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ARTICLE

The role of virtual field trips in Geography higher education: A perspective paper

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Abstract

In this perspective paper, we explore the role virtual field trips (VFTs) may play in creating a more resilient, sustainable and equitable field education for Geography students in higher education as we move away from the pandemic but into a financially precarious higher education environment. While in-person field trips are a fundamental part of Geography (and allied subjects) education, there is growing recognition of the equality, diversity, and inclusivity (EDI) barriers presented by fieldwork, the environmental and financial costs of trips, and the vulnerability of field education to disruptions. During the pandemic, there was a shift to online remote learning, which saw innovation and growth in the development of VFTs. Written from a staff perspective, this paper aims to review the opportunities and challenges VFTs present in education and consider future directions for this pedagogical practice. We argue VFTs should not replace in-person trips, but they can enhance field education and may help to address EDI and sustainability challenges. We identify that the resourcing and development of VFTs is a particular challenge and suggest that developing communities of practice and cross-institutional global collaboration could be one effective way to avoid duplication of time and effort as well as sharing valuable knowledge and expertise. Cross-institutional sharing of VFTs would also support the development, implementation and evaluation of VFTs as a teaching tool and would support continued innovation in this teaching practice.

KEYWORDS

equality, diversity and inclusivity (EDI), fieldwork, Geography education, higher education (HE), sustainability, virtual field trips (VFTs)

1 | IMPORTANCE OF FIELD EDUCATION IN GEOGRAPHY HIGHER EDUCATION AND CURRENT CHALLENGES

Field trips are a signature pedagogy for undergraduate Geography (and allied subject) programmes and are known to be an effective pedagogical tool for enhancing and facilitating transformative student learning (e.g., Elkins & Elkins, 2007; France & Haigh, 2018). Experiential, active and applied learning approaches within a field environment help students to consolidate their understanding of key concepts (e.g., Balci, 2010) and develop practical and transferable skills for employment (Solem et al., 2008). Students appreciate the learning gained from fieldwork (e.g., Friess et al., 2016) and there are some indications that it can improve student retention (Larsen et al., 2017; Smith, 2004). Fieldwork also provides students with opportunities for unique social learning experiences that help improve confidence, build communities and enable students to effectively transition from student to practitioner (Streule & Craig, 2016).

While the value of fieldwork remains (almost) universally accepted among geographers, field education has, and continues to face, multiple challenges. Over the last two decades, UK fieldwork has been disrupted by the Foot and Mouth epidemic (Fuller et al., 2003), the COVID-19 pandemic (Bacon & Peacock, 2021), and the changing climate (storms/flooding forcing cancellations). Financial challenges in UK higher education (HE) (QAA, 2024) loom over Geography departments, with field education being particularly costly and resource intensive (including staff time) (France & Haigh, 2018). In addition, time- and resource-poor schools are offering fewer field opportunities (Brace, 2023), resulting in students coming to HE with less prior field experience.

Currently, departments are having to weigh up the pedagogical value of fieldwork against the environmental costs (e.g., RGS-IBG, 2020), with many institutions debating the carbon costs associated with international trips (Williams & Love, 2022). Departments recognise that there is considerable pedagogical value to immersion within a field environment (e.g., Elkins & Elkins, 2007) and exploring environments and processes that are not present in a home-setting (Williams & Love, 2022) but are equally aware of the negative environmental impacts of fieldwork. As universities work to decolonise and move away from a Eurocentric curriculum, it is also important that field teaching does not become narrowly focused on western environments, problems and solutions, particularly when environmental education needs to be opening students' eyes to global environmental challenges and injustices. The financial and environmental sustainability of trips can be at odds with each other, with some international trips having a lower cost compared with UK-based trips because international trips can utilise the travel and accommodation infrastructure developed for mass tourism. In addition, international trips have been seen as an important marketing tool to recruit students and secure tuition fees, although some institutions are changing this practice in response to students' sustainability concerns (McGuinness & Simm, 2005; Williams & Love, 2022).

There is increasing awareness of the equality, diversity and inclusivity (EDI) barriers presented by field trips (e.g., Yorke et al., 2024). While physical barriers are perhaps the most obvious when working in the field (for an overview, see Carabajal et al., 2017), there are other invisible barriers. For example, going to new field environments can be challenging for neurodiverse students or clinically anxious students and staff (Boyle et al., 2007; Tucker & Horton, 2019). Students with caring responsibilities may be unable to attend trips due to the time taken away from home and socioeconomic barriers can arise due to the direct or indirect costs of trips (e.g., requirements for specific clothing and supplies) (Rotzien et al., 2021). Barriers can arise due to cultural or religious reasons and some barriers can be temporary, for example, a short-term illness, or temporal, for example, scheduling during a religious holiday. In some locations, there may be additional safety concerns for sub-groups, for example, women, racially minoritised and/or LGBTQ+ staff or students (Carlin et al., 2023).

Considering the above, we wanted to explore the role virtual field trips (VFTs) could play in enhancing learning as well as addressing EDI and sustainability challenges associated with field education. In addition, we wanted to consider future directions in this pedagogical practice. While VFTs existed prior to the COVID-19 pandemic (e.g., Stainfield et al., 2000), the pandemic forced innovation and creativity in pedagogical approaches to remote fieldwork learning, helped by technological developments (Klippel et al., 2019). Now that many trips have largely returned to pre-pandemic formats, the question remains whether there is still a need for VFTs in field education. This question framed a panel session at the annual conference of The Royal Geographical Society (with the Institute of British Geographers; RGS-IBG) in 2022 (chaired by the two lead authors on this paper, with the other contributing authors as discussants). This paper uses the individual experiences shared by discussants as inputs for a consideration of the future applicability and continued use of VFTs in Geography HE.

For the purpose of this paper, VFTs are defined as 'digital alternative representations of reality' (Stainfield et al., 2000, p. 256) and can include a wide range of resources from annotated photos; videos of key features, methods or instructions;

interactive maps; 3D virtual models (e.g., of outcrops); to e-games or virtual reality (Gregory et al., 2022; Pringle, 2013; Pugsley et al., 2022). VFTs can be further categorised into 'location based' (focused on one location) or 'thematic' (exploring one topic at multiple locations) and by mode of delivery, ranging from synchronous in-person tutor-led VFTs to asynchronous remote delivery (Pugsley et al., 2022). Student engagement can vary from students passively observing an environment to students actively driving the remote fieldwork decision-making process (Cooke et al., 2020). Technology has enabled VFTs to become more inquiry based (Granshaw et al., 2012) and digital immersion allows learners to go more deeply than books and lectures alone (Schott, 2017).

2 | VIRTUAL FIELD TRIPS: ROLE AND OPPORTUNITY TO ENHANCE LEARNING

It is important to highlight from the outset that our position is that VFTs are not a replacement for in-person field teaching and this position is supported by many authors who argue that VFTs cannot replace the experience of being physically present in a location (Friess et al., 2016; Maskall & Stokes, 2009; Mercer et al., 2022; Pugsley et al., 2022, among others). However, as we consider below, there are many benefits to the use of VFTs as preparatory or supplementary material alongside in-person fieldwork and as a way of diversifying and expanding 'geography education's reach' (Larsen et al., 2021, p. 3). While we acknowledge that VFTs are not the only approach to enhancing fieldwork learning and addressing EDI and sustainability challenges, it is beyond the scope of this paper to fully explore these other broader approaches, which might include local or campus-based field skills development. However, France et al. (2025) and Woodley et al. (2024) complement our focus on VFTs with a further and wider discussion of alternatives.

Not all students learn in the same way and so an advantage of VFTs is the ability to offer both virtual and face-to-face approaches, enabling students to access learning in a way, and at a pace, that suits them (Friess et al., 2016). This can be advantageous for students who might struggle engaging fully in the field environment (e.g., hearing impaired, easily distracted by their surroundings) and where field teaching is challenged by large group sizes and adverse weather conditions (Zhao et al., 2020). In the field, particularly on one-off day trips, interaction with staff may be limited due to group size, distance and time constraints, whereas in-person VFTs can facilitate student–staff interactions allowing opportunities for questions and ensuring all students have equal access to information in potentially multiple formats (visual, written) (Whitmeyer & Dordevic, 2020). In addition, VFTs enable students to 'visit' sites multiple times before and after a trip, thereby removing the one-time nature of in-person trips (Friess et al., 2016; Whitmeyer & Dordevic, 2020), and helping to reinforce learning.

Through the integration of multiple datasets, VFTs offer new modes of content delivery which can help students to develop a more varied and holistic understanding of locations (Pugsley et al., 2022). For example, through integrating historical imagery, students can 'travel through time' in a particular location (Davies & Davies, 2021), and overlaying field sketches on photographs can facilitate the demonstration and value of field sketching techniques (Granshaw et al., 2012). The ability to use drone footage to 'fly' over sites or get close-ups on sections that would otherwise be inaccessible provides new dimensions to field sites, with some evidence suggesting that VFTs can enhance spatial and 3D thinking (Pugsley et al., 2022) as well as learning outcomes and learning experiences (Klippel et al., 2019; Zhao et al., 2020).

Utilising VFTs for pre-trip preparations can maximise the value obtained from the time and resource associated with being in the field (Spicer & Stratford, 2001; Whitmeyer & Dordevic, 2020). By delivering the background content and giving students the chance to familiarise themselves with sites and features, the time spent in the field can be used more efficiently (Bonali et al., 2021; Mercer et al., 2022). This allows a focus on applied and deeper learning, thereby increasing the ratio of learning gained against the environmental or personal costs of a trip. Reducing the environmental costs of trips is particularly important where trips involve visiting sensitive locations (e.g., Sites of Special Scientific Interest [SSSIs]). VFTs offer students the opportunities to interact and explore these sites in depth (e.g., through effective use of 3D imagery/video footage) without needing to disturb these sites on a group visit. Field techniques and skills that might be utilised at these sensitive sites can then be developed in less sensitive or easily accessed local locations.

As VFTs enable students to get a feel for a location prior to a field visit, they can also facilitate staff–student conversations, allowing educators to alleviate any concerns ahead of a trip and adapt the trip where possible. For those unable to attend an in-person trip (due to last-minute emergencies or where reasonable adjustments are not feasible) there is evidence that immersive and interactive VFTs enable students to meet learning outcomes (LOs) associated with field trips (e.g., Gregory et al., 2022; Pugsley et al., 2022) as well as develop high-order skills (Whitmeyer & Dordevic, 2020), thereby offering a valuable alternative form of skills development and assessment.

Having a virtual alternative to every trip can equalise the learning experience as it allows students to practice similar skills as those who attend the in-person trip, engage with similar (or the same) environments, and allows students to participate in post-trip activities about that environment more effectively, helping to ensure social, as well as educational, inclusion. These alternatives need to be carefully constructed to scaffold students' learning and replicate social interaction to ensure they are truly equivalent experiences to in-person trips. For example, the VFT could be used as a platform for group tasks (e.g., design a field experiment and write a risk assessment for a (virtual) location), to act as discussion prompts (e.g., videos/images highlighting landscape-scale challenges and stakeholder perspectives) or integrating videos, images or datasets that enable students to collect and analyse measurement data (e.g., images of soil cores laid out against a ruler and a Munsell colour chart for students to virtually create a soil profile). In some cases, a virtual alternative could draw on different datasets (e.g., historical data) to those collected in the field, enabling post-field trip discussions to draw on modern and historical data with both groups of students bringing distinctive expertise to post-trip discussions.

VFTs can help meet universities' strategic priorities, such as increasing numbers of underrepresented groups or making education more flexible and inclusive. The constraints of scheduling trips and time costs can make it difficult for non-traditional students (e.g., mature) to engage with fieldwork due to caring commitments or work constraints, for example (Rotzien et al., 2021). Hybrid or online VFTs (including the possibility of live streaming) provide scope for universities to diversify their cohorts and widen participation beyond traditional students, accounting for students' needs from the start, rather than in an ad hoc way. Going beyond traditional university programmes, VFTs could also feature in other modes of delivery such as Massive Open Online Courses (MOOCs), microcredentials or other forms of career and professional development. Finally, VFTs provide an authentic plan B for all departments who might have to cancel a trip for several reasons (e.g., last minute cancellations of flights/hotel venues, extreme weather, epidemics/pandemics affecting people or animals, social instability, or natural hazards).

Although we argue that VFTs should not replace in-person field trips, when it comes to the carbon costs of trips, it is clear that VFTs could play a role in helping departments reduce their emissions (Bonali et al., 2021) while still ensuring the curriculum is not restricted to a localised understanding of the world. Effectively implemented, VFTs can take students to multiple destinations and, when coupled with interactive and data-gathering elements, can provide students with greater knowledge and understanding of methodologies at those sites than can be achieved through reading an article or listening to a lecture on the destination. Schott (2017) has shown how VFTs can bring in voices from the local communities, helping students to understand the realities of climate change, moving education beyond climate projections and sustainable development goals to a greater appreciation of what is happening to real people. There is scope for academics undertaking research trips to simultaneously gather teaching materials (e.g., 3D images, videos, data) that support the development of VFTs, providing a research-led teaching opportunity, thus gaining added value from the carbon costs associated with research (a topical issue explored in Le Quéré et al., 2015) and adding a pathway to impact for the research project.

3 | VIRTUAL FIELD TRIPS: DEVELOPMENT CHALLENGES

There are clearly numerous ways that VFTs can enhance learning for all and there is a strong rationale for the expansion and continued development of VFTs in the future. However, from a staff perspective, the panel identified numerous organisational and institutional challenges that are explored below.

Firstly, VFT development can be time intensive, competing with other teaching, administration and/or research activities (e.g., Friess et al., 2016). Funding sources for environmental education are often limited (McCauley, 2017) and difficult to secure, and institutional teaching and learning funds may be withdrawn during times of financial strain. While it could be argued that the frontloaded investment of creating VFTs pays off over time as VFTs are utilised year-on-year (Mercer et al., 2022), the size of that initial investment, particularly in staff time, is considerable and continued resourcing is needed to ensure materials remain current, engaging and relevant.

Secondly, technology advances rapidly, meaning that software may quickly become outdated and need frequent upgrades or sometimes be replaced with new platforms. Materials can become incompatible over time as new updates emerge or institutional licences changed. Therefore, longevity of the resources is a concern along with the time needed for digital updates and succession planning for when VFT developers leave an institution. It can also be difficult for academic staff to keep up with technological developments, or even possess the necessary digital literacy. Although there are many user-friendly platforms available, designing VFTs can require specific skills, and more advanced or interactive

VFTS can require more advanced digital skills, requiring support from digital education teams (Mercer et al., 2022) and/or computer science departments.

Thirdly, there are concerns that if VFTs continue to demonstrate that they meet student LOs and provide authentic experiences and assessment, students could opt for virtual rather than in-person field experiences, thereby missing out on practical learning opportunities. Similarly, there are concerns that universities will be tempted to reduce field trip provision to save time and money (Mercer et al., 2022). Although there is evidence that many students would prefer a physical trip over a VFT (e.g., Friess et al., 2016; Pugsley et al., 2022), it will be important to monitor both student and university use of VFTs.

Finally, if VFTs are simply deployed as stand-alone activities, students will lose the immersion of working in the field and the social learning that takes place (France & Haigh, 2018; Mercer et al., 2022). These social skills are important for professional development, providing students with opportunities to interact in a professional way, work in teams and problem solve. Although one of the benefits of VFTs is the integration of multiple data sources, this can lead to cognitive overload (Barth et al., 2022) and while VFTs can overcome some of the challenges associated with EDI in a field environment, it can create new EDI challenges, particularly around inequality of access to technology (Welsh et al., 2018) and where inclusivity has been considered inadequately in the design phase (e.g., fonts, colour contrasts, screen readers, structure).

4 | FUTURE DIRECTIONS

Having explored the benefits and challenges of utilising VFTs in Geography education, we then considered the future directions for this pedagogical tool and the opportunities for collaborations, mechanisms for sustainable resourcing and moving VFTs beyond the classroom.

4.1 | Cross-institutional creation and sharing of resources

If VFTs are a mainstay for Geography education due to their role in enhancing learning, addressing EDI challenges, and providing viable ways to address the sustainability agenda, then we need to avoid cross-institutional replication of time, effort and resources. Pooling and sharing VFTs amongst institutions, both in the UK and internationally, could provide staff with increasing opportunities to incorporate inquiry-based learning into more components of Geography education, even where trips are not currently a feature of a particular module. Resource sharing among institutions would also allow for more robust evaluations on the effectiveness of VFTs as there would be a larger and more varied pool of students to draw on (a limitation of some of the published literature on VFTs is their small sample size and short timeframe).

Whilst cross-institutional research collaborations are encouraged, it is rarer for academics (in the UK at least) to collaborate on teaching resources, with fewer opportunities for disciplines to share knowledge and expertise. While there are examples of VFT resource sharing, such as VR Glaciers (McDougall, 2019), resource sharing is limited by short-term funding, lack of suitable platforms, different software choices by universities, and limited staff time. In contrast, during the pandemic, the US National Association of Geoscience Teachers (NAGT, 2020) brought together more than 300 geoscience educators to share expertise and resources, and design new remote field experiences that are freely available on a shared platform (Teach the Earth, 2024), demonstrating that with the right funding, infrastructure and technological platform, cross-institutional development of VFTs is possible.

We believe that, in the UK, we should follow and expand on the NAGT efforts and explore ways to build more partnerships. Exploring mutually beneficial international partnerships could allow for more cross-cultural exchange, help to decolonise the curriculum, address sustainability concerns, enable students to experience and study unfamiliar global sites, and hear from those who live and work in those areas (e.g., Schott, 2017). Care needs to be taken to ensure relationships are reciprocal and we should be aware that local communities could be losing a source of income when an in-person trip goes virtual (Schott, 2017). There have been previous calls for international collaborations on VFTs (Arrowsmith et al., 2005; Stainfield et al., 2000), but we are unaware of how much progress has been made in this area. The two lead authors of this paper are currently engaged in a UK–Ukraine VFT collaboration (Hutchinson et al., 2024), showing the role VFTs could play in opening up education globally.

Future collaborations will be challenged by university technological compatibilities (e.g., which GIS or Virtual Learning Environment students can access); decisions on who manages, maintains and owns intellectual property rights of the

materials; and how to create resources that provide enough adaptability so that educators can tailor the VFTs to their own approach and context. We need to develop communities of practice, akin to Enhancing Fieldwork Learning (2024), that provide insight and support into the VFT development process and create best-practice guidelines to ensure that VFTs effectively meet accessibility requirements and genuinely support research skills development.

4.2 | Investment and resourcing

Our experience to date suggests that VFTs are often created by a small number of academics who have a particular interest in technology and pedagogy. Compared with research outputs, there is often little institutional recognition for the time and energy put into creating these resources, despite the known pedagogical benefits. Unfortunately, funding for teaching developments are limited and more strategic support and investment are needed if VFTs are going to be developed. The panel explored whether there was scope for a business model that could support the development of VFTs (similar to Time for Geography, 2024), but were concerned about: (i) intellectual property (and/or performance)—who owns them? (ii) increased competition between institutions—bigger/better outputs, (iii) students feeling less connected with their own university staff, and (iv) change from an education to business relationship with field sites/staff. While a business model could help fund and sustain collaboration and resource sharing, ultimately universities are likely to want to have control over their own resources.

In the context of 'bigger/better' outputs, we wish to highlight that VFTs need not be 'top of the range' (i.e., TV-production quality), but simply good enough to enable students to meet the LOs. Some research has suggested that the most technologically advanced VFTs are not necessarily more effective at meeting the LOs than less innovative trips (Zhao et al., 2020) and anecdotally we feel we have better student engagement where resources were less corporate perhaps because there is more personal connection between student and tutor. Most importantly, we must consider the pedagogy underpinning the development of any VFTs (Mercer et al., 2022) and not get distracted by the newest and shiniest technology (McCauley, 2017). Therefore, VFTs do not need to be created utilising expensive and complicated software, and there may be some benefit to staff and students for keeping things simple.

An emerging approach to VFT development could be via student co-creation (Mercer et al., 2022). Not only is this a cost-effective and time-efficient way of developing materials, but as Collins et al. (2022, p. 2) state, 'Fieldwork can, and should be done collaboratively where students share observations, perspectives and work together to create interpretation of the applied scientific content', which is fully encouraged during co-creation. Co-creation enhances students' learning in the field environment as students are engaged, active participants who require a secure understanding of the environment to allow them to communicate their ideas and translate them into an effective form of digital communication (Fuller & France, 2015). Future students may also respond and engage more positively with VFTs created by previous students. The pedagogical value of this approach will need to be emphasised and communicated to the students who may question why they, as paying students, are creating teaching resources.

4.3 | Beyond the classroom

We have explored VFTs as a pedagogical tool for HE, however there is scope for VFTs to be used beyond HE, opening environmental education to a wider audience. Examples of VFTs used in geotourism and for public and community engagement are starting to emerge (Bonali et al., 2021; Perotti et al., 2020), highlighting the scope for VFTs to be a valuable knowledge-exchange tool. Coupling the development of VFTs for teaching and research outputs (pathways to impact) could be an effective approach to the development of these resources with outputs benefiting students, stakeholders, public environmental education and researchers.

5 | CONCLUSIONS

VFTs offer flexible approaches to student learning, contributing to both EDI and sustainability challenges associated with in-person field trips. We advocate that VFTs, as a supplementary tool to in-person trips, have potential to significantly enhance learning, but challenges associated with staff time and resourcing need to be overcome. Improved platforms for sharing and developing communities of practice, to make VFTs an equitable and sustainable resource for future

field education, is one approach that could facilitate the development of these resources. Similarly, coupling teaching and research agendas to benefit VFT development could be an effective way to optimise resourcing and create pathways to impact.

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DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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