the GIS..

L171 "the least close to the real fieldwork" do you mean the worst approximation of in-person on location field work? I would be careful about the use of the word 'real'.

L174 "discussion, that makes it difficult to conclude on their real understanding" perhaps you mean "discussion, which makes it difficult to assess their actual understanding"?

L190 "its own model" perhaps "their own model"

L197 "compass on the plane" I'm not sure what you mean by this phrase, can you explain?

L199 "and eventually pointing some specific details" not sure what you mean.

L200 "colleague exploration", perhaps "fellow student's" instead of colleague?

L208 "with this respect" "in this respect"?

L224 "to conduct properly" "to properly conduct"

L226 "requires time for going" "required time to go "

L252 "point two serious", "point to two serious"

L256 "the more promising and" "the more promising option and"

L258 what do you mean by "if personal work is required"

L261 "alone of" "alone in"

L261 "more adapted" "adapted"

L262 "be easily done" "easily be done "

L262 "on the field" "in the field"

L265 "its own" "their own"

L277 "imposed to" "imposed on"

L279 "work by pairs" "work in pairs"

L302 "SIG" GIS?

L307 "Students are in general enthusiastic to experiment virtual fieldwork" Do you mean  
"The students surveyed were in general enthusiastic to experiment with virtual fieldwork"