WHAT'S IN A NAME? BRINGING ORDER TO THE TERMINOLOGY OF VIRTUAL FIELD EXPERIENCES

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Project Purpose

With improved technology, educators and learners are using more electronic field experiences throughout K-16 education. However, the propagation of available electronic geologic field learning experiences is limited due to inconsistent terminology. By identifying the varied terminology associated with learning and teaching through electronic geoscience field experiences as reported in published literature, our goal is to create a working taxonomy that characterizes experiences, as defined by common immersive and interactive components. Our question is:

- **How do users of electronic geoscience field experiences perceive the degree of interaction and immersive qualities associated with specific terminology described in recent literature?**

Methods

Many terms associated with digital learning and electronic field experiences have appeared in the published literature, but concise and uniform definitions are often lacking for each term. We performed a search of published papers using a wide range of terms, including "virtual field trip," "geology virtual field trip," and "virtual geology." Additionally, article references were searched for additional sources that fit the criteria. We then created a table that showcases the variable definitions and descriptions for the term "virtual field trip" (Table 1). Table 2 shows the range of terms used to describe electronic geoscience field learning experiences that we found in the literature.

Table 2. Range of Terminology Associated with Virtual Field Learning

Virtual Field Trip (8)[a]	Virtual Field Guides (2)[b]	Virtual Field Environment (2)[c]
Virtual Environments (1)[d]	Virtual Visit (1)[e]	Virtual Learning Environment (1)[f]
Virtual Fieldwork (1)[g]	Virtual Internet Trips (1)[h]	Virtual Field Experiences (1)[i]
Information Technology (1)[j]	Virtual Outcrops (1)[k]	Virtual Learning Spaces (1)[l]

a Norris, E., Shelton, N., Dunsmuir, S., Duke-Williams, O., & Stamatakis, E. (2015). Teacher and pupil perspectives on the use of Virtual Field Trips as physically active lessons. *BMC Research Notes, 8*(1), 719.; Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017). A synthesis of instructional strategies in geoscience education literature that address barriers to inclusion for students with disabilities. *Journal of Geoscience Education, 65*, 531-541.; Lei, S. A. (2015). Revisiting virtual field trips: Perspectives of college science instructors. *Education, 135*(3), 323-327.; Hurst, S. (1998). Use of "virtual" field trips in teaching introductory geology. *Computers and Geosciences, 24*(7), 653-658.; Bursztyn, N., Walker, A., Shelton, B., & Pederson, J. (2017). Assessment of student learning using augmented reality Grand Canyon field trips for mobile and smart devices. *Geosphere, 13*(2), 260-268.; Stumpf, R., Douglass, J., & Dorn, R. (2008). Learning desert geomorphology virtually versus in the field. *Journal of Geography in Higher Education, 32*(3), 387-399.; Gore, P. (1997). Using the world-wide web in the geology classroom. *Journal of Geoscience Education, 45*(3), 246-251.; Cliffe, A. (2017). A review of the benefits and drawbacks to virtual field guides in today's Geoscience higher education environment. *International Journal Of Educational Technology In Higher Education, 14*(1), 1-14. b Litherland, K., & Stott, T. (2012). Virtual Field Sites: Losses and gains in authenticity with semantic technologies. *Technology, Pedagogy and Education, 21*(2), 213-230.; Cliffe, A. (2017). A review of the benefits and drawbacks to virtual field guides in today's Geoscience higher education environment. *International Journal Of Educational Technology In Higher Education, 14*(1), 1-14. c Granshaw, F. D. (2019). Tablets in the field 2019: New tools and techniques for student-created virtual field environments. *In the Trenches, 9*(1), 5-7.; Granshaw, F., Duggan-Haas, D., Whitmeyer, S. J., Bailey, J. E., De Paor, D. G., & Ornduff, T. (2012). Virtual fieldwork in geoscience teacher education; issues, techniques, and models. *Special Paper - Geological Society of America, 492*, 285-303. d Mogk, D. W., & Goodwin, C. (2012). Learning in the field: Synthesis of research on thinking and learning in the geosciences. In K. A. Kastens & C. A. Manduca (Eds.), Earth and Mind II: A synthesis of research on thinking and learning in the geosciences (Vol.2, pp. 131-164). Denver, CO: Geological Society of America. e Hurst, S. (1998). Use of "virtual" field trips in teaching introductory geology. *Computers and Geosciences, 24*(7), 653-658. f Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017). A synthesis of instructional strategies in geoscience education literature that address barriers to inclusion for students with disabilities. *Journal of Geoscience Education, 65*, 531-541. g Cliffe, A. (2017). A review of the benefits and drawbacks to virtual field guides in today's Geoscience higher education environment. *International Journal Of Educational Technology In Higher Education, 14*(1), 1-14. h Stumpf, R., Douglass, J., & Dorn, R. (2008). Learning desert geomorphology virtually versus in the field. *Journal of Geography in Higher Education, 32*(3), 387-399. i Dolphin, G., Dutchak, A., Karchewski, B., & Cooper, J. (2019). Virtual field experiences in introductory geology: Addressing a capacity problem, but finding a pedagogical one. *Journal of Geoscience Education, 67*, 1-17. jMogk, D. W., & Goodwin, C. (2012). Learning in the field: Synthesis of research on thinking and learning in the geosciences. In K. A. Kastens & C. A. Manduca (Eds.), Earth and Mind II: A synthesis of research on thinking and learning in the geosciences (Vol.2, pp. 131-164). Denver, CO: Geological Society of America. k Cawood, A. J., & Bond, C. E. (2018). eRock: An open-access repository of virtual outcrops for geoscience education. *GSA Today, 29*(2), 36-37. l Mogk, D. W., & Goodwin, C. (2012). Learning in the field: Synthesis of research on thinking and learning in the geosciences. In K. A. Kastens & C. A. Manduca (Eds.), Earth and Mind II: A synthesis of research on thinking and learning in the geosciences (Vol.2, pp. 131-164). Denver, CO: Geological Society of America.

Discussion

This review of the literature demonstrates the range of terms used to describe electronic field learning experiences in the geosciences. Several issues are worth noting in the findings of the literature review. First, a single term such as "virtual field trip" has been used to describe a wide range of student learning experiences across a wide range of technology and platforms (e.g., websites, virtual immersion systems, etc.). Not all terms accurately describe the technology or platform they represent. Future work is needed to classify the different digital learning systems used in the geosciences, and to compile complete and concise definitions for each. Different types of virtual and digital learning systems and platforms have varying amounts of user presence and immersion, adding to the confusion of what name to give it. To help determine how users interact with the terms currently in use, you are invited to show us where you think different terms belong on the interaction-immersion graph (Figure 1).

Table 1. Definitions and Descriptions Associated with the Term "Virtual Field Trip"

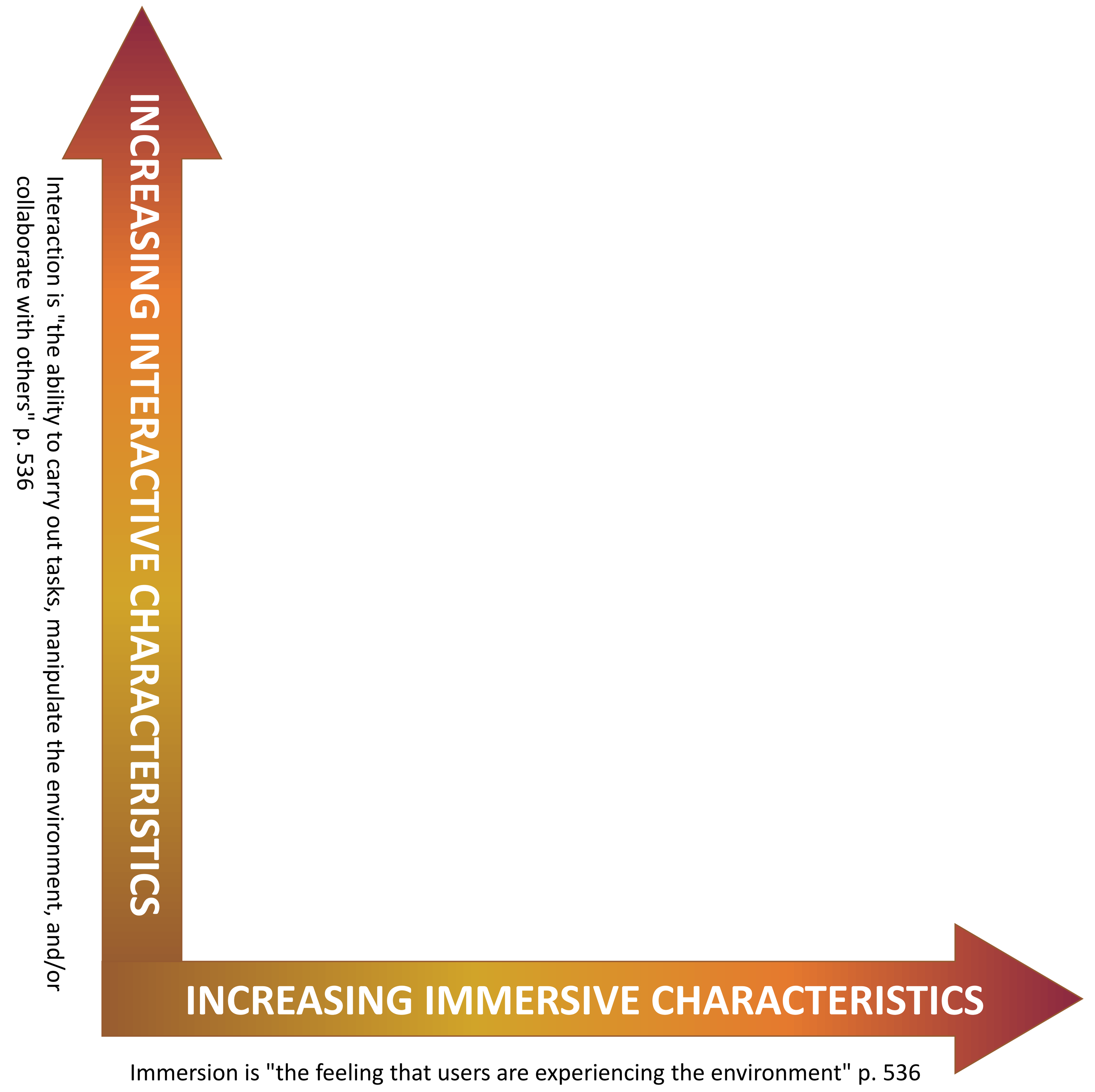
Author Definition of "Virtual Field Trip"	Author Description of "Virtual Field Trip"
Activities available on computers used for teaching[1]	Students use digital maps to explore and learn about geologic content
"A digital representation of, or remote access to a field site, real or fictional, through which students engage in learning activities"[2] p. 536	A subsection of VLE used to reinforce content before or after a physical field trip
"a journey taken without actually making a trip to the field site[3]" p. 323	An alternative trip through the internet, CDs, movies, videos, or slides
Used to provide partial amounts of information and interaction that typically occur on real field trips.[4]	Interchangable with virtual visits, a valuable classroom aid that gives more control of data analysis to the student
None Given[5,6,7]	Interactive systems increase student interest in the subject matter, and can increase motivation[5]; Interchangable with virtual internet trips[6]; A website[7]
A capture of the "real world environment of a specific location or region through a collection of data, photographs, cartography and other technologies such as GIS, without the cost of physically being there" [8](p.3)	Interchangable with virtual field guide and virtual fieldwork; an alternative to fieldwork

1 Norris, E., Shelton, N., Dunsmuir, S., Duke-Williams, O., & Stamatakis, E. (2015). Teacher and pupil perspectives on the use of Virtual Field Trips as physically active lessons. *BMC Research Notes, 8*(1), 719. 2 Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017). A synthesis of instructional strategies in geoscience education literature that address barriers to inclusion for students with disabilities. *Journal of Geoscience Education, 65*, 531-541. 3 Lei, S. A. (2015). Revisiting virtual field trips: Perspectives of college science instructors. *Education, 135*(3), 323-327. 4 Hurst, S. (1998). Use of "virtual" field trips in teaching introductory geology. *Computers and Geosciences, 24*(7), 653-658. 5 Bursztyn, N., Walker, A., Shelton, B., & Pederson, J. (2017). Assessment of student learning using augmented reality Grand Canyon field trips for mobile and smart devices. *Geosphere, 13*(2), 260-268. 6 Stumpf, R., Douglass, J., & Dorn, R. (2008). Learning desert geomorphology virtually versus in the field. *Journal of Geography in Higher Education, 32*(3), 387-399. 7 Gore, P. (1997). Using the world-wide web in the geology classroom. *Journal of Geoscience Education, 45*(3), 246-251. 8 Cliffe, A. (2017). A review of the benefits and drawbacks to virtual field guides in today's Geoscience higher education environment. *International Journal Of Educational Technology In Higher Education, 14*(1), 1-14.

What Do You Think?

Please use the provided stickers to indicate where the different terminology should be located on the diagram. By participating, you are indicating that you agree to supply anonymous data that will be used in this study.

Figure 1



Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017). A synthesis of instructional strategies in geoscience education literature that address barriers to inclusion for students with disabilities. *Journal of Geoscience Education, 65*, 531-541.

Based on your perception of these virtual field experiences, please place the corresponding sticker on the diagram based on your perceived range of immersive and interactive characteristics.

= VIRTUAL FIELD TRIP

= VIRTUAL FIELD GUIDES

= VIRTUAL FIELD ENVIRONMENT