Using technology and GIS in geography teaching

‘Despite living and working in a predominantly digital era, the age-old tradition of students developing and demonstrating knowledge, understanding and skills by writing on paper still continues.’ (David Rayner, The Handbook of Secondary Geography, p150)

- Refer to the trainee teacher webpages about Using technology in geography teaching.

The opening quote reassures us that technology has not yet completely taken over our classrooms. But we live in a digital age and it is important for a new teacher to use the potential of these technologies to help students learn geography. We are using the general term ‘technology’ to encompass terms such as ‘E-learning’ (electronic learning), ICT, computer-assisted learning – all descriptions that have been employed in the past. Whatever the term, technologies have an important role as a resource to support geography teaching and learning.

While the descriptive terms we use in education to describe this topic have changed, the technology itself changes even more rapidly. It is important to ‘futureproof’ your training, by focusing on the principles of how trainee teachers should employ good teaching practices in using technology, rather than on specific software and hardware. David Mitchell (Institute of Education) gives this advice to those training geography teachers:

‘I suggest the two key areas of a) evaluating e-learning and b) skills and techniques for using ICT, be kept clearly in mind, with the emphasis on evaluation. The rationale for this is that many e-learning resources and techniques will be provided by future schools and/or personal experience, and indeed some current resources may become quickly obsolete. But establishing a critical approach to e-learning is less certain to happen once in teaching posts, and best tackled at the beginning of a teaching career.’

When trainee teachers use technology in the classroom, they often take their ‘eye off the ball’ in terms of geography. They can be content with a smoothly managed lesson even if students are engaged in low level geographical activity. As a teacher trainer, you must make sure that all lessons have clear geography learning objectives – including those where trainee teachers are using technology. Good questioning, effective intervention and assessment of learning are as important in technology-based lesson as in all others.

Indeed, trainee teachers need to draw strongly on pedagogical understanding if they are to embed technology effectively in their teaching. They not only need to understand their subject, how to teach and how students learn, but in addition they need to understand how technology works and how it contributes to students’ cognitive development in both geography and technology subject understanding.

Involve school ICT coordinators (or technology managers) in supporting geography trainees in this aspect of the training. They can give trainees pertinent and practical advice on how to make best use
of the hardware and software available in their school. They can also explain how to get access to equipment and book computer rooms. They can advise on the use of the web, and particularly the school’s Internet safety policy. They can also advise trainees about the best ways to manage and organise classes when technology is used in lessons and make trainees aware of any conventions that are followed in the school. Trainee teachers should observe the ICT/computer staff teaching lessons so that they can see how these matters work in practice.

Suggested training activities

- Use the **ICT school-based task** developed by the mentors for the University College London Institute of Education PGCE, or adapt it for your scheme and the terms used e.g. ICT/digital technologies/e-learning.
- Lessons that make practical use of technology can provide excellent opportunities for collaborative learning because it is certainly a situation where two teachers can be beneficial. The trainee could assist in a mentor’s lessons, or vice versa.
- Discuss the suggestions in Shipman, K. 'Using ‘apps’ in the classroom' in **Teaching Geography** Spring 2014.

Discussion with trainee teachers

- How can geographical learning be supported by technology in ways that cannot be done with traditional resources?
- How can the use of technology raise the quality of geography and students’ performance (see Fred Martin’s article quoted on the trainee’s webpage)? Discuss this in the context of the lessons they have taught.
- Can the use of digital technology hinder learning?
- Is there a danger that using technology is ‘all gloss and no substance’? Have you seen evidence of this when you observed lessons?
- What issues face teachers in managing the use of smartphones and tablets in and out of the classroom? What is ‘acceptable’ and ‘not acceptable’ use by students?
- How can you ensure that your students critically evaluate the resources they obtain on-line or through social media?
- How might geography teaching change if/when you have 30 tablets at your disposal for student use?

What technologies should trainee teachers use? Where should they start?

Trainee teachers should explore the use of a range of different technologies. This **basic categorisation of E-geography opportunities** can provide a useful aide-memoire.

How early, and how much, trainees use technology in the classroom will depend on their confidence and competence, both as a teacher and a user of the technology. It is probably best for them to start with simpler applications both in terms of the software and the learning intentions. Encourage them to use software applications they are already familiar with, so they have confidence when using it with classes. They can adapt how they use these applications in several topics and with students of different ages. Trainees need to recognise how the use of technology can bring good geography to the lesson and not just use it for the sake of it.
Can ICT be used too much?

A common difficulty for a few trainees is that they get ‘hooked’ on using technology. This can even happen with trainees who need considerable persuasion to get started. When trainees get over any anxieties and begin to develop their expertise in preparing resources, they can sometimes let the ICT take over. They find that the use of powerful images, video clips and exciting presentations can hold students’ interest for lesson starters. They feel in control when their lesson in planned out using PowerPoint. Geography colleagues often praise their creative resources and are keen to use them. So, what is the problem?

Basically, PowerPoint is using high tech ‘chalk and talk’. While stimulating images and videos are good to use, they must not be allowed to replace teacher interaction and discussion. Is the trainee giving plenty of opportunity for students to talk about what they see or find out from the technology? If the answer is ‘no’, this is the root of the problem.

How might an ITE trainer tackle this situation? They could take a strong line and stop the trainee using the data projector and PowerPoint for a while – perhaps moving them to teach in a different classroom. But this does not address the root cause of the problem. The mentor needs to refocus the trainee on the students’ learning, pointing out any shortcomings in students’ understanding in his classes. It is important for trainees who have slipped into a reliance on ICT to support didactic presentations to re-consider how to create real learning. The mentor should discuss e-learning strategies that might be more effective and could refer the trainee to read Fred Martin’s article about raising achievement. The trainee teacher should be encouraged to look at how different methods of e-learning can be used to engage students in activities and work things out for themselves - perhaps using a spreadsheet or GIS application.

It is important that the trainee’s hard work and commitment to using the technology are not be devalued in the scenarios described above. Nor should the trainee be deterred from using imaginative visual resources. They should be encouraged to broaden their approach and not just get stuck with presentational applications. If other geography colleagues are using the resources the trainee has produced, but differently, with more opportunity for discussion and student talk, then the trainee should observe this.

Look at Simply Teaching in which an experienced teacher describes how she set about a whole day teaching when her technology failed. Her conclusions make good reading for a trainee teacher who is hooked on using technology.

Reading for ITE trainers/mentors (in addition to the trainee teacher readings)

- Martin, F (2006) e-geography – Using ICT in quality geography, Sheffield: Geographical Association. This book provides many ideas on classroom applications but is intended to stimulate thought about the pedagogy of using ICT applications. Some uncompromising views are presented with regard to criteria and expectations of standards in the subject to provoke debate.
Using geospatial technologies (including GIS)

- Refer to the trainee teacher webpages about Geospatial technologies/GIS.
- Refer to these PowerPoint presentations which offer useful resources for ITE trainers:
  - Enhancing lessons with ArcGIS Online by Raphael Heath (GA conference 2016).
  - Data, data everywhere but not a geographical thought to think? – a PowerPoint presentation by Mary Fargher at the 2017 GTE conference.

GIS is an important area to embrace in initial geography teacher education, especially since it now features prominently in the National Curriculum and the examination requirements for geography. Trainees need to have an understanding of geospatial technologies and the ways that these resources can contribute to students’ geographical learning. They also need to gain experience of the use of these technologies in the classroom so that they can build further on this in their NQT year and beyond.

Many recent graduates have studied courses in GIS during their degree, for example one wrote on their audit of subject knowledge:

‘I completed a module in GIS as an undergraduate and used graphical software during my PhD. I have experience of communicating my knowledge to a variety of audiences including 6th form students, my peers and senior academics.’ (PGCE trainee teacher)

If a trainee has a strong background such as this in GIS applications encourage them to exploit fully their expertise. They could provide some resources for their school geography department from the results of their exploration of classroom use.

However, many trainees do not have such experience and will need to develop their subject knowledge in this area. Explore how confident trainees are in their knowledge about GIS theory and software. If they are not, discuss with them ways to improve their subject knowledge as outlined on the trainee webpage and reassure them that many experienced geography teachers face this challenge too.

Trainees should introduce the use of geospatial technologies in their teaching gradually. They should be familiar first with the important role of maps in the classroom as a beneficial resource for learning. When you set expectations for individual trainees in using GIS, take account of their prior knowledge and refer to the activities outlined in the trainee webpage to set appropriate targets for them to achieve. They could begin with software such as Google Earth in lessons and move on to using a GIS package. They may also find it useful to incorporate some of the online resources through ArcGIS Online’s ‘Storymaps’ in their lessons.

Trainees should, at first, observe and co-teach GIS lessons. They need to recognise that these applications can be challenging for students because they demand high order thinking and this requires careful management by the teacher. Read the teachers comments on the trainee webpage about the use of GIS in enquiries and the participants’ reports of the Spatially Speaking project, which highlight some of the pitfalls and challenges that more experienced teachers have faced.

If a trainee is training in a school without access to geospatial technologies/GIS, try to provide an alternative experience for them. This could be a factor to consider in the choice of a second school. Arranging a visit to a school where GIS is well embedded into their curriculum, where trainees can observe lessons, explore resources and talk to students and teachers about their work, could additionally provide valuable experiences for trainees.
Since April 2017 ArcOnline has been available free to UK schools. Encourage the schools in the geography partnership to take up this offer so that the software will be available for trainees to use. ([https://schools.esriuk.com/sign-up/](https://schools.esriuk.com/sign-up/))

- Look at the Powerpoint by Nicola Walshe *Beyond a cookbook approach to GIS: Developing trainee teachers’ pedagogy and practice across a PGCE year* which reports on her experiences with trainees. This was presented at the 2017 GTE conference.

**Discussion with trainee teachers: GIS and learning**

You might find that a video is helpful to start your discussion. For example, *Using ArcGIS Online* includes a short video on how Dover Grammar School for Boys school use ArcGIS.

Some aspects of the use of geospatial technology with students to discuss when trainees have had some experience of classroom use of geospatial technologies are:

- What experiences do students have of these technologies in their everyday lives that can be built on in the classroom?
- Do these technologies introduce a ‘wow’ factor and release the ‘power of geography’ for students?
- How can overlays created using these technologies be used as a visual tool for helping students develop their spatial literacy?
- Is it true that these technologies allow students to ask questions about spatial relationships that simply could not be posed without a GIS?
- Which geographical skills are developed through using these resources?
- When reviewing trainees’ GIS lessons, ask: what did you want students to learn? How did geospatial technologies contribute to this? Could this have been achieved in other ways?

**References for ITE trainers/mentors** (in addition to the trainee teacher readings)


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