A potential way to mitigate the effects of COVID-19 pandemic on earth and space sciences education: immersive technologies

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There has been a lot of negative news about the dramatic effects of COVID-19 pandemic on human societies at all levels. One of the most critical questions is how this pandemic will affect the paradigm of education in general? Although there are a lot of uncertainties about the future of teaching and learning, there can be glimmers of light at the end of the COVID-19 tunnel, especially for the educational sections. One of the examples of such hope lies in the enormous investments and, consequently, the growth in the infrastructures of online/virtual/distance education. The pandemic may act as a turning point in turning the potentials of online learning to success on a global scale. Therefore, in this essay, we are highlighting a paper that shows how earth science education can be transformed through immersive technologies such as augmented or virtual reality.

The paper entitled “Transforming Earth Science Education Through Immersive Experiences: Delivering on a Long Held Promise” by Klippel et al. was published in the Journal of Educational Computing Research in 2019, as a result of a collaboration between Pennsylvania State University and the University of Missouri. In this work, the authors explored the idea of turning classic field trips into a virtual experience through immersive technologies. They divided the participants of an introductory geosciences class into two groups: one group experiencing a traditional field trip and the other, visiting the same site virtually by using a head-mounted device.
In this paper, the authors first highlight the fact that despite almost fifty years of vision for immersive experiences and considering all the potentials, their usage is still in its infancy, because of missing pedagogies as well as a lack of empirical studies demonstrating advantages of such experiences. Then the authors mentioned while certain areas such as behavioral therapy have shown enormous success using immersive experiences and already have developed guidelines, many areas, including earth and space sciences, still face questions such as what can be considered as a good design and what separates effective from ineffective immersive learning.

The concept of immersive virtual field trips (iVFTs) is well explained and expanded in this paper. First, the advantages of iVFTs are thoroughly discussed and compared with actual field trips (AFTs). Then, the authors proposed a taxonomy for iVFTs, and later they validated the “basic” iVFTs taxonomy. In this regard, “basic” means that they largely mimic an actual field site visit and do not play-out all the possibilities that immersive technologies and especially virtual reality offer. They established a baseline by selected an introductory geosciences class at The Penn State University with a lab exercise that traditionally takes students to an outcrop. The learning objectives of their lab study were identifying and distinguishing different sedimentary rocks in the field by grain size/color, identifying changes in the depositional environment based on grain size and sedimentary structures, and distinguishing the sedimentary units based on grain size, bedding contacts, and depositional environments.

We suggest to our readers to check the impressive experimental design of this paper to see what variables, instruments, and procedures were used. After a comprehensive explanation of results and discussing the outcomes that were surprisingly in favor of iVFTs in essentially every respect from self-reported enjoyment and learning experience to the actual lab grades, the authors explained their exciting, ambitious plans for the future, such as designing guidelines for iVFTs in education, diversifying their methodology to add more qualitative components, finding ways on how to deviate from the standard lab assignment and adding a lot more detailed assessment with rubrics for a more differentiated picture to decouple the empirical evaluation from rather crude lab grades.
Although no one can predict how the education in earth and space sciences will exactly look like after the COVID-19 pandemic, there is one thing for sure: it will not be the same as before. Therefore, exploring the world of immersive technologies could be a possible avenue to take for mitigating the adverse effects of this pandemic and turning a crisis into opportunities.