

COMMENTARY

Resilient education: The role of digital technology in supporting geographical education in Ukraine

Simon M. Hutchinson¹  | Elizabeth R. Hurrell²  | Kateryna Borysenko³ | Vladyslav Popov³ | Dariia Kholiavchuk⁴ | Yana Popiuk⁴

¹School of Science, Engineering and Environment, University of Salford, Salford, UK

²Department of Environment and Geography, University of York, York, UK

³Department of Physical Geography and Cartography, V.N. Karazin, Kharkiv National University, Kharkiv, Ukraine

⁴Department of Physical Geography, Geomorphology and Paleogeography, Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine

Correspondence

Simon M. Hutchinson, School of Science, Engineering and Environment, University of Salford, Salford, UK.
Email: s.m.hutchinson@salford.ac.uk

Funding information

University of Salford Manchester; Central European Initiative; University of York

Abstract

This commentary spotlights the continued impact of the Russian invasion on geography education in higher education in Ukraine. From discussions with Ukrainian geographers in institutions in contrasting regions of the country, we describe their resilience in adapting the delivery of the physical geography curriculum, especially in the essential area of fieldwork and the use of digital tools. This 'lived experience' perspective builds on the theoretical contributions to the discussion initiated by Klinke (2023) in this journal about the challenges posed for geographers. In the third year of the conflict, the challenges set out are considerable, long term, and we call for individuals, universities and funders to further facilitate teaching and learning collaborations despite the limited funds available for the exchange of teaching and learning support and innovation.

KEYWORDS

digital visualisation tools, diversity, equity, fieldwork, inclusion and accessibility, physical geography, Russian invasion and warfare, Ukraine

1 | INTRODUCTION AND CONTEXT

We have now passed the tenth anniversary of the occupation of Crimea and the second anniversary of the most recent widespread invasion of Ukraine. To build on the theoretical perspective of the war in Ukraine provided by Klinke (2023), we consider the practical on-the-ground concerns of physical geographers for the functioning of geography as a discipline after two years of warfare. Our discussion resonates, and expands on, the aim of the 'Geography in the World' initiative in providing a glimpse into some of the challenges and opportunities faced by those teaching geography in higher education (HE) in the current context of the war in Ukraine (McFarlane, 2022, 2023).

The information, practices and views in this article are those of the author(s) and do not necessarily reflect the opinion of the Royal Geographical Society (with IBG).

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2024 The Author(s). *Transactions of the Institute of British Geographers* published by John Wiley & Sons Ltd on behalf of Royal Geographical Society (with The Institute of British Geographers).

For much of Ukraine, HE is now entering its fifth year of disruption, firstly due to the COVID pandemic (e.g., Kostikova et al., 2023; Mospan et al., 2022) and now the Russian invasion, with few signs that the war is coming to an end. Universities in the Crimea and Donbas regions have been uprooted even longer (Oleksiyenko et al., 2021). Even when the war has ended, HE in Ukraine is going to take a long time to rebuild due to the extent of damage to university buildings (Dixon, 2024; Ma et al., 2022), the displacement of staff and students (Ma et al., 2022) with concerns about brain drain and loss of human capital (de Rassenfosse et al., 2023), years of underfunding as educational funds have been diverted towards military defence (Galynska & Bilous, 2022), and staff/student mental health and trauma (Tsybuliak et al., 2023). However, continued HE in Ukraine is paramount to enable the country to successfully rebuild after the 2022 invasion.

Graduates from physical geography and environmental science disciplines are vital to Ukraine both during the war and for post-war recovery. Both these disciplines have fieldwork and spatial thinking as a core component of the curriculum. For the war effort, field skills can help the military understand landform features, monitor weather patterns and observe water flows and stores in the environment, and understand how all these features look and appear on maps and remote imagery. For post-war recovery, proficient field skills will be imperative to effectively understand and tackle land contamination (e.g., Vidosavljević et al., 2013), environmental damage, adapting to the climate crisis, and fostering a strong, green recovery. However, the COVID pandemic, and now the war, is resulting in a generation of Ukrainian students losing out on vital field skill training.

The aim of this commentary is to identify and highlight some of the continued challenges faced by physical geography academics teaching at two Ukrainian geography departments: V.N. Karazin Kharkiv National University (KKNU) in the east of Ukraine sitting close to the Russian border and Yuriy Fedkovych Chernivtsi National University (YFCNU) to the west of Ukraine sitting close to the Romanian border. Due to its proximity to the Russian border, KKNU has experienced substantial and ongoing damage to university buildings (e.g., Ma et al., 2022) and disruption to its educational systems and, as a result, staff have continued to teach entirely online. In contrast, YFCNU has been less directly impacted. At the start of the war, teaching initially was forced entirely online, but has since moved towards a hybrid model of delivery (in-person teaching for students who are able to attend university but online materials for student refugees or those unable to travel). As a result of the war, Chernivtsi has also welcomed a large number of refugees who have fled to the east of Ukraine. This exploration of lived experiences highlights both the impacts of the war on physical geography HE, but also the resilience and innovation of academics to develop materials that support spatial thinking and field skills.

The experiences shared below reflect contributions to a hybrid summer school titled 'Enabling geography teachers in higher education: Virtual fieldtrips for inclusive field skills training' held at the University of Suceava (USU), Romania in September 2023 and funded by the Central European Initiative. The summer school was developed after a series of successful online workshops were delivered as a UK (Salford) and Ukrainian (KKNU) collaboration whereby academics and students were trained in the co-creation of virtual fieldtrips. The aim of the summer school was to bring the community (mainly academic but including environmental managers for the local national park) together to share good practice in the creation of virtual fieldtrips. Speakers (in-person and online and from the UK, Czechia, Slovakia and Ukraine) covered a range of topics from the creation of highly technical virtual field trips (e.g., virtual reality, live streaming) to simple approaches (e.g., ESRI StoryMaps or Google Projects) that could be adopted by Ukrainian colleagues who are unable to deliver in-person fieldwork. The summer school also included practical training whereby participants used ThingLink (an education focused visualisation online platform) to create their own virtual field trips.

2 | LIVED EXPERIENCES AND RESILIENCE OF PHYSICAL GEOGRAPHY EDUCATORS IN UKRAINE

The experiences below draw on talks at the summer school delivered by Kateryna Borysenko and Vladyslav Popov, who teach in the Physical Geography and Cartography Department of KKNU, and Dariia Kholyavchuk and Yana Popiuk who are based in the Department of Geography, Geomorphology and Paleography of YFCNU. The talks provided an insight and reflection on field teaching prior to the war, the problems academics are facing in delivering field education during the war, and the adaptation and resilience of academics to continue field education in the face of adversity.

3 | PRE-WAR FIELD TEACHING CONTEXT AT KGNU AND YFCNU

At KGNU, before the war, fieldwork for first-year students took place from a field base in the Kharkiv region (Kamianka village) where this training period consolidated and deepened students' knowledge and understanding through the application of basic techniques and methods in geology and geomorphology, including mapping and sampling. A second field station (Gaidary village) was also used as a base to deliver geographical field-based teaching with students living on site for a month as an integral part of their programme. For second-year students, KGNU provided a residential field trip to the Ukrainian Carpathians which provided a diverse and rich environment to cover a range of field skills, including an exploration of the local geology, vegetation, soils and hydrology as well as developing mapping skills. In addition to these training periods, staff also used to provide 'weekend expeditions' for geography students to sites in the local area; that is, extra-curricular field training for smaller student groups based on hydrological and water quality monitoring, drone piloting and landform mapping exercises. Data collection at these events could form the basis for subsequent student research projects and provided additional experience in the use of field equipment.

YFCNU sits in the foothills of the Carpathian Mountains and in a forest-steppe ecological zone which provided significant opportunities in the local region for physical geography orientated fieldwork. The Department of Geography, Geomorphology and Palaeogeography teaches geography spanning a core of physical geography and trains geography schoolteachers. In the first and second year, field trips aimed to explore and showcase a broad range of landscapes located in Ukraine (e.g., Carpathian Mountain diversity and ecozones). In the third and fourth year, fieldwork became more tailored towards students' specialisms such as paleontological sampling in the caves of the West Ukraine uplands. Within the teacher training specialism, field-based training was (and still is) professionally orientated. Prior to the war, student field trips involved relatively large student groups (around 50 on average) and trips usually took place in summer with accommodation under canvas as the university has no field station-type facilities. As a department, in-person fieldwork was seen as providing an important means of delivering not only academic material, but also engendering a student cohort identity and facilitating staff-student communications, with the field experiences captured and shared using social media by both staff and students.

4 | ONGOING CHALLENGES OF FIELD TEACHING

For both institutions, the COVID-19 pandemic led to a shift to online teaching and virtual fieldwork, which has then been perpetuated by the war with Russia. To an extent, some of the adaptations for remote fieldwork delivery were in place prior to the war, however for KGNU in particular, the paucity of content, due to staff being unable to safely go out and develop new field materials, as well as the loss of key institutional facilities (damaged university buildings and internet connectivity issues), has added a significant burden upon staff. In addition, while KGNU's field station at Gaidary village remains intact, the facilities at Kamianka have been destroyed because of the area's occupation by Russian forces and their subsequent expulsion. Being in the East of Ukraine, close to the border with Russia, it is not possible to do any in-person field teaching and while some staff/students remain in the Kharkiv region, others are now refugees in other countries.

For YFCNU, the war has restricted fieldwork opportunities in terms of the range and diversity of environments to which access is possible. Despite being located at the western margin of Ukraine, online teaching and the use of virtual field trip alternatives was necessary, particularly at the start of the invasion, and programmes are now delivered in a hybrid format to accommodate the different circumstances of individuals. At the start of the war there were internet connectivity issues for students who had returned home as a number of students live in the upland areas of the region. This impacted all teaching delivery at least in the earlier months of the war.

5 | DIGITAL FIELDWORK LEARNING: ADAPTATION AND RESILIENCE OF UKRAINIAN ACADEMICS

Despite the significant challenges of delivering field education during the Russian invasion, both institutions have effectively utilised digital technology to continue to develop students' spatial thinking and field methodologies. In both cases, some students have been able to undertake fieldwork in their local areas (e.g., if they are located in a safe area) following

online instruction from their respective universities and are able to report back on their findings, particularly landforms in other countries if the student has become a refugee.

At KGNU, field learning is delivered using Google Earth and employing landform photography and 3D landform models delivered online. Field techniques, for example water quality monitoring, are demonstrated in a series of bespoke video packages made by staff. Carefully collated online resources, including site video clips (from previous in-person student field trip), field sketches made in earlier years and online resources are used to facilitate a virtual field experience (assessed as a field trip [digital] notebook) which receives positive student feedback (especially in recognition of the difficult circumstances the war has inflicted).

Given the research specialism of Vladyslav Popov (KGNU), GIS and Remote Sensing have been integrated into online teaching that was necessitated by COVID and the war's restrictions on fieldwork. Web tools such as Sentinel Earth Observation (EO) Browser and Planet Explorer provide robust instruments for imagery analysis without a dependency on desktop software. During the pandemic, tasks covered topics including flooding and illegal deforestation in the Ukrainian Carpathians. Subsequently, however, the impacts of the war have added a topical dimension to student exercises. For example, exercises using geospatial tools to map deforestation have been applied to detecting the effect of the battlefields on forest cover.

At YFCNU, staff proactively developed a range of training exercises to allow field activities to continue remotely. For example, short bespoke videos provided instruction and simplified measurements (e.g., of soil properties and mapping using Google Earth) allowed students to work independently, submit a report and receive feedback. ESRI StoryMaps has also been used as a measure of virtual instruction. The COVID-19 pandemic is seen as the initial impetus for the department's development of online resources but students' comments about the lack of social interaction that entirely online learning can precipitate, encouraged the staff to develop the use of social media to encourage student interaction around their discipline area and they have made frequent use of YouTube channels. They include both videos made by staff members demonstrating field techniques and instrumentation as well as field site visits. To extend the reach of this media and recognising the teacher training specialism of the department, these YouTube channels are also available to schools. To further encourage a sense of community and promote engagement, the web pages of the department were also adapted. The revised format is more user friendly and promotes discussion of key themes and awareness of the department's activities and student clubs for those students based outside Ukraine in particular, although this requires staff time to ensure content moderation.

In addition to adaptations to the war for students, outreach activities to the wider population have also been developed. In particular, the region around YFCNU was flooded with refugees in the early weeks of Russia's invasion of Ukraine. Alongside other departments of the university, staff delivered 'science BBQs' in public spaces to this transient population in the hope of providing education in addition to hope and reassurance. These events comprised demonstrations of equipment, the display of specimens, for example, rocks and fossils for children, and therefore a welcome distraction. An emphasis of this environmental outreach is that Ukraine is still a beautiful country despite the ongoing destruction seen by the war.

6 | SUMMARY AND FUTURE

These experiences, provided by Ukrainian academics on opposite (east/west) sides of Ukraine, not only highlight the challenges of continuing physical geography HE during a war, but also the resilience, adaptability and determination of staff to continue to provide an education for their students. Moreover, this commentary offers a 'lived' perspective in contrast to the theorising of previous responses (e.g., Megoran, 2023; Smirnova, 2023) and provides an additional glimpse into the challenges and opportunities countries across the world face in the delivery of geography education (McFarlane, 2022, 2023).

For Ukraine, digital tools have been instrumental not only to adapt to the inability of staff and students to go out into the field together, but also to allow students and staff to remain connected to one another, a priority also highlighted in Lavrysh et al. (2022). In addition, digital tools provide a platform from which Ukrainian academics can connect, interact and gain support from academics outside their own institutions (Oleksiyenko et al., 2023) with the hybrid virtual field trip summer school presented in this paper providing one example of such opportunities.

When the war in Ukraine is over, the skills developed through physical geography education are going to be vital. Ukraine is not only going to need to build back more sustainability, but it will also need to address post-war contamination in addition to mitigating and adapting to the ongoing climate crisis. Current and future graduates trained in spatial

and field sampling skills are imperative for that future, and currently digital tools are proving to be key for facilitating the development of these skills. While virtual fieldtrips cannot replace the experience of being physically present in the field (e.g., Spicer & Stratford, 2001), at times of crises (pandemic, war) they provide a viable option when the alternative would be no field education, and virtual tools may continue to be needed even after the war is over in areas where mines and unexploded ordnance may pose a continued threat to fieldwork.

Although Ukrainian academics are showing resilience and adaptability, they are also increasingly experiencing signs of burnout (Tsybuliak et al., 2023). As the war continues and shows little signs of abating, the continued stress of delivering high-quality education alongside continued disruption (bomb blasts) (Dixon, 2024), volunteering roles (Lavrysh et al., 2022), adjusting to relocation, limited access to educational materials and trying to motivate students deeply affected by war (Lavrysh et al., 2022) is going to begin to take its toll on education. As highlighted by Oleksiyenko et al. (2023), it is important that at times of turmoil we develop new strategies for ‘international networking and collaboration in teaching and student support’ (Oleksiyenko et al., 2023, p. 1115). In the UK, there has been support for research collaboration via the UK-Ukraine Research and Innovation twinning grant scheme (Universities, 2023) and the UK-Ukraine Partnership Grant Scheme (British Council, 2024), but limited funds exist for the exchange of teaching and learning support and innovation more widely.

In the third year of the war, at a time when missile and rocket attacks on the Kharkiv region have increased again, we call for universities and funders to further facilitate, through time and financial resourcing, teaching and learning collaborations between UK (and other countries) and Ukrainian universities to ensure high-quality HE continues in Ukraine and to support our colleagues who are continuing against the odds. This could be via the collation of high-quality, readily available online materials (as demonstrated through the Virtual Palaeoscience project; Hutchinson et al., 2022) and North American Geoscience Teachers (NAGT, n.d.), and suggestions for how those materials could be utilised to support teaching of specific subjects. Support could be through collaborating with Ukrainian academics to share good practice and co-create new online teaching resources (or share and develop existing online resources). For physical geography education specifically, we propose that future collaboration and funds could be used to create virtual field trip materials that can be shared with Ukrainian partners, who are currently not in a position to go out and create new materials, to ensure the continuation of field education. The development of virtual field trip materials can be of benefit to both UK academics (via addressing equality, diversity and inclusion and sustainability concerns—see Hurrell et al., *in review*) as well as Ukrainian academics.

ACKNOWLEDGEMENTS

The authors wish to thank all the students who have participated in our Virtual Field Trip workshops, the participants of the DWTs Summer School and, especially, the international group of staff who contributed to, facilitated and hosted the event (the University of Suceava, Romania).

DATA AVAILABILITY STATEMENT

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

ORCID

Simon M. Hutchinson  <https://orcid.org/0000-0003-0072-1062>

Elizabeth R. Hurrell  <https://orcid.org/0000-0003-4290-9047>

REFERENCES

- British Council. (2024) *UK-Ukraine partnership grant scheme*. Available from: <https://opportunities-insight.britishcouncil.org/news/opportunities/uk-ukraine-partnership-grant-scheme> [Accessed 22nd August 2024].
- De Rassenfosse, G., Murovana, T. & Uhlbach, W.H. (2023) The effects of war on Ukrainian research. *Humanities and Social Sciences Communications*, 10, 856. Available from: <https://doi.org/10.1057/s41599-023-02346-x>
- Dixon, E. (2024) *Is it time for Ukraine's exiled academics to return?* Available from: https://www.timeshighereducation.com/depth/it-time-ukraines-exiled-academics-return?utm_source=newsletter&utm_medium=email&utm_campaign=editorial-daily&spMailingID=28588858&spUserID=MTIzNTk4NTM4MTUzOAS2&spJobID=2430876253&spReportId=MjQzMDg3NjI1MwS2 [Accessed 30th April 2024].
- Galynska, O. & Bilous, S. (2022) Remote learning during the war: Challenges for higher education in Ukraine. *International Science Journal of Education & Linguistics*, 1, 1–6. Available from: <https://doi.org/10.46299/j.isjel.20220105.01>
- Hurrell, E.R., Hutchinson, S.M., Yorke, L., Batty, L.C., Bunting, M.J., Swanton, D. et al. (in review) *The role of Virtual Field Trips in geography higher education: A perspective paper*.
- Hutchinson, S.M., Bacon, K.L., Bunting, M.J. & Hurrell, E.R. (2022) The virtual Palaeosciences (ViPs) project: Resources for online learning in or out of a pandemic. *Journal of Geography in Higher Education*, 48(1), 133–143. Available from: <https://doi.org/10.1080/03098265.2022.2129599>

- Klinke, I. (2023) Of tanks and tankies: What's 'left' for geography after the invasion of Ukraine. *Transactions of the Institute of British Geographers*, 48, 811–815. Available from: <https://doi.org/10.1111/tran.12627>
- Kostikova, I., Holubnycha, L., Marmaza, O., Budianska, V., Pochuieva, O. & Marykivska, H. (2023) Real country experiences: On-line teaching in wartime after pandemic in Ukraine. *International Journal of Interactive Mobile Technologies*, 17, 123–134. Available from: <https://doi.org/10.3991/ijim.v17i03.36419>
- Lavrysh, Y., Lytovchenko, I., Lukianenko, V. & Golub, T. (2022) Teaching during the wartime: Experience from Ukraine. *Educational Philosophy and Theory*, 1–8, 1–8. Available from: <https://doi.org/10.1080/00131857.2022.2098714>
- Ma, X., Gryshova, I., Koshkald, I., Suska, A., Gryshova, R., Riasnianska, A. et al. (2022) Necessity of post-war renewal of university Teachers' potential in terms of sustainable development in Ukraine. *Sustainability*, 14, 12598.
- McFarlane, C. (2022) Editorial: Geography in the world. *Transactions of the Institute of British Geographers*, 47(1), 2–8. Available from: <https://doi.org/10.1111/tran.12497>
- McFarlane, C. (2023) Geography in the world part 2: Editorial. *Transactions of the Institute of British Geographers*, 49, e126552. Available from: <https://doi.org/10.1111/tran.12655>
- Megoran, N. (2023) Making sense of the Ukraine war: Geographers should not be afraid of geography. *Transactions of the Institute of British Geographers*, 48, 821–825. Available from: <https://doi.org/10.1111/tran.12626>
- Mospan, N., Ogneviuk, V. & Sysoieva, S. (2022) Emergency higher education digital transformations: Ukraine's response to the COVID-19 pandemic. *Information Technologies and Learning Tools*, 89, 90–104. Available from: <https://doi.org/10.33407/itlt.v89i3.4827>
- NAGT. (n.d.) *Earth education for all: Teaching resources*. Available from: https://nagt.org/nagt/teaching_resources/index.html [Accessed 22nd August 2024].
- Oleksiyenko, A., Shchepetylnykova, I. & Furiv, U. (2023) Internationalization of higher education in tumultuous times: Transformative powers and problems in embattled Ukraine. *Higher Education Research and Development*, 42, 1103–1118. Available from: <https://doi.org/10.1080/07294360.2023.2193727>
- Oleksiyenko, A., Terepyshchyi, S., Gomilko, O. & Svyrydenko, D. (2021) 'What do you mean, you are a refugee in your own country?': Displaced scholars and identities in embattled Ukraine. *European Journal of Higher Education*, 11, 101–118. Available from: <https://doi.org/10.1080/21568235.2020.1777446>
- Smirnova, V. (2023) Russia's spatial anxiety and the construction of geographical knowledge. *Transactions of the Institute of British Geographers*, 48, 816–820. Available from: <https://doi.org/10.1111/tran.12638>
- Spicer, J.I. & Stratford, J. (2001) Student perceptions of a virtual field trip to replace a real field trip. *Journal of Computer Assisted Learning*, 17, 345–354. Available from: <https://doi.org/10.1046/j.0266-4909.2001.00191.x>
- Tsybuliak, N., Suchikova, Y., Shevchenko, L., Popova, A., Kovachev, S. & Hurenko, O. (2023) Burnout dynamic among Ukrainian academic staff during the war. *Scientific Reports*, 13, 17975. Available from: <https://doi.org/10.1038/s41598-023-45229-6>
- Universities, U.K. (2023) *UK-Ukraine R&I twinning grants scheme*. Available from: <https://www.universitiesuk.ac.uk/topics/international/international-research-collaboration/uk-ukraine-ri-twinning-grants-scheme> [Accessed 30th April 2024].
- Vidosavljević, D., Puntarić, D., Gvozdić, V., Jergović, M., Miškulin, M., Puntarić, I. et al. (2013) Soil contamination as a possible long-term consequence of war in Croatia. *Acta Agriculturae Scandinavica Section B Soil and Plant Science*, 63, 322–329. Available from: <https://doi.org/10.1080/09064710.2013.777093>

How to cite this article: Hutchinson, S.M., Hurrell, E.R., Borysenko, K., Popov, V., Kholiavchuk, D. & Popiuk, Y. (2024) Resilient education: The role of digital technology in supporting geographical education in Ukraine. *Transactions of the Institute of British Geographers*, 00, e12728. Available from: <https://doi.org/10.1111/tran.12728>