Institution: University of Chester		
Unit of Assessment: 14 Geography, Environmental Studies and Archaeology		
Title of case study: Opening up Digital Fieldwork Technology to Staff and Students in Further and Higher Education.		
Period when the underpinning research was undertaken: 2010 – 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Derek France	Deputy Head of Department	1993 (ongoing)
Katharine Welsh	Senior Lecturer	2010 (ongoing)
Period when the claimed impact occurred: 2013 – 2020		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact (indicative maximum 100 words)

The surge in mobile devices and tablet computing afforded an exciting opportunity to make learning more mobile, thereby increasing efficiency and broadening the opportunities available to field-based teaching through the use of these novel technologies. As a result of our research into mobile learning, there has been:

- transformed teaching practice of staff in 222 Higher and Further Education (HE/FE) institutions, both nationally and internationally
- transformed perceptions about the use of technology for field work teaching in 101 institutions
- enhanced student engagement and employability skills
- augmented sales for 8 companies as a result of the technologies and book chapters purchased
- expansion of 1 learned society
- 3 new collaborations between external partners, which empowered Field Studies Council staff, saved time in the field for students, led to better technical solutions for EDINA and the Environmental Systems Research Institute (ESRI), and shared best practice within the Joint Information Systems Centre (JISC)

2. Underpinning research (indicative maximum 500 words)

Funding from the Higher Education Academy resulted in the creation of a multi-disciplinary team from the Universities of Chester (lead institution), Reading and Sheffield, which conducted research focused on the application of mobile technologies to solve pedagogic issues faced by practitioners and students during fieldwork. Known as the 'Enhancing Fieldwork Learning' (EFL) Team, the University of Chester staff involved were:

- Derek France (1993-present, Professor of Pedagogy in Geographical Sciences, Principal Investigator)
- Katharine Welsh (2010-present, Postdoctoral Researcher (2010-2013), Visiting Lecturer and Researcher (2013-2016), Senior Lecturer (2016-present)
- Victoria Powell (2012-2013, Postdoctoral Researcher to cover maternity leave)

The partner staff and institutions involved with the research were:

- Julian Park (1994-present, Pro-Vice Chancellor (Education), University of Reading)
- Alice Mauchline (2003-present, Senior Research Fellow, University of Reading)
- Brian Whalley (2010-present, Emeritus Professor, University of Sheffield)
- Katherine Clark (2015-present, Postdoctoral Researcher, University of Reading)

The estimated Research Contribution from the University of Chester is as follows:

- Conception of the research idea: 50%
- Data Collection: 70%
- Journal publications: 65%
- Books and Book Chapters: 50%

- Workshops and conference outputs: 60%

Early research **[R1]** identified that 50% (n=89) practitioners wanted to integrate technology into fieldwork in order to develop student digital literacy, and 66% (n=89) also wanted to use technology to speed up data processing and analysis whilst out in the field. Furthermore, as a result of the increase to student tuition fees in 2012/13, and consequent university budgetary constraints and existing financial burdens for students, we **[R2]** identified that 23% (n=27) of Geography, Earth and Environmental Science departments in the UK planned to replace residential fieldwork with individual day trips, thereby demonstrating a clear need to increase time efficiency, whilst students were out in the field, in order to achieve the learning outcomes.

To remedy the issues identified, our subsequent research **[R1,R3,R5]** presented the first substantial investigation into the application of tablets, smart devices and the concept of Bring Your Own Device (BYOD i.e. where students use their personal devices in the classroom/field) for fieldwork. We were able to demonstrate that by deploying cost-effective, portable devices e.g. tablets, time spent collecting and analysing data in the field was more efficient. We **[R1]** identified that 20% (n=89) of practitioners felt that staff reluctance or incompetence was a barrier to introducing technology into fieldwork, and subsequent research **[R5]** further supported this finding with practitioners perceiving a lack of support both for those using and who want to use BYOD within their fieldwork.

Our findings outlined that the upskilling of staff, to ensure they were sufficiently digitally literate, was a vital part of enhancing student digital literacy, employability and experience. Further research **[R3, R5]** demonstrated that students were comfortable with using mobile and app-driven technologies for academic purposes, as they required significantly less "set-up" time due to student familiarity with the devices, thereby saving further time when out in the field. The findings suggested that providing students with the opportunity to personalise their own learning by using their own devices, further enhanced time efficiency during field work, which resulted in enhanced student engagement. Finally, our work on graduate attributes **[R4]** demonstrated an encouraging insight in that students recognise the relationship between mobile app use from fieldwork learning and how this influences their wider skill set for employability purposes.

3. References to the research (indicative maximum of six references)

This selection of research outputs underpins a nationally recognised double award-winning project. Outputs R1 and R3-R5 have been published in international journals that require rigorous peer-review. Output R2 is a primary research report which was commissioned by the Higher Education Academy and was peer reviewed by the subject lead, Dr Helen Walkington.

[R1] Welsh, K.E., Mauchline, A.L., **France, D**., Park, J., and Whalley B. (2013) Enhancing Fieldwork Learning with technology: practitioner's perspectives, Journal of Geography in Higher Education, 37 (3), 399-415. https://doi.org/10.1080/03098265.2013.792042
[R2] Welsh, K.E. and **France, D**. (2012) The Future of Higher Education Fieldwork in Geography, Earth and Environmental Sciences. The Higher Education Academy STEM Report. https://www.heacademy.ac.uk/system/files/The-Future-of-Higher-Education-Fieldwork-GEES_2012.pdf
[R3] Welsh, K.E., Mauchline, A., Powell, V., **France, D**., Park, J.R., and Whalley, W.B. (2015) Student perceptions of iPads as mobile learning devices for fieldwork. Journal of Geography in Higher Education, 39 (3), 450-469. https://doi.org/10.1080/03098265.2015.1066315
[R4] France, D. , Powell, V., **Welsh, K.E**., Mauchline, A.M, Park, J.R., and Whalley, W.B. (2016) Ability of students to recognize the relationship between using mobile apps for learning during fieldwork and the development of graduate attributes. Journal of Geography in Higher Education, 40 (2), 182-192. https://doi.org/10.1080/03098265.2016.1154931
[R5] Clark, K. A., **Welsh, K. E**., Mauchline, A. L., **France, D**., Whalley, W. B., and Park, J. (2020). Do educators realise the value of Bring Your Own Device (BYOD) in fieldwork learning? Journal of Geography in Higher Education, 1-24. https://doi.org/10.1080/03098265.2020.1808880

Grants awarded which directly funded research

[G1] France, D., Park, J.R, Whalley, W.B. (2010-2013) " Personalised Learning Environments in Active Field Science", Higher Education Academy - National Teaching Fellowship scheme (NTFS), £198,489.
[G2] Welsh, K.E. & **France, D.** (2012) "The Future of Fieldwork in GEES", Higher Education Academy Invited Report, £1,500.
[G3] Mauchline, A., **France, D., Welsh, K.,** Park, J.R, Whalley, W.B. (2015) "Practitioners Perspectives of Bring Your Own Device for Fieldwork" British Ecological Society Funding £2,000.

4. Details of the impact (indicative maximum 750 words)

We have achieved the impacts described below through national and international dissemination events (01/08/13-31/07/20), including 7 participatory events, 15 conferences, and 18 workshops across 4 continents, where, for the first time, a range of interdisciplinary educators were exposed to the concept of using mobile technologies to enhance their fieldwork practice. This has resulted in impact for the following beneficiary groups:

National and international impact on teaching staff in HE/FE

- Our research findings outlined the need to support educators to effectively embed technology into fieldwork. The team therefore ran 7 participatory events, where 222 educators from 66 UK and 18 international HE/FE providers, 14 non-academic organisations, and 3 schools were able to gain practical experience of applying mobile technology in a fieldwork environment. This has led to 222 upskilled and more digitally literate educators, many of whom have embedded skills learned at the events into their own fieldwork practice: "The video compilation exercises [from the event] have given me the confidence to produce my own videos to explain troublesome concepts." **[S1a],** "I gained confidence in the use of technology and have no fears about using iPads and mobile phones in fieldwork." **[S1b].**

- Where practitioners have embedded mobile devices, fieldwork has been more efficient, saving students time and reducing departmental costs "The iPads have been embedded into the Conservation Biology activities to help address staff-student ratios, so the ~60 students feel adequately supported and have confidence to complete the task in a timely fashion." **[S2a]**; "The EFL project has had a significant impact on MSc teaching in SBS…at the end of the field practical session the results from individual student groups were then realised on screen as an annotated campus map and a discussion of strengths, weaknesses and lessons-learned" **[S2b]**.

- Educator attitudes towards technology have been transformed. The EFL team won an Advance HE Collaborative Award for Teaching Excellence (CATE) in 2018 with an *additional* 'spotlight' recognition received at the awards ceremony for "multi-institutional and multi-disciplinary collaboration which demonstrated a transformational impact on attitudes towards the use of technology to enhance fieldwork learning" **[S3a]**.

Impact on national and international students in HE/FE

Our research and events have led to educator upskilling, therefore students nationally and internationally have:

- Benefitted from enhanced learning as they are more engaged during their time in the field "Bringing digital stories into my fieldwork teaching practice has actively engaged my students" **[S4a]**; "[it] enhanced the way in which students engage with qualitative data in the field…this developed both student and tutor confidence in their applicability to everyday teaching" **[S4b]**;" [it has]… made group work more engaging" **[S4c].** Students also recognised how the technology had engaged them "it helped me think and expand upon ideas and problems" **[S4d]**.

- Improved their digital literacy and enhanced inclusion "Having made a video [at the EFL event] ... my 1st year students now produce a 4 min video on a research topic." **[S5a]**; "I've been told that the ways in which I've been able to help people use technology to support fieldwork has been transformational…The EFL community really champion education and are open to adopting inclusive approaches to education, the work I'm able to do has been inspired and informed by the collaborations and conversations I've had with EFL attendees" **[S5b].**

- Enhanced their employability skills "I attended the workshop ... we learned how to use technology in the field ... I took iPads/minis on an ERASMUS-funded trip to Iceland in 2014… Students make videos from their photos and videos and these are uploaded onto a WordPress site …I use the blog/video when writing student references. My fieldtrip partners with UMass Dartmouth (USA), EAFIT and Universidad de Antioquia (Colombia) and University of Akureyri (Iceland). The UMass colleague also now incorporates a blog and video website within their teaching. The pan-European nature of the trip ensured a wide dissemination of good practice..." **[S6a**]; "Students are able to learn new skills as well as the traditional learning from a field course... We have uploaded all their films to the department's YouTube channel, providing them each with a web presence which is useful for their employability" **[S6b].**

- Transformed their perceptions of using mobile devices for fieldwork. Our research **[R3]** showed that 72% of students (n= 173) stated that their perceptions of using devices had improved during the course of the fieldwork. Some students described a complete change in their perceptions of using the device "from feeling sceptical to feeling dependent on its use." **[S3b]**

Impact on teaching staff and students in secondary schools and further education

- Digital literacy has also improved in 3 schools as a result of engagement with our research and events, "I've taught hundreds of students in the time since [the event], and they have been exposed to new ideas, technology, Google Forms, VR and other exciting opportunities" **[S7]**.

Impact on non-academic organisations

As a result of attending an EFL, new collaborations between organisations occurred and further impact within those organisations took place.

- Collaboration between the Field Studies Council and The Open University to develop the Field Network System which "enables the FSC to extend the time students spend in the field and facilitates student discussion of their results by enabling them to contextualise their findings at the fieldwork site," thereby engaging the students and enabling deeper learning **[S8a].**

- Collaboration between EFL, EDINA and ESRI led to better technological solutions to field-based problems being developed: "[Event] participants gave invaluable feedback on our Fieldwork GB app… through our involvement with the project we feel more confident that we are building useful tools and understand the needs of potential users" **[S8b].**

- Through attending the EFL event, further good practice has been applied and shared by colleagues at the Joint Information Systems Committee (JISC) both nationally and internationally: "The events that Katharine [EFL] facilitated were designed to foster and share innovation and I took away numerous ideas…I was able to take this new knowledge skillset back into my practice and it influenced workshops that I ran for the HE and FE sectors on technology enhanced learning, particularly digital storytelling that I was also able to incorporate into presentations at an international and UK conference" **[S8c].**

Impact on learned societies

As a result of our research, events and collaboration, there has been an expansion of the British Ecological Society with the formation of a Teaching and Learning Special Interest Group: "Our relationship with the EFL has helped the BES demonstrate and build support for.... teaching-focussed members ... a special interest group.... supporting early career researchers and lecturers in developing their teaching practice" **[S9].**

Commercial Impact

- There have been 4,657 chapter downloads of the book written by the project team, which totals a commercial impact for Springer (publisher) of £93,093.43 in sales **[S10a]**.

- As a result of direct engagement with our research and dissemination events, 6 UK institutions **[S2a, S4c, S10d, S10e, S10f, S10g, S10h]** are known to have purchased their own field-based mobile technologies, leading to commercial impacts for 8 companies **[S10]**: Apple, Samsung, Panasonic, Griffin, GoPro, Oculus, Raspberry Pi and Proscope. The Field Studies Council **[S10b]** has also estimated that they have purchased at least 250 tablet devices (Apple and Android). The total commercial impact for technology companies is estimated to be £199,978.74 **[S10c]**.

5. Sources to corroborate the impact (indicative maximum of 10 references)

Corroborating Statements

[S1] HE/FE Educators are more digitally literate (HE Staff quotes from Keele University and Northumbria University)

[S2] Fieldwork is more efficient (HE Staff quotes from Keele University and University of Reading)

[S3] Transforming perceptions about technology enhanced fieldwork (Advance HE Collaborative Award for Teaching Excellence and student quote)

[S4] Students are more engaged in their fieldwork (HE Staff quotes from Massey University, University of Chester, Bangor University and student quote)

[S5] Students have enhanced digital literacy (HE Staff quotes from Liverpool John Moores University and Open University)

[S6] Students have enhanced employability skills (HE Staff quotes from University of Reading and University of Southampton)

[S7] Students in schools benefitting from embedding of field-based technology (Teacher quote from King's Ely School)

[S8] External Collaborations (Quotes from Open University, EDINA, JISC)

[S9] Impact on Learned Societies (Quotes from British Ecological Society)

[S10] Commercial Impact (chapter downloads, Quotes from Field Studies Council Educational Technology Tutor, Institutional technology purchases at University of Reading, University of Chester, Manchester Metropolitan University, University of Southampton and Bangor University)