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Comment on gc-2021-37

Glenn Dolphin (Referee)

Referee comment on "Virtual field trips utilizing virtual outcrop: construction, delivery and implications for the future" by Jessica H. Pugsley et al., Geosci. Commun. Discuss., https://doi.org/10.5194/gc-2021-37-RC1, 2021

I am happy to see an article addressing the use of virtual out crop models and virtual field trips in geoscience courses. Thought they have been gaining in popularity, the recent experiences with the pandemic have really placed them front and center. The more people we have looking at this kind of strategy, the better informed we will be in all facets of their use, developing, implementing, and evaluating efficacy.

That said, it is my opinion that this paper would need to add to or change its scope prior to acceptance for publication. As stated earlier, using various types of virtual field trips has been gaining in popularity, increasing with more sophisticated technologies, for the past couple of decades. There have been numerous publications addressing many of the problems addressed in this paper. The following represents a list of the present authors' conclusions and previous literature that support them.

- VFTs enable a larger volume of data at varying scales to be integrated and developed.

(Arrowsmith et al., 2005; Atchison & Feig, 2011; Hurst, 1998; Çaliskan, 2011)

- VFTs are logistically easier to plan and deliver.

(Hurst, 1998; Peat et al., 2005)

- VFTs are financially inclusive

(Fletcher et al., 2002; Jacobson et al., 2009; Litherland et al., 2012; Stainfield et al., 2000; Ramasundaram et al. 2005)

- VFTs are time efficient

(Ramasundaram, et al., 2005)

- VFTs have a lower carbon emission

- VFTs are inclusive to those with restricted physical access

(Atchison & Feig, 2011; Atchison, 2011; Gilley et al., 2015; Stainfield et al., 2000; Çaliskan, 2011)

- VFTs are flexible, inclusive to those with other time commitments

(Hurst, 1998)

- VFTs allow individuals to work at their own speed

(Arrowsmith et al., 2005; Bentley, 2014; Fletcher et al., 2002; Li et al., 2003)

- VFT can serve to prepare/orientate a class for a real excursion

(Bentley, 2014; Litherland et al., 2012; Peat et al., 2005; Çaliskan, 2011)

- VFTs can be geographically independent

(Stainfield et al., 2000)

Need to incorporate teamwork

(Arrowsmith et al., 2005; Atchison & Feig, 2011; Lukes, 2014; Stumpf et al., 2008)

Reflecting on this indicates that this paper really does not add to the knowledge base. There does not appear, in my reading of the manuscript, to be anything novel to report. This does not take into consideration that many of the conclusions of the article were not even addressed in the paper. For instance "VFTs have lower carbon emmissions." It seems intuitive here, but there is no measurement or even mention of this in the manuscript at all, nor do they site any other resource that makes such an assertion. VFTs are time efficient and VFTs can serve to orient a class for a real excursion. Again, the manuscript does not entertain these ideas, nor provide any data to support them. They are intuitive, sure, but one thing science has shown us is that intuition oftentimes is not coherent with reality. So, it seems to me that without actual data, or reference to published data someplace else, These concluding statements are inappropraite for this paper as currently written.

The authors use course standard course evaluations plus one made specifically for the reported activities. There is quite some literature on how standardized course/teaching evaluations are unreliable for a number of reasons (Boring, et al. 2016; Esaarey & Valdes, 2020; Spooren et al., 2013). Part of the reason is that though they show that the virtual field trips scored higher than the actual field trip, yet all students said they would reather be on the actual field trip. It could be that because ALL classes were on line at the time, and the field trip course offered a lot of variety and therefore *compared to other courese on line*, this one scores higher. We just do not know because there is no way to standardize the data.

Where this manuscript could go: In my mind, this manuscript needs to do one of two things to allow it to add to the knowledge base. First would be to focus on the building part, or focus on the evaluation part.

For the building part, there isa lot of technical information already about "how to" create and implement. This is great for people who would like to try it on their own. What it should have, however, is more about mathiing the building to insdtructional outcomes. For instance, "We wanted students to learning X, Y, and Z. There fore we incorporated strategies 1, 2 and 3." This part does not appear in the manuscript as written. There are some learning goals written, "To study extensional tectonic and associated arid rift basins…etc.", but this does not outline what the authors want the student s to learn. Without this part, evaluation of the VFT is merely opinion. Students self reported they liked it and said they learned something. However, because we do not know what we do not know, the sense of unserstanding is a terrible predictor of actual understanding (Kuorikoski & Ylikoski, 2015). Without measuring actual knowledge gains, there is no way to know how effective the VFT is. The manuscript was explicit saying that this type of measurement was out of the scope of the investigation. My suggestion is to use the literature to guide what the course learning objectives could be (Mogk & Goodwin, 2012), and then mathch them up with the different aspects of the VFT. This would ultimately give the authors a structure that others could follow, and ultimately give a rubric for doing the much needed evaluation of VFTs in general. The literature here is very sparse to non-existent. This would be a truly important contribution to the knowledge base.

On side note, I am assuming that the authros received etics approavel to use student derived data for the manyuscript. It would be good to mention this explicitly in the methodology or data collection section.

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