

Personal Digital Assistants (PDAs): the benefits, challenges and creative possibilities encountered by geography trainee teachers.

Mark Jones (with comments from reviewer)

Abstract

Mobile devices are now a part of everyday life whether it is mobile phones, media players or hand held computers. This small-scale study examines the extent to which secondary school geography trainee teachers made use of a hand held computer during their PGCE course. Each trainee teacher was allocated a university loaned Personal Digital Assistant (PDA) in order to assess firstly, its usefulness in supporting the trainee's organisation, learning and teaching during the PGCE course and secondly, the pedagogical potential of using PDAs with geography classes. After initial generic training on using a PDA, later workshops focused on mobile learning including the creation of virtual fieldwork tours and mediascapes. Data was collected via three online questionnaires and an end of course focus group to assess the trainees' use of the PDAs. Results show somewhat limited use of the PDAs during the PGCE course in relation to personal organisation and management of teaching and learning. Use with geography classes in placement schools was limited by not having class sets of PDAs; however, the potential value of PDAs for mobile learning in out-of-class situations was seen as a key benefit of this type of mobile device. Drawn from the data, a number of factors, which influenced the trainees' use of the PDAs, are discussed. These include the functionality of the PDA, the preferred familiarity of alternative digital hardware, the intensity of a PGCE course, the school and university environments. This work in progress raises important questions for teachers and teacher educators about how trainee teachers are introduced to and experience mobile digital technologies during a PGCE course.

Comment [IS1]: This level of detail might be better in the introduction?

Introduction

For the 'net' generation' of young people in our schools today the use of digital technology is a part of everyday life. Research into 7 to 18 year olds' digital lives by Green and Hannon (2007) suggests that using digital technology has been completely normalised by this generation. Working with such tech-savvy young people can present challenges for educators. One such challenge is for trainee teachers and teachers to be digitally literate, up to date with the increasing range of mobile devices available (Becta 2008). Mobile devices include mobile phones, Personal Digital Assistants (PDAs) and personal media players (Anderson and Blackmore 2004). This work in progress examines the use of PDAs, small handheld computers, by geography trainee teachers during their Post Graduate Certificate in Education (PGCE) course. The trainee teachers assessed two aspects of having the PDA: its usefulness in supporting their organisation, learning and teaching during the PGCE course and the potential value of PDAs for pupils' learning. Data collected throughout the year presents the trainee teachers' views on the PDA functionality, the factors affecting their use of the PDA and the potential of PDAs or similar mobile devices to support teaching and learning.

Finally, how teachers and teacher educators support trainee teachers' developing confidence and competence with mobile technologies is considered.

PDA's

There is a growing literature base evaluating the use of PDAs in schools, colleges and higher education in the UK (Perry, 2003; Becta, 2004; JISC, 2005; McFarlane et al, 2007; Hadfield et al, 2009). Increasingly, trainee teachers are encountering the use of PDAs and other mobile devices in schools and therefore it is important that they can identify and critically evaluate potential benefits for teaching and learning. Research into the use of PDAs in primary and secondary schools has shown their value in supporting teachers in workload management and the organisation of information; however, it is less conclusive about the value of mobile devices for teaching and learning (Perry, 2003). Exploring the pedagogic value of schools' students using PDAs includes large scale studies such as 'The Learning2Go' initiative in Wolverhampton which has funded the trialling of thousands of handheld devices in schools at all key stages since 2003. The most successful applications of handheld devices are seen through case studies which describe how teachers have changed their pedagogic practice (Learning2Go, 2007). McFarlane et al (2007) identified three main ways teachers in schools are using mobile devices: teacher-directed activity, teacher-set activity and autonomous learning activity. In any learning situation there is the potential for one or all of these types of activity to occur. In further and higher education PDAs have been seen to be valuable in encouraging learning where technology is not usually accessible (JISC, 2005).

In schools, PDAs offer opportunities for innovative practice in geography lessons, both in the classroom and in out-of-classroom learning. PDAs can be used to Bluetooth files between devices and carry out internet research for geography classwork and homework (Thawait, 2009). PDAs have been successfully used in the e-scape project as part of GCSE controlled assessments, being used by GCSE students both to collect data in the field and back in the classroom under controlled conditions to record their responses (Martin and Lambert, 2008). Where teachers have successfully utilised commercially produced Geographical Information Systems (GIS) software with PDAs, this has had significant impact on learners' engagement during fieldwork and in follow up lessons in school (Dunn, 2007). Benefits of using mobile devices for fieldwork include the speed and accuracy of data collection whilst developing students' ICT skills (Steward, 2005). PDAs can also support virtual fieldwork in the **school grounds** including exploring personal geographies at KS2 & KS3 (Battista, 2008).

If trainee teachers are to critically engage with the pedagogic potential of new mobile digital technologies, then Initial Teacher Training (ITT) courses in partnership with placement schools need to provide this opportunity. The Training and Development Agency (TDA) notes that while hardware and **internet access has risen in schools**, developing classroom practice and improved outcomes has been slower (TDA 2004). Through continuing ICT funding opportunities for ITT providers, the TDA aims to support trainee teachers' engagement with

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Comment [IS2]: And beyond?

Comment [IS3]: There are also issues of quality of service, restricted access etc which limit the potential of computers/internet. And there are concerns about the negative effects of computers on children – health risks etc

The point I am making is that it all sounds 'very matter of fact' – new technologies have much potential – which they have, but it would be useful to take a step back and look at the bigger picture. It would only take a sentence to do this.

new technologies. The final report evaluating the impact of funding showed that during 2006-2007, some 13,222 trainees were involved in or beneficiaries of TDA funded ICT projects (Hadfield et al, 2009, p.3). Whereas approximately 74% of respondents in the final report were involved in projects with laptops and tablet PCs, only 18% responded as being involved in projects with PDAs. However, recent small-scale research has analysed how trainee teachers are engaging with PDAs. In a study of 14 science trainee teachers who were loaned a PDA throughout their PGCE year, having instant access to the internet for searching information at anytime, accompanied by the organisation tools of a PDA were identified as beneficial functions (Wishart et al, 2007). A further study of 7 Modern Foreign Languages (MFL) trainee teachers established that while the trainee teachers could see the potential usefulness of a having a PDA, the socio-cultural context of the schools and MFL departments were a significant factor in the restricted level of use (Wishart, 2008). This work in progress will contribute findings from 12 geography trainee teachers' use of PDAs as part of their 2008-2009 PGCE course.

Research method

The 2008-2009 cohort consisted of 12 geography trainee teachers, all of whom agreed to participate in the study exploring the potential of PDAs for supporting learning and teaching. They completed an online questionnaire before signing an acceptable use policy, which also outlined the rationale for the study. Each trainee teacher received a university loaned PDA for the duration of the remaining 33 weeks of the PGCE course. Immediately following the completion of the initial questionnaire, the trainee teachers received a two-hour hands-on workshop. In this workshop, they were shown the basic functions of the PDA, how to use the accompanying cradle required for charging and then given time to explore the different functions. The PDAs used a Windows mobile operating system with which all trainee teachers were familiar. A number of geography specific university ICT workshops occurred later in the course focusing on using the PDAs in out-of-class learning.

Two further online questionnaires occurred after the completion of the two school placements in January and June 2009. These included questions with single and multiple-choice answers, rating scales and opportunities to type unrestricted responses to more open questions. In June 2009, one semi-structured focus group explored emerging themes concerning the trainees' use of the PDAs.

The PDA used in this study was a HP ipaq hw 6910. It used a Windows mobile operating system (word, PowerPoint, excel spreadsheet, calendar, diary, organiser, note scribing), had Web browsing capability via wi-fi connectivity, Bluetooth connectivity (for file sharing), a photosmart camera with digital photo and digital video capability and built-in Global Positioning System (GPS). The built-in GPS had been an attraction of this particular model over others. Mobile phone connectivity could have been utilised if wanted, however no trainee teachers used the PDA as a mobile phone, preferring to use their own models and existing www.geography.org.uk/geoged

Comment [IS4]: About?

Comment [IS5]: how was the focus group was organised? How many meetings?

networks. Each PDA came with a cradle for recharging and an instruction manual. A PDA requires another laptop or PC to synchronise or 'synch' thus through 'synching' it was possible to exchange data between devices.

Research findings

Prior to receiving the PDAs, trainee teachers completed an initial questionnaire which included questions to elicit their perception of the functionality and pedagogic potential of PDAs. All expected internet connectivity via the mobile device with the majority knowing about or expecting a PDA to have applications similar to a mobile phone (see figure 1).

Comment [IS6]: Would subheadings and the themes identified give this section a better structure?

Figure 1: Questionnaire results to question 2 (September 2008).

Q2: Which of the following functions do you think you can carry out on a PDA?	Response Count
Access the internet	12
Take photographs	9
Make voice recordings	11
Take video	9
Locate position using GPS	8
Bluetooth enabled	10

Question 3 assessed the trainee teachers' confidence with particular ICT applications of fixed and mobile technologies. Trainee teachers are often experienced users of ICT (Wishart et al 2007; Wishart 2008). However, in addition to being experienced with home and work/university personal computers, the results showed that a significant number of the geography trainee teachers were confident or very confident in performing functions on mobile devices (see figure 2).

Figure 2: Questionnaire results to question 3 (September 2008).

Q3.How confident are you in performing the following ICT activities?					
ICT activity	Not confident	Some confidence	Confident	Very Confident	Total
Access the internet on a mobile device	2	2	6	2	12
Access the internet via Wi-Fi	1	3	6	2	12
Record images and audio onto a pc	0	6	5	1	12
Record images and audio	1	4	6	1	12

onto a mobile device					
Share files e.g. upload and download images/audio	0	5	5	2	12
Share files via Bluetooth	1	2	6	3	12

It is likely that future cohorts of trainee teachers will use mobile devices as a normal part of the way they work at university, in school and to organise their social lives (Green and Hannon, 2007). However, despite the trainee teachers perceiving themselves as confident users of ICT involving mobile devices they were unsure of a PDA's pedagogic potential (see figure 3).

Figure 3: Questionnaire results to question 4 (September 2008).

Q4. During your PGCE course how useful, do you think having a PDA will be in relation to the following?						
	Unsure at this point	Not useful	Limited use	Useful	Very useful	Total
Recording your personal journey over the 36 weeks.	9	0	2	0	1	12
Sharing resources PGCE student to PGCE student.	10	0	1	1	0	12
Sharing resources PGCE student to pupil.	11	0	1	0	0	12
Sharing resources pupil to pupil.	12	0	0	0	0	12
Recording pupils' work.	9	0	2	1	0	12
Recording pupils' progress.	12	0	0	0	0	12
Fieldwork and outdoor learning.	9	0	2	1	0	12

This shared uncertainty is perhaps not unexpected at the start of an ITT course. since the first three weeks are very intensive and the trainee teachers have not started the first school placement. In addition, the timing of the workshop had been a conscious decision taken by the group tutor to introduce other elements of the ITT course before focusing on the research project, leaving the PDA workshop to the end of the third week. As one trainee teacher explained

"When we had the workshop I was very tired and all I could think about was going into school on the Monday I couldn't see any benefits of having it [the PDA], it

would have been better to have set tasks on using it [the PDA] early on when we were fresh.”

Trainee B.

Once the trainee teachers were in school, their use of PDAs was somewhat restricted. Early uses involved note-taking, trialling the use of the camera and video camera during fieldwork and for taking ‘on the spot’ records of classrooms and pupil work. In the first school placement, only two of the twelve trainees made significant use of the PDAs.

“I have used it to scribe notes during lesson observations, to take pictures of the re-organisation of the classroom, used the GPS and games coming out of W-S-M [Weston Super Mare] at the weekend and other personal use.”

Trainee C.

“Yes I have used it [the PDA] to take some images of the school I am in and the classroom displays I took some pupils work but the images are not that great.”

Trainee A.

Other trainees limited their use of the PDA to fieldwork and out-of-class learning.

“I have only really used the PDA when I went on the two field trips we had I took photographs and some video clips and then transferred them onto my laptop when I got home ...”

Trainee G.

During the first school placement the trainee teachers who used their PDAs did so mainly for recording evidence of the school environment and learning outdoors. However, the majority of trainee teachers made limited use of the PDA during this time. For many of the trainee teachers it quickly became apparent that the mobility afforded by the small size of PDAs was also a limiting factor. The size of the small screen and use of the stylus to navigate the screen keyboard was proving problematic.

“The screen is tiny I’ve seen others where the screen is full size you have two keyboards which has cut down the screen size on this one I tried to open the webpages but found them difficult to see so gave up on that one ...”

Trainee F.

“I intended to use it but it was too fiddly ...”

Trainee E.

For other trainees the perceived reliability of the PDA became an issue.

“... size of windows screen-quality can not switch off-therefore charging a problem
.... couldn't get GPS to work for a long time.”

Trainee K.

“GPS not working and problems with battery.”

Trainee H.

“The technology often lets you down.”

Trainee E.

The applications the trainee teachers most wanted to use on the PDA were the video and camera; however they were quick to make comparisons with the quality of images afforded by their own mobile phones and digital cameras.

“My mobile phone has a better digital camera and video recorder so I used that on the field trip.”

Trainee K.

With only a 1.3 megapixels camera, the quality of the images and video became an issue if the images were to be presented in another form, for example to play back in class or use in a PowerPoint presentation. Trainees continued to use their own digital cameras and mobiles for taking images; in fact throughout the year it became clear that trainees continued to use other digital technology they possessed in preference to the PDAs.

“I use my mobile phone on fieldtrips and my laptop in school and at home for lesson preparation.”

Trainee K.

“It [the PDA] is another piece of equipment; I am using others; laptop, mobile phone, paperwork all these need integrating.”

Trainee H.

“A computer/laptop is much more crucial than a PDA, they essentially perform the same functions but a PDA is too fiddly, time-consuming and unfamiliar.”

Trainee E.

In addition to making choices about which types of technology were more accessible and easier to use, a number of the trainee teachers identified needs relating to their developing teacher identities. Developing confidence in the classroom and coping with the intense

workload of a PGCE course were two aspects identified as more important than learning to use another mobile device.

“... confidence. My main focus is to build my confidence teaching a class and then hope to bring PDAs in at a later stage.”

Trainee A.

“ I felt there hasn't been enough time for me to use the PDA Other time pressures in school.”

Trainee E.

“ ... was going to use it more when we were back at uni [university] but we had the Masters assignment and that took over.”

Trainee F.

Trainees who made little use of the PDA also commented on the extent to which schools were or were not using mobile technologies in their curriculum and school organisation.

“Not widely used in schools It's difficult to use in a class setting with just one.”

Trainee C.

“The schools I have been placed in are quite traditional and the support would not have been there for using something like a PDA.”

Trainee D.

“I didn't use it [the PDA] for notes or the diary; I used the school planner given me I felt part of the department and school, so when I was in the staff room and somebody asked me if I could go to a meeting or we could meet to discuss something I just wrote it down.”

Trainee H.

The trainee teachers made limited pedagogic use of the PDAs with the exception of fieldwork and out-of-class learning where half of the group felt that the PDAs had been useful (see figure 4).

Figure 4: Questionnaire results Question 1 (February 2009)

Q1. During your PGCE course, how useful has having a PDA been in relation to the following.						
	Unsure at this point	Not useful	Limited use	Useful	Very useful	Total

Recording your personal journey over the 36 weeks.	0 (9)	6 (0)	6 (2)	0 (0)	0 (1)	12
Sharing resources PGCE student to PGCE student.	0 (10)	8 (0)	4 (1)	0 (1)	0 (0)	12
Sharing resources PGCE student to pupil.	0 (11)	10 (0)	2 (1)	0 (0)	0 (0)	12
Sharing resources Pupil to pupil.	1 (12)	10 (0)	1 (0)	0 (0)	0 (0)	12
Recording pupils' work.	0 (9)	8 (0)	3 (2)	1 (1)	0 (0)	12
Recording Pupils' progress.	0 (12)	9 (0)	2 (0)	1 (0)	0 (0)	12
Fieldwork and outdoor learning.	0 (9)	1 (0)	5 (2)	5 (1)	1 (0)	12

Note: The September 2009 responses to the question - *During your PGCE how useful do you think having a PDA will be in relation to the following* are given in (brackets) for comparison.

The positive response to the value of the PDA in supporting fieldwork may have been influenced by having two structured workshops at the university in January 2009. One workshop explored the benefits of using the GPS and taking images during fieldwork, then using freeware COPIKS Photomapper to add geographical identification including latitude, longitude and altitude to the digital images, a process known as 'geo-tagging'. The images were then imported in to Google Earth to create a virtual fieldwork tour. Geography teachers have been quick to utilise Google Earth creatively in their teaching (see Jenkins, 2006). The PDA negated the need for a separate GPS device and digital camera however this would have achieved the same effect. A second workshop focused on the creation of mediascapes. A mediascape is a series of images, sounds and video, which can be attached to specific co-ordinates or an area. Using the PDA to explore different zones in an outside location, the data files can appear manually or automatically providing a resource-rich experience of place.

"Using the PDA has been limited to university sessions like the mediascape and Google Earth maps. I have not experienced the use of PDAs in either placement schools."

Trainee D.

"That one where we added hotspots and found them walking around outside I think that could bring anywhere in the world onto the school site for pupils to learn about."

Trainee F.

By the end of the second placement whereas a significant number of the other trainees had now completely stopped using the PDAs, one trainee continued to use her PDA both in school and in her social life.

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“I still use the PDA for note taking, playing games ,... internet when out, GPS around Bristol.”

Trainee C.

However, the June 2009 questionnaire revealed that the remaining 11 trainee teachers were making minimal or no use of the PDAs in school. Responses reiterated inhibiting factors, mainly the intensity of the PGCE course and the preferred use of familiar equipment such as laptops and mobiles for organising and managing workloads.

“Perhaps being set tasks that we had to complete on the PDAs would have stopped them from getting left in the box for 28 weeks.”

Trainee J.

“Everything I do is on my laptop and I just plug in video and camera if I want to transfer files...”

Trainee E.

“A lack of time and a diary has meant that they [PDAs] have very much taken a back seat. Even a video camera or laptop would have been put to better use in the classroom.”

Trainee J.

The trainee teachers, while making limited use of the PDAs, could still see the potential value of PDAs for supporting pupils’ learning in geography, particularly if there were class sets for fieldwork and out-of-class learning, recoding pupils’ work and pupils’ progress (see figure 5).

Figure 5: Questionnaire results: Question 1 (June 2009)

Q1. During your PGCE course, how useful could having a PDA been in relation to the following.						
	Unsure at this point	Not useful	Limited use	Useful	Very useful	Total
Recording your personal journey over the 36 weeks.	0 (0)	3 (6)	5 (6)	3 (0)	1 (0)	12
Sharing resources PGCE student to PGCE student.	1 (0)	4 (8)	4 (4)	3 (0)	0 (0)	12
Sharing resources PGCE student to pupil.	1 (0)	6 (10)	3 (2)	2 (0)	0 (0)	12
Sharing resources pupil to pupil.	1 (1)	5 (10)	5 (1)	1 (0)	0 (0)	12
Recording pupils’ work.	0 (0)	2 (8)	5 (3)	5 (1)	0 (0)	12

Recording pupils' progress.	0 (0)	2 (9)	4 (2)	6 (1)	0 (0)	12
Fieldwork and outdoor learning.	0 (0)	0 (1)	3 (5)	5 (5)	4 (1)	12

Note: The February 2009 responses to the question - *How useful has having a PDA been in relation to the following* are given in (brackets) for comparison.

However, such potential use of the PDAs to support learning was not being realised in the placement schools. While Interactive Whiteboards (IWBs) and laptops were commonplace, PDAs were less visible. This lack of class sets of PDAs became a major constraint for the trainee teachers.

"It is hard when you are the only one with the PDA, if schools had whole sets and everyone was using them then it would be a case of fitting in but I didn't see that in school not many of us did."

Trainee K.

"I understand that they [PDAs] can be useful however having one PDA inhibits their usefulness in a classroom of 30 young people. "

Trainee J.

"I know the benefits of ICT and want to introduce this in my teaching but in some schools it is still quite traditional."

Trainee A.

However, despite the invisibility of PDAs in school placements, the trainee teachers recognised the need to become familiar with mobile learning.

"Geography teachers need to be confident in new IT use like PDAs and it does need to be integrated again although this varies once in schools it is still useful to be ahead of your school in terms of IT."

Trainee D.

The trainee teachers suggested ways to overcome some of the challenges they had experienced with using the PDAs. Suggestions included exploring integration of devices could encourage greater use of PDAs for personal management and organisation during the PGCE course. Having class sets in placement schools would have enabled exploration of learning with PDAs in geography. As well as the school context, several trainee teachers referred to the university's role in supporting their engagement with mobile technologies. Trainee teachers referred both to the number and nature of practical ICT workshops.

Comment [IS7]: In some respects these are rather 'formalised' categories when thinking of pedagogy – did the student teachers suggest other ways the PDAs could support teaching and learning – either during workshop sessions or during the focus group discussions? Or the questionnaires – if any of the questions focused on this? It would be useful to know – and **stated either way** i.e. yes they came up with other ways in which the PDAs could support pupils geographical learning – and details of the ways OR not they didn't

“It would be better with more structured lessons on how to use the PDA and possible ways of overcoming various problems e.g. camera not working, GPS signal not working.”

Trainee D.

“Learning ICT is heavily reliant on efficient and effective demonstration. It is time consuming and some occasions students randomly wander sites, neglecting the aim of the task – they need to have to produce something so they stick with the task”

Trainee B.

Comments also related to the transferability of learnt ICT skills to the school context.

“All the ICT sessions we have here [university] I can quickly see how to learn how to do something like moviemaker, the animations and I can use it in my teaching but with the PDAs it takes a long time to learn about them.”

Trainee K.

Other comments related to how ICT is modelled and embedded in practice at the university, for example through teaching and potentially in assignments.

“the lessons [ICT workshops] which we received were excellent but perhaps more were needed or indeed integrated into assignments.”

Trainee D.

“...perhaps if we used the PDA all the time and it was modelled more like the other things we do I may have used it more”

Trainee K.

The trainee teachers’ final comments raise interesting questions about the nature and range of university ICT sessions and the extent to which trainees experience effective use of ICT during university-based ITT.

Commentary

This study set out firstly, to examine how useful PDAs would be in supporting trainee teachers’ organisation, learning and teaching during the PGCE course and secondly, the potential value of PDAs for supporting pupils’ learning in geography. The majority of the trainee teachers made limited use of the university loaned PDAs to support their progress during the PGCE course. While PDAs can be useful for teachers’ management of their workload in schools (Perry, 2003), the geography trainee teachers preferred the familiar organisation and management systems of their own mobiles, but also paper-based approaches such as diaries and school planners. However, all the trainee teachers used the www.geography.org.uk/geoged

PDA's digital camera for taking photographs and video at different points during the PGCE course. The majority of trainees used the PDA's digital camera for recording fieldwork, school trips and examples of pupils' work. Half the trainees recognised the latter as potentially useful for monitoring pupil progress. In relation to the potential value of PDAs for supporting pupils' learning in geography, the trainee teachers recognised potential, despite the invisibility of PDAs in the placement schools. This lack of class sets of PDAs in the schools meant that learning with sets of PDAs was restricted to the university-led workshops. In one workshop, all trainees successfully used the PDA's digital camera with GPS for creating virtual fieldtrips using Google Earth. A second workshop enabled the majority of trainees to explore mediascapes and despite some technical problems create their own 'work in progress' mediascapes. The trainee teachers were particularly positive about the pedagogic potential of PDAs for supporting learning in geography in out-of-class contexts.

Comment [IS8]: Did they use them to support pupils' geographical learning in any way?

Comment [IS9]: How? Such information would be useful.

Wishart et al (2007) highlighted four main factors, which affected the 14 science trainee teachers' use of PDAs in their study.

- the socio-cultural context of the school environment;
- the pressure of work on a PGCE;
- other hardware availability;
- and certain 'killer applications, that is software applications that are so useful or desirable that they prove the value of the technology it runs on.

(Wishart et al 2007, p.106)

A number of factors emerged in this study, which affected the 12 geography trainee teachers' use of the PDAs. These factors should not be viewed in isolation, but are interrelated and were often working together when trainee teachers were making decisions about the use of the PDAs. Several of these factors resonate with factors in the study by Wishart et al (2007).

- the PDA; its ownership, functionality and educational potential
- preference for using alternative mobile technologies
- the intensity of a PGCE course
- the school context
- the university context

Early on, it emerged that the trainee teachers viewed the PDA as 'another piece of equipment' to become familiar with, some being reluctant to engage fully with a second mobile device (Traxler and Riordan, 2003). The functionality of the PDA was seen as problematic (Trinder et al, 2005). The trainee teachers found the small screen size frustrating to use, particularly when viewing spreadsheets or navigating webpages; the GPS required time for the location of satellites to be fixed and the quality of digital images and video restricted their use for certain teaching purposes. Maintaining enthusiasm for using a PDA

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when students encounter problems in using them is difficult (McFarlane et al, 2007). Most mobile devices are devised for business use and not education (Ally, 2009). The PDA used in this study was essentially a 'mobile messenger' more suited to personal business organisation than pedagogical concerns.

Investing time was problematic during the busy PGCE course. The trainee teachers were more comfortable with the tried and trusted functionality of their own mobile devices including laptops, digital cameras, mobile phones and smart phones. There is a growing trend for young people to have ownership of multiple technological devices, for example multitasking with laptop, mobile phone and MP3 player (Becta 2008). This applies equally to new cohorts of trainee teachers with laptops, in particular, being part of a trainee teacher's "emergent professional identity" (Hadfield et al, 2009, p.32). This preference for using other hardware and mobile devices over the PDA perhaps is not unexpected with laptops and data projectors commonplace in schools while PDAs are less visible.

A 36-week PGCE course is very intense. Trainee teachers prioritised workload demands placed upon them in school and in university over familiarising themselves with the PDA. In university, priorities included keeping up with readings and successfully meeting assignment deadlines, particularly assignments with Masters level credits. In schools, trainees focused on the day-to-day responsibilities of lesson planning and preparation, teaching and assessment. For many, establishing their emerging teacher identities in the placement schools was more important than persevering with the potential of the PDA to support and manage this workload.

The school context is a significant factor influencing the use of ICT in schools (Gado et al, 2006; Wishart et al, 2007; Wishart, 2008; Hadfield et al, 2009). In the placement schools, the trainee teachers reported an invisibility of PDAs, with one exception (see Battista, 2008). The trainee teachers could see pedagogic potential for using PDAs in geography; however, they identified the lack of class sets of PDAs in the placement schools as limiting their potential use for supporting learning. The nature and status of different ICT in school can affect the level of engagement by trainee teachers with these technologies. Whereas laptops and IWBs are commonplace, PDAs are limited to a smaller, but growing number of schools; often funded through Local Authority projects (see Wolverhampton's Learning2Go). This lack of class sets of PDAs may not have been such an issue if school students were allowed to use their mobile phones for learning; however, restrictive policies in schools militated against this.

The university context emerged as a further factor affecting the trainee teachers' perspectives on the value and use of the PDAs. Whereas certain ICT was seen as accessible in schools and could readily support teaching geography, the trainee teachers were less convinced about the PDAs. The trainee teachers experience different ICT through university taught sessions. How ICT is embedded into a PGCE course is often negotiated by geography tutors

and ICT technical colleagues who run generic workshops. The trainee teachers in this study benefited from weekly ICT sessions, co-planned by the geography tutor and ICT colleagues. However, the timing of the PDA workshop may have influenced the trainee teachers' initial use of the PDAs, occurring days before the start of the two-week school placement. This afforded little time for informal familiarisation or time to play, which is important (McFarlane et al, 2007). Students and teachers need to become confident in using new technologies and have sufficient time for familiarisation with access to comprehensive information and support is very important (Becta 2004).

How ICT is introduced to trainee teachers during ITT is very important (Becta, 2003). Although the use of the PDA was demonstrated in workshops, the geography tutor did not model its use. Whereas the use of IWB, moviemaker, creating animations and applications of GIS were modelled, the PDA was not. Lack of confidence of some tutors and trainers has been identified by Hadfield et al (2009) who recommend auditing both trainees and trainers' ICT skills to examine the level of match, before providing professional development through mentoring and coaching. Should teacher educators learn the technical aspects of using and teaching with new digital technologies, something emphasised by Borko et al (2009)? The trainee teachers in this study attached a 'digital value' to the different ICT skills they were learning. The ease with which learning activities could be created was important to the trainee teachers, suggesting hierarchical value in terms of usefulness now and in the future. Where ICT skills were quickly acquired, this allowed time for more critical reflection. Mishra and Koehler (2006) argue that the use of technology requires teachers to have a complex, situated form of knowledge, which they conceptualise in the framework of Technological Pedagogical Subject Knowledge (TPACK). The ability of trainee teachers to evaluate new and emerging forms of digital technologies critically is crucial according to Mitchell (2007).

Conclusion

It is clear that some aspects of the geography trainee teachers' experience of using PDAs resonates with that of science trainee teachers (Wishart et al, 2007) and MFL trainee teachers (Wishart, 2008). However it is not possible to generalise from such small scale studies. The geography trainee teachers were reluctant to take on additional mobile technology, preferring to use an existing range of technology (mobile, digital camera, laptop), Despite the limited opportunities in school and university to use class sets of PDAs, the trainee teachers could see the creative benefits of mobile learning for out-of-class learning.

With digital technology increasingly shaping learning in schools, it is important to constantly review how ITT prepares trainee teachers for such a future. Building on basic auditing of ICT skills and familiarisation with new technologies, trainee teachers must critically engage with ICT innovation and practice. Trainee teachers need to develop a more critical digital literacy, both as a consumer and in terms of creative productivity. Developing this ability to critically analyse how digital technologies (re)present geographical concepts and content will be vital in www.geography.org.uk/geoged

Comment [IS10]: Delete 'however' beyond this,

schools of the future. **Knowing** how to create a mediascape may prove digital competence (Martin, 2009) but there is also a need to recognise that mediascapes involve '(re)construction, expression and communication of deeper meanings associated with a sense of place' (Loveless et al 2007, p.3).

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How and where teachers and **teacher educators** provide opportunities for trainee teachers' to develop confidence, competence and critically engage with mobile technologies is important. Trainee teachers require modelling and practice both during ITT and through continuing professional development if mobile devices are to be used productively as part of learning and teaching (Naismith et al, 2004). Examining the ICT repertoire that trainee teachers are exposed to during ITT, both in schools and at university is essential if teachers are 'to become confident pedagogical innovators with new technology' (Becta 2008, p.21).

Comment [IS12]: So what comes next for Mark – any further research? What going to do next with his student teachers?

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