THE 5TH SERBIAN CONGRESS OF GEOGRAPHERS

NOVI SAD, SERBIA

IMMERSIVE VIRTUAL TRIPS IN GEOGRAPHY TEACHING: SUPPLEMENT AND/OR SUBSTITUTION FOR FIELDWORK

Ivan STOJŠIĆ[1], Anđelija IVKOV-DŽIGURSKI[1], Ljubica IVANOVIĆ BIBIĆ[1], Kristina ADANIN[2], Olja MARIČIĆ[3]

[1] University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism and Hotel Management, Novi Sad, Republic of Serbia, e-mail: ivan.stojsic@yahoo.com and ivan.stojsic@uns.ac.rs

[2] Ohio University, Patton College of Education, McCracken Hall, Athens, Ohio, United States of America, e-mail: ka005016@ohio.edu

[3] University of Novi Sad, Faculty of Education in Sombor, Sombor, Republic of Serbia, e-mail: olja.maricic@pef.uns.ac.rs

Introduction

Field trips and fieldwork are often indicated as the most valuable and essential part of geoscience learning (Brazda, 1985; Fuller, 2006; Kent et al., 1997; Zhao et al., 2020). However, traditional (actual) field-related activities are often underutilized due to logistical considerations, financial expenses, and safety constraints, as well as inclusion issues since fieldwork locations may be inaccessible for students with disabilities (Friess et al., 2016; Wallgrün et al., 2019; Zhao et al., 2020). The current COVID-19 pandemic made the situation even worse since the majority of schools and universities postponed, reduced, or completely canceled planned excursions and fieldwork activities (Sershen et al., 2020).

Using ***virtual field trips*** **(VFTs)** in geoscience education is not a novelty, and researchers have investigated them for more than two decades (Friess et al., 2016; Stumpf II et al., 2008; Wallgrün et al., 2019). Current literature (Bos et al., 2021; Han, 2020) make a distinction between ***immersive VFTs*** (which are head-mounted displays [HMDs] based) and ***conventional*** (or ***traditional***) ***VFTs*** (usually comprised of multimedia materials [such as digital pictures, audio, and video] or available via various online tools and computer software). Conventional (or traditional) VFTs have a relatively long history in geography education (Bos et al., 2021), but new, improved, and consumer-priced HMDs opened up possibilities for using immersive VFTs in geography teaching and learning, as well. VFTs are considered as an alternative (substitution) for actual field trips/fieldwork, as well as a supplement (Friess et al., 2016; Wallgrün et al., 2019; Zhao et al., 2020).

Figure 1. Using a 360° camera during the fieldwork (Photo: Kristina Adanin, 2018)

Using immersive VFTs to supplement actual fieldwork

Several authors (Bos et al., 2021; Minocha et al., 2017; Wallgrün et al., 2019) pointed out that the technology of immersive virtual reality (with HMD devices) could be utilized in various segments (stages) of actual fieldwork.

"Preparation is critical for efficient fieldwork" (Kent et al., 1997, p. 320). According to Bos et al. (2021), HMDs are an excellent addition to field trip preparation since they "can be used as resource to equip students with key geographical skills prior to entering the field" (p. 2). Also, mobile-based HMDs (e.g., *Google Cardboard*) can be used in a field site to improve observation activities and reflection (Minocha et al., 2017).

In addition, during fieldwork, teachers and students can capture 360° panoramas and video materials with 360° cameras (Figure 1). Created materials can be used in the post-field trip stage for the presentation of the results, revision and reflection, as well as immersive VFTs (for students that didn't participate in actual fieldwork).

Using immersive VFTs as a substitution for traditional field trips

In recent years, the body of literature regarding creating and using immersive VFTs (with HMDs) as a substitution for actual field trips/fieldwork is rapidly growing (see Markowitz et al., 2018; Wallgrün et al., 2019; Zhao et al., 2017, 2020). Although some researchers indicated that the integrated approach (using VFTs to support actual fieldwork) could be the best option (Friess et al., 2016), immersive VFTs can be useful and effective (as a substitute for actual field trips) for inaccessible, remote (Figure 2) or dangerous sites (Wallgrün et al., 2019).

Due to the COVID-19 pandemic, educational institutions have to be ready to switch to hybrid or fully online teaching at any moment (which can jeopardize the planned field-related activities). Therefore, VFTs may be the only option available (Sershen et al., 2020). The research conducted by Ip et al. (2019) showed that immersive VFTs could be successfully integrated into a geography-related online course.

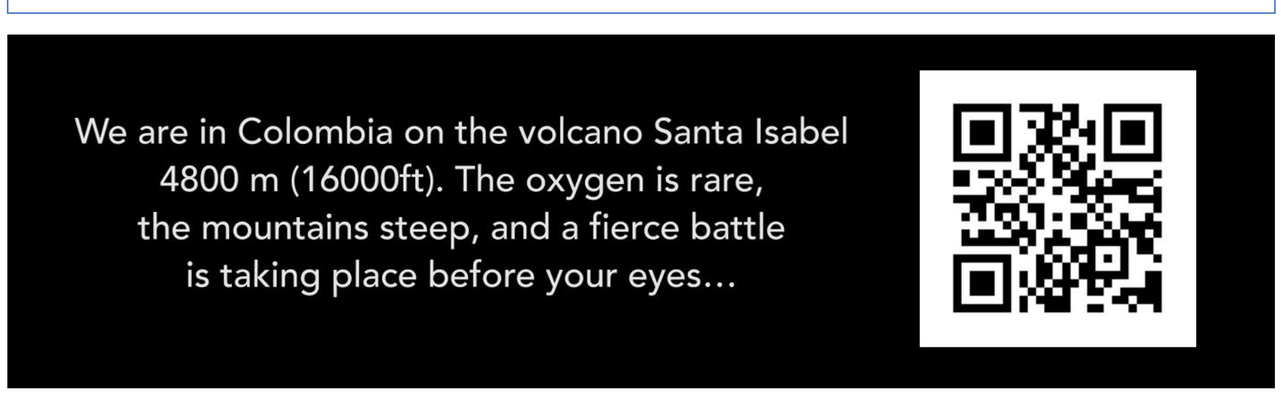

Figure 2. QR code to a 360° video (Video: Kristina Adanin et al., 2020)

Conclusion

Immersive VFTs can be used to support different stages of actual fieldwork, as well as a substitution for traditional field trips. Although HMD devices and authoring tools have become more accessible to teachers and students, the actual use of immersive VFTs in geography teaching is limited. Our further research is a study regarding the readiness and intention of teachers to integrate VFTs in hybrid/online teaching at all levels of geography education.

References

Bos, D., Miller, S., & Bull, E. (2021). Using virtual reality (VR) for teaching and learning in geography: Fieldwork, analytical skills, and employability. *Journal of Geography in Higher Education.* https://doi.org/10.1080/03098265.2021.1901867

Brazda, M. (1985). *Terenski rad i ekskurzije u nastavi geografije: Priručnik za nastavnike*. Školska knjiga

Friess, D. A., Oliver, G. J. H., Quak, M. S. Y., & Lau, A. Y. A. (2016). Incorporating "virtual" and "real world" field trips into introductory geography modules. *Journal of Geography in Higher Education*, *40*(4), 546-564. https://doi.org/10.1080/03098265.2016.1174818

Fuller, I. C. (2006). What is the value of fieldwork? Answers from New Zealand using two contrasting undergraduate physical geography field trips. *New Zealand Geographer*, *62*(3), 215-220. https://doi.org/10.1111/j.1745-7939.2006.00072.x

Han, I. (2020). Immersive virtual field trips in education: A mixed-methods study on elementary students' presence and perceived learning. *British Journal of Educational Technology*, *51*(2), 420-435. https://doi.org/10.1111/bjet.12842

Ip, H. H. S., Li, C., Leoni, S., Chen, Y., Ma, K.-F., Wong, C. H.-T., & Li, Q. (2019). Design and evaluate immersive learning experience for massive open online courses (MOOCs). *IEEE Transactions on Learning Technologies*, *12*(4), 503-515. https://doi.org/10.1109/TLT.2018.2878700

Kent, M., Gilbertson, D. D., & Hunt, C. O. (1997). Fieldwork in geography teaching: A critical review of the literature and approaches. *Journal of Geography in Higher Education*, *21*(3), 313-332. https://doi.org/10.1080/03098269708725439

Markowitz, D. M., Laha, R., Perone, B. P., Pea, R. D., & Bailenson, J. N. (2018). Immersive virtual reality field trips facilitate learning about climate change. *Frontiers in Psychology*, *9*, Article 2364. https://doi.org/10.3389/fpsyg.2018.02364

Minocha, S., Tudor, A.-D., & Tilling, S. (2017). Affordances of mobile virtual reality and their role in learning and teaching. In L. Hall, T. Flint, S. O'Hara, & P. Turner (Eds.), *Proceedings of the 31st International BCS human computer interaction conference (HCI 2017)*. BCS Learning and Development. https://doi.org/10.14236/ewic/HCI2017.44

Sershen, Stojšić, I., & Munien, S. (2020). Teaching practicals in the time of physical distancing: Advances, challenges and recommendations for higher education. In N. Ndimande-Hlongwa, L. Ramrathan, N. Mkhize, & J. A. Smit (Eds.), *Alternation African scholarship book series: Technology-based teaching and learning in higher education during the time of COVID-19* (Vol. 2, pp. 34-53). CSSALL Publishers. http://alternation.ukzn.ac.za/Files/books/series-02/02-Sershen.pdf

Stumpf II, R. J., Douglass, J., & Dorn, R. I. (2008). Learning desert geomorphology virtually versus in the field. *Journal of Geography in Higher Education*, *32*(3), 387-399. https://doi.org/10.1080/03098260802221140

Wallgrün, J. O., Chang, J. (S.-K.), Zhao, J., Sajjadi, P., Oprean, D., Murphy, T. B., Baka, J., & Klippel, A. (2019). For the many, not the one: Designing low-cost joint VR experiences for place-based learning. In P. Bourdot, V. Interrante, L. Nedel, N. Magnenat-Thalmann, & G. Zachmann (Eds.), *Proceedings of the 16th EuroVR international conference: Virtual reality and augmented reality. Lecture notes in computer science* (Vol. 11883, pp. 126-148). Springer. https://doi.org/10.1007/978-3-030-31908-3_9

Zhao, J., LaFemina, P., Carr, J., Sajjadi, P., Wallgrün, J. O., & Klippel, A. (2020). Learning in the field: Comparison of desktop, immersive virtual reality, and actual field trips for place-based STEM education. In K. Johnsen, J. E. Swan II, B. MacIntyre, & K. Kiyokawa (Chairs), *Proceedings of the 2020 IEEE Conference on virtual reality and 3D user interfaces* (pp. 893-902). IEEE. https://doi.org/10.1109/VR46266.2020.00012

Zhao, J., LaFemina, P., Wallgrün, J. O., Oprean, D., & Klippel, A. (2017, March 19). *iVR for the geosciences* [Paper]. 2017 IEEE Virtual reality workshop on K-12 embodied learning through virtual & augmented reality (KELVAR), Los Angeles, CA, United States. https://doi.org/10.1109/KELVAR.2017.7961557