Enabling remote activity: widening participation in field study courses

Book Section

Enabling Remote Activity: Widening participation in field study courses

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Abstract

Field courses provide opportunities for students to engage with the world as part of their learning process. This chapter explores the use of a portable WiFi network and mobile technologies to support the inclusion of physically disabled students in field study courses. The Enabling Remote Activity (ERA) approach, which has been developed through multiple field courses at The Open University (UK), is introduced and a case study involving two field courses from a second-level undergraduate environmental science module is presented. The findings are discussed with regard to inclusive education and a set of recommendations for facilitating social inclusion are concluded.

Keywords: accessibility, accessible fieldwork, biosciences, enabling remote activity, enquiry learning, environmental science, field study courses, fieldwork learning, geosciences, group work, live video streaming, mobile learning, outdoor learning, portable communication toolkit, remote access, social inclusion, VoIP telephony, widening participation, WiFi, wireless local area networks.

Introduction

Field study courses are a valued aspect of authentic practical science that offers opportunities for learning and problem solving in contexts comparable to those that students will face during their subsequent professional practice (Butler, 2008; Whitmeyer, Mogk, & Pyle, 2009). Within geology, for example, fieldwork education is considered to provide opportunities for students to synthesise and apply their knowledge, acquire professional field skills and techniques, develop the values and ethics of practicing geoscience, and gain exposure to a variety of geological phenomena (Pyle, 2009). Similarly, Mogk and Goodwin (2012) argue that field education improves student's knowledge and problem-solving skills, enhances their ability to reflect on their own understanding, generates positive feelings towards the subject that help motivate learning, offers direct and immersive experiences, and introduces students to professional practice. Residential fieldwork has been found to help develop generic as well as subject specific skills (e.g. teamwork, decision making and autonomy) and interpersonal skills (Stokes & Boyle, 2009). Petcovic, Stokes and Caulkins (2014) report on a survey with 172 geoscientists (self-classified as: learners n=93, instructors n=66 and industry professionals n=25), which found that 89.5% agreed that fieldwork should be a fundamental requirement on undergraduate degree programs.

Fieldwork is also viewed as a central component within the biosciences, supporting the development of key biological skills and transferable skills that are linked with graduate employability (Mauchline, Peacock, & Park, 2013). Based on the findings of a comparative case study, Scott et al. (2012) argue that fieldwork enhances undergraduate learning within the biosciences. They asked one group of students to collect organisms from the field and create labelled drawings of them, and another group to create labelled drawings of specimens they had not collected. Through questionnaires and written exercises they found that the students that had collected the organisms themselves were better at constructing a taxonomic list of the organisms, recalling the structural details of those organisms and the ecological sampling method used to collect them, than students that had created labelled drawings of specimens they had not collected and had the sampling method described to them in a classroom setting.

Although field courses are recognised as beneficial within science education, the costs involved in running these courses has brought increased pressure to consider alternate learning experiences (Çaliskan, 2011). A further pressure is the accessibility of such courses. Within the UK the Special Educational Needs and Disability Act requires educational institutions to ensure that disabled students are not placed at a disadvantage in comparison with non-disabled students. Fuller et al.,

(2009) present an extensive study of UK university practices to support disabled students and argue the case for developing inclusive curricula and a supportive environment for all students.

Hall et al., (2002) critically reviewed the representation of fieldwork by geography, earth and environmental science departments in UK universities, and present the findings of a postal survey of departmental experiences of supporting disabled students (n=88). They found that departments typically adopted a mixture of two approaches, namely a 'responsive approach' and an 'enabling approach'. Responsive approaches instigate measures in reaction to situations or problems as they arise in order to overcome the barriers excluding disabled students. Enabling approaches seek to reconstruct fieldwork in an inclusive way, so that the barriers excluding disabled students are not inherent in the first place. In fact, an action undertaken when planning fieldwork could be classified as an enabling approach (preventing barriers), or as a responsive approach when undertaken to overcome a barrier. They note that responsive approaches are not necessarily less effective at including disabled students than enabling approaches, and that "it is unlikely that all eventualities can ever be foreseen and planned for" (Hall et al., 2002, p. 227).

One aspect that was rarely addressed in the survey responses was the social problems that disabled students may encounter. Typically there was a focus on physical access to the extent that more complex and challenging barriers to social inclusion (Ash, Bellew, Davies, Newman, & Richardson, 1997; Borland & James, 1999) were overlooked. The following section introduces a range of approaches that have been developed to support disabled students access to field courses.

Accessible fieldwork and alternate experiences

A spectrum of approaches can be used to provide accessible fieldwork learning, ranging from immersive 'virtual reality' fieldwork through multimedia-based virtual fieldtrips, and technology-assisted field experiences, to simply providing more accessible fieldwork. Gardiner and Anwar

(2001) outline the following five strategies to use when a mobility-impaired student cannot directly access a field site or carry out a fieldwork activity:

- facilitate the activity so that the student can participate in it (this may involve alternate routes, assistance for rough terrain such as off-road wheelchairs, or from helpers who can take notes or make measurements under a student's direction),
- facilitate the activity so that the student can participate in it, but at a different location (i.e. find a new, accessible location for the whole cohort of students to use),
- substitute an alternative activity with the same learning outcome(s) (e.g. Cooke et al., (1997) provided geological specimens in a laboratory as a small scale substitute for the field),
- provide additional time for the activity, and/or for gaining access, or
- don't do real fieldwork, do virtual fieldwork instead.

Gardiner and Anwar also emphasised the importance of students with mobility impairments being able to share all the experiences available to the other students, including the social life and domestic arrangements of a residential trip. It is recognised that social interactions during fieldwork are an important part of the whole learning activity (Stokes & Boyle, 2009).

Multimedia-based virtual fieldtrips can be created as websites and on CD/DVDs using a combination of photographs, video, text-based information and data. These may involve linear, narrative-led approaches, such as the CD-ROM-based tidepools virtual fieldtrip discussed by Spicer and Stratford (2001), or more free-form exploratory approaches, like the web-based geography virtual fieldtrip reported by Dykes, Moore and Wood (1999).

Stitching together photographs using software such as Gigapan and Photosynth can create panoramic views of field sites. The use of high-resolution photography with these tools allows students to explore a site and zoom in on details. An advantage of this approach is that students are presented with the whole scene, which they are able to interrogate and it is for the student to decide what to examine in detail (Stimpson, Gertisser, Montenari, & O'Driscoll, 2010).

A similar form of open enquiry is supported through virtual reality systems. Atchison and Feig (2011) discuss the development of an immersive virtual reality model of a series of field locations within Mammoth Cave National Park in Ohio. Their system developed as an alternative learning environment for mobility impaired students uses a stereographic surround display system (CAVE) and supports real-time synchronous interaction between users.

More recently, as part of the OpenScience Lab (see http://www.opensciencelab.ac.uk), the Open University (OU) has produced a multi-user 3D virtual geology fieldtrip of Skiddaw (a mountain in the UK Lake District). This virtual fieldtrip (built in Unity 3D) was developed to provide wider access to fieldwork and preparative support for actual fieldtrips. It is based around a 10km x 10km model of the terrain produced from LiDAR data with overlaid aerial photography. The project also explores what can be done on virtual field trips that can't be done on actual fieldtrips, such as flying over the terrain, looking at rock sections in the field using a virtual microscope, and raising 3D geological sections out of the ground.

Virtual fieldtrips are most often used to complement existing field activities, either to prepare students for going into the field or to reinforce learning after fieldwork (e.g. Stainfield, Fisher, Ford, & Solem, 2000; Rumsby & Middleton, 2003; McMorrow, 2005). It is worth stating that the aims, objectives and learning outcomes of virtual fieldtrips can differ significantly from those of traditional field activities (Qiu & Hubble, 2002). Studies of student and tutor perceptions of actual field experiences versus virtual fieldtrips show that virtual fieldtrips are seen as valuable activities, but not as direct replacements for actual fieldwork because of the variety of physical, social and real world experiences involved (Spicer & Stratford, 2001; Fuller, Gaskin, & Scott, 2003; Scott, Fuller, & Gaskin, 2006).

The Enabling Remote Activity approach to accessible fieldwork

Healey et al., (2001) provide a guide for teaching and support staff at higher education institutions on the provision of learning support for disabled students undertaking fieldwork and related activities. Emphasising the application of the social model of disability, their approach prioritises the development of an inclusive curriculum that is appropriate for all students. For example, when selecting fieldwork locations, accessibility should be considered not just in terms of the numbers of students accessing the site, but also their modes of access.

The Enabling Remote Activity (ERA) approach draws extensively on the guidelines presented in (Gardiner & Anwar, 2001), and was devised in response to an enquiry from the OU's Earth Sciences Department in 2006:

> *"We are trying to make the fieldwork components of the residential school programme more accessible to students with severe mobility impairment. Currently the fieldwork involves walking distances of several kilometres across moorland and on coastal sections, all inaccessible to students in wheelchairs. We would like to set up an alternative learning experience for students in wheelchairs that matches as closely as possible that experienced by the other students. We envisage the possibility of using two-way audio and video communication between the student (positioned on the nearest roadside) and a tutor (on the hill/beach)." [email enquiry from OU curriculum manager]*

This was initiated in response to a request from a wheelchair using student, and therefore the initial work was part of a 'responsive approach' to address a given situation. However, the accessibility of fieldwork courses was identified as a broader issue and therefore an 'enabling approach' was subsequently adopted to produce a flexible toolkit that could be deployed in a variety of ways on any field course.

Within the context of use, fieldwork takes place over multiple days as part of a residential course. Students work in groups (typically between four and six students per group). The fieldwork activities typically follow a problem-based learning approach in which the students are required to undertake an investigation involving field observations, group communication and interpretation. During the day the students are transported to specific locations to undertake fieldwork, returning to a residential centre in the evening for lab work, data analysis and lectures. Group work is a core aspect of the learning experience and therefore it is critically important to facilitate the social inclusion of students in all aspects of the course. Although accessible fieldwork locations are used where available, this is not always feasible. For locations that a mobility-impaired student is unable to access directly, our approach is to get them as close as possible and then use technology to provide remote access to the inaccessible field site.

The technology aspects of the ERA approach include a portable communications network and a flexible set of communication tools (Collins, Gaved, & Lea, 2010). The portable communications network comprises one or more battery-powered outdoor WiFi routers mounted on photography lighting stands. These create a temporary wireless local area network at each location, enabling communication without depending on mobile phone coverage or internet connectivity (neither of which is available in more rural field locations). Mobile devices are then used to provide a set of communication tools. A netbook computer runs a web server application and a VoIP (Voice over Internet Protocol) telephony application, creating a local web and phone service. IP (Internet Protocol) video cameras and encoders provide live video streams, and WiFi cameras (or mobile phone cameras) are used to upload photographs to the web server as they are taken. The students and tutors can then use VoIP phone applications to make (free) phone calls over the network on mobile devices, and they can also view the live video streams and photographs using a standard web browser (see Figure 1).

Figure 1. Enabling Remote Activity technology in use: an accessible base location (left) is connected to an inaccessible field site (right) using a portable wireless local area network (middle). A camcorder is used (right) to produce a live video stream and VoIP calls are used to provide a two-way audio link. Photographs taken on a WiFi camera can also be uploaded over the network to a web server at the base location.

The rapid deployment of the equipment is crucial, as the students' time in the field is precious and they often visit multiple locations in a day. Typically, the approach requires two additional roles: one member of staff needs to be responsible for setting-up the equipment and a second for providing additional tutoring support. Voice communication is the most important service as it maintains a direct link between the individuals involved. The video streams bring a strong sense of live interaction. Placed at a wide-angle shot position video cameras can provide a sense of presence and hand-held (high-resolution) cameras can be used to zoom-in on detailed parts of a site. Photographs are also used to capture wide views of a site or macro-level detail views of specific items. The choice of tools and use made of them varies according to the demands of the learning activity, the tutor's teaching approach and the preferences of the students involved.

The ERA system has been used on a range of undergraduate field study courses, including: 'Ancient Mountains' (OU course code SXR399) at Kindrogan in 2006 and 2008; 'Environmental Change: The record in the rocks' (SXR369) at Durham in 2009; and the 'Practical Environmental Science' course (SXE288) at Preston Montford and Malham Tarn in 2014. The following section presents a case study of the most recent example, where the toolkit was used to support a mobility-impaired student on two separate field courses undertaken as part of a practical environmental science module.

An environmental science case study

In 2014 the ERA system was used to support a student on two field courses on the OU 'Practical Environmental Science' module (SXE288). This distance-learning module, which is compulsory for the BSc degree in Environmental Science, is taken at the end of the second-level and, as such, students already have some experience of practical scientific observations and measurements. The aim of the module is for students to undertake scientific enquiry into environmental relationships through observation and experimentation. The module involves on-screen and home-based practical work, as well as two compulsory field courses, namely: 'Hydrology and meteorology in the field' and 'Vegetation and soils in the field'. These take place in the UK at the Field Studies Council (FSC) residential field centres at Malham Tarn in Yorkshire and Preston Montford in Shropshire (respectively).

The Hydrology and meteorology in the field course concentrates on how to collect and interpret hydrological and meteorological data. Students measure the flow of water in rivers and through soils, and analyse water quality. They collect meteorological data, examine cloud formations, and explore relationships between weather and hydrology. Students work in small groups of five or six on an assessed project in which they investigate the water balance of a river catchment.

The Vegetation and soils in the field course focuses on how to describe and interpret vegetation and soils. Students learn to identify plant species, map plant communities, investigate soil properties, and study the interactions between soils and vegetation in upland environments. For the assessed project work, students work in small groups to investigate the differences between two contrasting vegetation stands.

Each field course comprises a group of 30 students, supported by three tutors, and runs over three and half days. One additional field tutor and one educational technologist were needed to run the ERA system. The student using the ERA system (referred to here as the ERA student) has mobility, co-ordination and speech impairments, and had the support of a personal carer and a note-taker. The ERA student uses a wheelchair but is able to walk short distances over flat ground. He has some speech capability and sometimes uses a text-to-speech device.

Accessible field sites were used wherever possible, and in those situations, and in the classrooms and laboratories, the student took part in activities alongside his peers. However, when the field sites were inaccessible for the student (e.g. because the terrain was too uneven or the slope too steep), the ERA system was used to remotely connect the student to the field sites through audio and video links (see Figure 1).

The system was used flexibly, depending on the fieldwork activity involved, in one or more of the following configurations:

- For field site descriptions and more didactic teaching situations, a tutor talking to the whole class was fitted with an audio headset and videoed by a field tutor. The ERA student (or helper) could talk to either tutor.
- For group working, a field tutor acted as the remote ‘eyes and ears’ of the ERA student relaying the activity of the student group to the ERA student using audio, video and still images, and acting as an audio conduit between the student group and the ERA student.
- For group working, the field tutor stayed with the ERA student, with another helper operating the field audio and video. The tutor could then help the ERA student understand what was happening in the field and relay queries to the helper.
- For group working, the students in the field used the audio headset and talked directly to the ERA student or a co-located helper.

- For group working, some students stayed at one site with the ERA student and used the system to communicate with other students or a helper at the remote field site.

After each course a follow-up email questionnaire was sent to the ERA student, the other members of their project group, the tutors and the note-taker, to elicit information about their experiences with the technology and their reflections. Feedback showed the ERA approach helped the student not only to attend, but also to participate actively in the field courses:

> *"The ERA technology was superb, without it, I would have been a spectator, instead, I was a contributor." [ERA student]*

The student appreciated the audio and visual features of ERA that enabled him to view remote environments that he could not access, and to communicate with the tutors and other students:

> *"To be able to see environments which I wasn't able to access myself. …. There was no way I would have been able to get inside the bracken, but with the ERA equipment, I could see most things, which was useful" [ERA student]*

> *"The ability for me to see what the other students were being shown was great. To be able to hear the tutors and questions from students was also of great benefit." [ERA student]*

As the field courses were about learning through scientific enquiry, it was important that the student could engage in that aspect. He commented that the technology helped him *"to see scientific processes in the field"*. As the note-taker also commented, this helped to provide a more meaningful learning experience than simply being provided with the field data:

> *"The technology allowed [the ERA student] to see how different measurements and readings were taken in the field. I took many of the readings whilst [he] used ERA to watch from a distance. Having watched the readings being taken, the results were, I believe, more meaningful to [him] than just pure data recordings." [note taker]*

It was important that ERA acted as an enabling system and, as such, was available to the student when he needed it. Therefore, the requirement for the ERA system may well depend on the capability of the student at a particular time and place. For example, on one occasion the ERA system was set up to provide remote access to a river site, but it was not needed as the student wanted, and was able, to get to the river. On another occasion, the student was able to access one vegetation stand in the morning, but later that day felt unable to access another vegetation stand and so the ERA system was then brought into use. The ability to rapidly deploy the system meant that it could be used to visit a number of sites within a fieldwork period:

> *"It was very helpful to have such a lightweight system that's easy to set up and take down, and therefore can be available when the student needs to use it, and on standby when the student may or may not want to use it." [field tutor]*

> *"Travelling to more than one site meant that knowledge acquired could be used in more than one area; leading to better understanding of field techniques." [ERA student]*

Other students most closely involved with the ERA technology were those in the ERA student's project group, so it was important to explore how the technology impacted on them and their learning experience. None of those students found the technology distracting or felt that it interfered with their work:

> *"After the initial few seconds of oh there is a camera I forgot it was there, it was just another person." [project group student]*

> *"I was pleased with the way it wasn't too intrusive with the rest of the students and that some students used it to talk to me when I had a question from … [the ERA student] that I could relay to them, they seemed happy to talk to me using the headset" [field tutor]*

None of the tutors that were teaching the whole group of students felt that ERA distracted or interfered with their work during the field courses.

Group working and peer discussion are important parts of these field courses, but are also more generally important for social inclusion. One of the aims of the ERA approach is to enable students to take part in fieldwork experiences alongside their peers and the questionnaire responses showed an appreciation of this aspect:

> *"… the opportunity to work with other students, in an environment like Malham, is invaluable. Taking readings and interpreting data can be done on an individual basis but working in a group environment and having the opportunity to discuss ideas helps a great deal." [note taker]*

> *"Attending the residential gives students the chance to feel like part of a community and I believe that it is important for everyone to be able to experience that." [project group student]*

> *"… the technology was superb. It was very unobtrusive and certainly made it easy to include [the ERA student] in all the group activities. I felt that he was an integral part of the group, I hope he did too. It was very important to all members of the group that he felt included and able to make some very insightful and useful contributions to our discussions. I feel sure that without the technology this would not have been the case." [project group student]*

We also explored how the project group students interacted with the ERA technology. The students reported that they helped the ERA student by ensuring that what they were doing was relayed clearly through the video back to the ERA student and, where necessary, repeated some of what was said to ensure the ERA student heard and understood what was happening at the field site.

> *"Showing the camera what we had in our hands so [the ERA student] could see what we had found whilst having a discussion with the group as to what it was." [project group student]*

Interestingly, the process of selecting information to share with the ERA student and relaying it to him was recognised as useful in terms of reinforcing their own learning:

"In terms of interaction with the ERA, I hope that I helped the OU staff in ensuring that what we were doing was relayed clearly and, in doing so, repeated some of what was said. As we were learning the scientific names of the vegetation around us, I think this helped me, and perhaps others in my group, to commit them to memory." [project group student]

Using such technology in fieldwork isn't without problems. There were minor technical issues with using ERA in the field due to glare from laptop screens, wind noise on microphones interfering with the audio and occasional loss of video. However, these issues did not cause major problems with the fieldwork learning. The main teaching concern was the social aspects of how best to involve the student when he was remote from the group, and this was noted both by the field tutor and by other students:

"The main issue was facilitating [the ERA student] to participate in the group work - although I could show him what was going on in the field, the fast pace of group work made it difficult for me to involve him fully. This may just need more consideration of how this could be achieved better." [field tutor]

"It would have been nice if [the ERA student] could have contributed more to the plant discussions by perhaps someone asking any questions he had as he contributed when he was able to get to the quadrats we were studying." [project group student]

However, the overall use of ERA in these field courses was a success. The student completed the two field courses and afterwards stated that:

"Without ERA technology, my participation, inclusiveness and general enjoyment would have been lower." [ERA student]

Discussion: Socio-technical solutions for inclusive field courses

The ERA approach involves a combination of both social and technological interventions to improve the accessibility of field courses. This section discusses the issues raised by the comments and feedback presented in the previous section in order to identify the factors that contribute towards a sense of inclusion and the remaining areas of difficulty within these courses.

The students on each course came from all over the UK and in most cases did not know one another beforehand. The course designs emphasise group work: they require students to work effectively in teams to undertake their fieldwork. Afterwards, each student writes up the work individually in a report, which is assessed and contributes towards that student's overall course result. There is therefore an incentive for the students to work well together. The group dynamics are a primary concern for tutors and the importance of effective teamwork is underlined in the course text and in the guidance provided by the tutors.

In this case study the ERA student's group worked well together and the overall result was a sense by all of the students that the course was inclusive. Notably, the students themselves took ownership and responsibility to make it work. The ERA student commented on being a "contributor" rather than a "spectator", the other members of his group commented that he was an integral member of the group, and that he had made insightful and useful contributions. The level of active participation by all members of the group made the course inclusive in this case.

The presence of additional access technologies inevitably affects the learning context, but in this case the field tutor commented that it "wasn't too obtrusive". One of the students noted that after an initial surprise, the use of the camera was ignored. Another said that they tried to ensure that what they were doing was relayed clearly, and felt that this had benefited them and the other members of the group. The field tutor also commented that the students seemed to be happy to use the technology to discuss what they were doing with her and the ERA student.

Another important theme was flexibility, specifically, with regard to the optional use of the equipment and the adaptability of the field tutor. Although the field locations had been surveyed and plans were made for how to use the system for each activity, the students decided at each location what they were going to do and how they would do it. The role of the field tutor and educational technologist was to guide and facilitate their activities, but not determine them. The field tutor commented that it was helpful having the system "on standby when the student may or may not want to use it".

One area of difficulty that was not fully resolved was the pace of group work and the facilitation of discussion between all students. At the field locations the ERA student accessed directly, the impact of their speech impairment was minimised, but nonetheless repeating or clarifying his questions at times did affect the pace of the group's discussion. The field tutor commented that she found it difficult to involve the ERA student fully in some of the group activities remotely. Some of the visual communication cues that the students used when face-to-face were not well supported by the system. As noted previously, not every eventuality could be planned for, but two-way video calls had been used in previous courses and this may have been helpful in this context.

Conclusions: Reflections and recommendations

This chapter has explored inclusive fieldwork through the discussion of related approaches and a case study on the optional use of portable network and web technologies to support remote access to inaccessible field locations. An action-oriented approach has been used to develop and deploy the ERA (Enabling Remote Activity) system that involves students and tutors in a process of technology appropriation to support their active participation in distributed group work at field locations. In drawing together the comments and observations of the participants involved, the following conclusions are extended for others seeking to develop inclusive teaching practices facilitated through technology.

Unobtrusive simple technology

Minimising the negative impact of additional access technology can be difficult, but using tools in a way that foregrounds and facilitates the learning objectives of the course is critical to helping tutors and students engage with the technology and adapt their teaching and learning practices accordingly. When introducing the technology drawing comparisons with recognisable examples was a useful way of alleviating anxieties around technology failure. For example, the portable network was directly comparable to domestic WiFi routers that people use at home, the telephony service could be likened to Skype, and the video cameras were comparable to camcorders.

Flexibility of use and adaptability of teaching approaches

Maintaining an active and flexible approach to 'making things work' that focused on what people could do, rather than what they could not do, helped develop a sense of group responsibility and engagement. The positioning of the tutor and educational technologist as facilitators with relevant expertise, rather than instructors, helped create and maintain the student group's sense of autonomy. A major advantage of residential courses is that there are multiple opportunities to make things work, so the tutor can explore different ways of working with a group to help them make the most of their learning opportunities.

Active participation in groups and social inclusion

Working with the whole group, rather than individuals, helped engage everyone in the learning process. Within the courses' enquiry based learning activities, the students' agency and responsibility for the decisions made by the group contributed in this case to the success of the group work. Although technical interventions can be used to improve physical access to field locations, it is only through active participation that social inclusion can be achieved. Interestingly, this is not totally within control of the tutor or institution, they can create an environment that encourages participation, but it is the individuals that ultimately choose to engage (or not). Arguably, social inclusion is a shared responsibility and setting students' expectations around active participation is important in all group-learning contexts.

Preparation, expectations and hindsight

Finally, coordinating tutor and student preparation, and setting realistic expectations, is difficult. Hindsight is generally clearer that foresight. Every student that has used the ERA system has had an individual set of requirements and when a course is taking them to new and unfamiliar environments, their specific needs are difficult to predict. Where a course has been undertaken previously at a specific site, drawing on example cases and illustrative photographs or recordings can help tutors and students prepare for the course. Ultimately, the ERA approach combines elements of 'enabling' and 'responsive' approaches (Hall et al., 2002); the portable network and use of the communication tools are planned and prepared to meet a wide range of needs, but individual differences and day-to-day variations means that the tutor needs to adapt to meet all the students needs as they emerge.

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