

Using Personal Digital Assistants (PDAs) with Internet Access to Support Initial Teacher Training in the UK

Jocelyn Wishart¹, Angela McFarlane¹ and Andy Ramsden²

¹ Graduate School of Education, University of Bristol, UK

² Institute of Learning and Research Technology, University of Bristol, UK

Corresponding author: *j.m.wishart@bris.ac.uk*

Abstract:

Fourteen initial teacher training students studying to become science teachers have been given internet enabled PDAs in a pilot study to assess whether PDAs have the potential to support them in their own teaching and learning, and in their role as trainee teachers.

Initial use of the devices was high, we recorded many positive impressions and the devices were well used. Several applications, in particular the use of the calendar, task list, email and internet search facilities were found to be supportive by the teacher trainees to both their teaching and learning. Other successes were bespoke software programs to record attendance, grades and behaviour, to perform scientific calculations and to provide information from the periodic table of elements. At this point in the course the trainees were moving regularly between school - for observation and teaching practice and university - for subject teaching and reflective discussion sessions.

However, for nearly all the teacher trainees, use of their PDAs dropped during the main 12 week block of teaching practice when they are placed in schools full-time. Some trainees reported that under pressure of time and workload they reverted to use of paper and pen to organise themselves and plan their teaching. Also some schools are unsupportive of the need to synchronize PDAs with a desktop PC to copy trainees' presentations and worksheets to the school network.

In this paper the authors will highlight sociocultural issues arising from the role of the initial teacher trainee and their school context and discuss how their situation impacts upon their freedom to explore how a PDA can support them as they develop as a teacher.

Introduction:

The increasing use of PDAs by legal and medical students in the US (Manhattan Research, 2002) suggests that where professional training requires access to sizeable quantities of information, a PDA can deliver information directly to the individual as and when required.

The one year science teacher training course in the UK, the Postgraduate Certificate of Education (PGCE) is particularly information heavy. It also requires the students to spend 24 of the 36 weeks of the course in a partner school rather than in the University making access to conventional information sources for students such as the library difficult. In particular, initial teacher training (ITT) students need access to the documentation of the various UK statutory requirements for schools including the National Curriculum and Qualifications and Curriculum Authority (QCA) Schemes of Work and information to supplement their subject knowledge such as science data and teaching resources. Then there is the documentation associated with being on a PGCE course such as timetables, assessment guidance, pupil mark books, lesson observation and lesson plan proformas. Our students are currently supported via a virtual learning environment (VLE) with discussion groups, PGCE documents and links to teaching resources that can be accessed on any computer linked to the internet. However, finding a computer in the teaching practice school, getting logged on and finding media on which to store downloaded information makes regular use of this system very difficult.

Previous research such as the Becta Project, PDAs in schools, (Becta, 2003) reported a recognition of the real value of handheld computing devices for teachers in English schools. Their most positive indicator showed that PDAs offer considerable potential to make teachers' management and presentation of information more efficient. One Science teacher noted "I would never willingly go without one now; it is my instantly accessible

encyclopaedia, thesaurus, periodic table, diary, register/mark book, world map and even star chart!'. A US teacher is on record as noting that PDAs are particularly useful for managing grading (<http://teachers.net/mentors/software/topic989/1.21.04.13.35.50.html>) confirmed by a UK teacher at http://www.handheldlearning.co.uk/index.php?option=com_content&task=view&id=12&Itemid=1. Additionally, an evaluation study carried out with undergraduates at the University of Bristol (Ramsden, 2003) found that web content including course documentation, course announcements, email and discussion boards were all accessed successfully from the University's VLE, Blackboard, via an internet-capable PDA.

Thus it appears that there is likely to be considerable potential benefit to a PGCE Science student from having personal access to a PDA, allowing them to access information wherever and whenever they need it. Whilst technical issues such as battery life, reformatting documents for a small screen and synchronisation of the PDA with a base station can make life difficult for the PDA owner, their potential as an electronic book, as a source of dedicated science software, as an interface to the World Wide Web especially via a course linked VLE, as a store of previously recorded pupil data and as a communications device for emailing peers and tutors stands out. The communications capability of the PDA is the key feature in this context.

In order to identify where and to what extent these potential benefits can be realised with the current generation of PDAs and what factors have to be in place in order to realise that potential, fourteen PGCE science students on the teacher training course at the University of Bristol were given handheld computers with mobile phone connectivity and cameras to take with them on teaching practice. As one aspect of the study was to prepare for variety in individual ownership of PDAs amongst students arriving at the university a range of handheld computers was supplied. The project itself was funded jointly by the Teacher Training Agency (TTA) for England and the Graduate School of Education at the University of Bristol.

Method

The 14 PGCE Science students were given either a Windows Pocket PC or a Palm OS based handheld and four hours of training in its use. During this training they were informed that the PDAs have the potential to support them in:

- accessing the VLE (Blackboard) discussion groups and email;
- accessing course documentation (on PDA or via Blackboard or via synching);
- just in time acquisition of knowledge from the web;
- acquisition of science information from e-books and encyclopaedias;
- delivering accurate figures for scientific constants and formulae;
- organising commitments, lesson plans and timetables;
- recording and analysing lab results;
- recording pupil attendance and grades;
- photographing experiments for display and reinforcing pupil knowledge;
- maintaining a reflective web log (blog) that will allow them to record lesson evaluations and other reflections on their teaching.

The students were chosen from volunteers from the PGCE cohort of 55, all of whom had a home PC, by selecting randomly from a stratified sample in order to create a mixed group: 4 biologists, 5 chemists and 5 physicists including 6 males and 8 females. Their teaching practice schools were sited over a wide area from South Wales to Somerset and included private as well as government maintained schools.

Students received PDAs chosen from the range then available in the UK that could deliver web browsing via the internet, email, SMS texting, word processing, spreadsheet management and picture messaging. The researchers wished to compare platforms so these comprised 4 Tungsten Ws running Palm OS 4 and 2 Treo 600s running Palm OS 5 and 5 Qtek 2020s and 3 i-mates (both the latter are SIM free XDA II clones running Pocket PC 2003). Mobile phone connectivity via GPRS was supplied by Vodafone as it had proved a reliable service provider in a pilot test. The PDAs were supplied with aluminium protective cases and screen protectors. Separate collapsible keyboards were also originally provided for all the Pocket PC PDAs as they have only the pop-up on screen keyboard and then later for the Treo 600s as the students found their keys too small to write with. Add on cameras were later obtained for the Tungsten Ws as they were the only PDAs without integral cameras.

The students were participant researchers in the project; they reported in via a weekly online survey and additionally were encouraged to reflect on their experiences via a diary of use in the form of a web log or 'blog'. There was also a dedicated discussion area on Blackboard, the VLE, for them to exchange information and ideas about the PDA project. Additionally a focus group of all PDA users was organised for the end of each of their two blocks of teaching practice in order to collect impressions and share potential uses face to face. Lastly there was an exit interview on finishing the project.

Results

At the point that the students had just completed their first four week teaching practice, the results of the weekly online survey indicated that they recognised that there is great value in having the PDA for both their practical teaching in the field and in their learning about teaching and the underpinning pedagogy. 41 entries were made over the 4 week period giving a return rate of 73%. Later in the academic year, towards the end of the main 12 week teaching practice PDA use had tailed off with three students dropping out of the study, however, 26 entries were still made in the online survey making the return rate for this teaching practice 74%. Not all of these entries were complete though and 8 referred only to reasons for not using the PDA.

For the students using the PDAs the pattern of applications used remained similar throughout the academic year. Their most commonly used applications were the diary scheduler, the web browser and the email client whether Palm or Windows based. Table 1. shows the results when participants were asked at intervals throughout the year to name their three most frequently used software applications.

Table 1. Most frequently used software			
First teaching practice		Main teaching practice	
Software application	Percentage of mentions (total=118)		Percentage of mentions (total=46)
Calendar/Diary	19.5	Calendar/Diary	17.4
Email	19.5	Web Browser	15.2
Web Browser	14.4	Email	13.0
Word	12.7	Word	13.0
Tasks/To Do list	8.5	Spreadsheet	8.7
Spreadsheet	6.8	SMS	6.5
Memo/Notes	5.9	Games	4.3
Games	3.4	Memo/Notes	4.3
SMS	2.5	Periodic Table	4.3
Tiny Red Book (mark book)	1.7	Camera	4.3

Spreadsheets for recording attendance and grades and SMS texting gained slightly in popularity during the study as participating students shared their ideas and templates and the To Do or Task list lost popularity – the students largely swapped to using the calendar to record tasks as they could set reminders for deadlines.

When considering what software was most supportive for actual teaching of lessons the PDA's own calendar or diary software and task lists were mentioned often. One student explains why, "The calendar and task functionality has been extremely useful. My timetable is surprisingly fluid, with various planning and review meetings being scheduled and re-scheduled - any paper diary would be unreadable and unusable. The task list helps me effectively track and manage the many different tasks that need to be done to survive as a student teacher.". Interesting discoveries amongst downloadable software were Tiny Red Book (at <http://www.tiny-red-book.com>) and a variety of periodic tables including one associated with Calc98 (at <http://www.flosim.com/fsi/download.htm>). Tiny Red Book (for Palm OS) incorporates a customisable mark book, attendance tracking and a place to record student behaviour. One student particularly benefited from using the attendance tracking to prove a child was absent from their lesson. Other students used Excel for this purpose.

Another success story was the use of the internet, especially the search engine Google, to look up answers to students' (and staff's) questions and get an almost immediate response. Examples cited include "Where do red robins go in summer?", "How do starfish reproduce?", searching for up to date information on cloning and finding the telephone number for the local hands-on science centre. One of the students reported that "Instant access to the internet has been particularly useful. For example, during one lesson I was able to quickly look up the answer to a pupil's question - this really helped to keep them engaged and interested in the subject matter (in addition to promoting ICT to them)". Table 2 shows the results when PGCE students were asked at intervals in the teaching practices to identify the software that was most helpful to their teaching. Applications in bold were mentioned throughout the year as being helpful to teaching.

Table 2. Software that was most helpful to actual teaching.	First Teaching Practice	Main Teaching Practice
Application	Frequency (n=41)	Frequency (n=13)
Using the Internet as a resource (Google)	8	2
Calendar/date book/diary for schedule/timetable	7	3
To do / Task list	6	
Attendance Register/mark book/test scorer	5	2
Recording/writing up lesson evaluations	4	1
Writing/noting ideas for lesson plans	3	
Note-taking	2	
Calculator	2	1
MSN chat with an expert	1	
Reviewing a powerpoint presentation	1	
Physical constant look up program	1	
Periodic table program	1	1
Email		2
Showing presentations		1

Showing presentations was only mentioned by one student as the hardware (Margi Presenter to Go) only arrived very late on in the study but the concept of being able to plug the PDA directly into the data projector was very popular amongst all the students.

The use of the internet was also the most popular when, as shown in Table 3, the students were asked to identify the software that was most helpful to their learning on the course. Also popular though was the use of a word-processor or note-recorder either of which were used to jot down or tape information at the point of reception for later processing into assignments or lesson plans. The effectiveness of this activity is reinforced by this student's report "During teaching practice I have found myself constantly bombarded with new and noteworthy information (e.g. scientific facts, ideas for teaching approaches, school procedures, evidence for QTS standards etc.). The PDA has allowed me to keep meaningful notes of this information, and structure the information (i.e. file) in a way that allows me to access it easily."

Table 3. Software that was most helpful to your learning.	First Teaching Practice	Main Teaching Practice
Application	Frequency (n=41)	Frequency (n=14)
Using the Internet as a resource (Google)	10	4
To do / Task list	7	
Notes for note-taking in meetings and lesson observations	7	
Notes or Word for lesson evaluations and essays	6	2
Calculator	3	1
Calendar/ Diary scheduler	2	2
Spreadsheet of audit for QTS standards	2	
Reading electronic journals	1	
Periodic table	1	
Email	1	2
Physical constant look up	1	
Recorder for lesson evaluations		1
Showing presentations		1
Taking pictures		1

However, when asked what software was the most use to them, as an individual, the students, as shown in Table 4 reverted to citing the information management functions of the PDA such as the Task or To Do list, the diary scheduler and the use of email. Another student puts in plain words “I formed a comprehensive To Do list and prioritised well - really useful with everything mounting up.”.

Table 4. Software that was most helpful to you as an individual.	First Teaching Practice	Main Teaching Practice
Application	Frequency (n=41)	Frequency (n=17)
To do / Task list	10	
Email	8	4
SMS/Texting	6	2
Calendar/date book/diary for schedule/timetable	5	2
Taking photos	2	1
Contact info/Address book	2	
Word for recording lesson evaluations/making notes	2	1
Spreadsheet audit of QTS standards	2	
Syncing via Bluetooth	1	
MSN chat with expert	1	
Spreadsheet for registers		1
Internet for personal use – recipes, maps, shopping	2	4
Recorder for lesson evaluations		1
Games		1

As well as Tiny Red Book, three downloadable software applications were recommended by the students: OmniRemote which allows the PDA to remote control the television and other devices in the home, PhysConst and an interactive periodic table containing physical constants and element data respectively. Two students in the first week of teaching practice reported using the periodic table software successfully to give pupils accurate data almost instantly. Another student downloads e-books. “Using the e-book meant that I could catch a few pages at convenient times, I don't think it can ever take the place of reading books, but it certainly cuts down carrying (my bag is so full of school things that I just couldn't carry around any more books)”.

One of the most useful aspects of the PDA is the ability to use it wherever you happen to be, and the carry over into elements of student life beyond the course underlines this. Whilst most use, as shown in Table 5, takes place at home or in the school staff areas, activities such as keeping up to date or even ahead of others in school

by accessing the latest educational news on the way in to school and taking photos of local events were reported extremely positively by the students.

Table 5. Places where you have used your PDA in the past week.	First Teaching Practice	Main Teaching Practice
Place	Percentage of respondents (n=41)	Percentage of respondents (n=18)
Home	95.1	83.3
School staffroom	85.4	55.6
School classroom/lab	58.5	27.8
Public Transport	29.3	11.1
Café/Restaurant/Bar	24.4	5.6
University teaching room	17.1	5.6
Elsewhere on campus	12.2	16.7
Car	7.3	27.8
During shopping	2.4	0.0
Carnival	2.4	0.0
Other people's homes	0.0	5.6

Table 5 also shows the decline in student' use of the PDAs which is most marked in public areas including the classroom. Students reported feeling uncomfortable about being the only one in the school with a PDA, that it was a distraction in the classroom and, in one case, fear of damage or loss.

The PDAs were used immediately by half the students for keeping in touch with the University tutor whilst they were away from campus on teaching practice in school. Table 6 shows how many times the students used the PDA to communicate with their tutors and peers during the first teaching practice.

Table 6. Who have you communicated with via the PDA this week and how.			
	email on PDA	SMS* on PDA	VLE discussion group (via PDA)
University tutor	15	0	5
School based mentor	2	0	0
Other PGCE students	18	8	5

*Short Messaging Service (texting).

The pattern of using email to contact the university tutor and SMS and occasional email to contact other students continued into the main teaching practice but more sporadically. The VLE discussion group was also less well used despite the students spending a longer period separate from each other in partner schools. One student used MSN on a regular basis and even 'chatted' with medical student colleagues during a biology class to gain answers to pupils' questions.

Documents on the VLE were used via PDA but only eight students downloaded from the choice of background reading, presenter's slides or course documentation from Blackboard during the first teaching practice and six of these also downloaded materials during the second, main teaching practice. These students appear to be fairly well aware of the different ways they could transfer documents from the VLE to their PDA and made sensible choices linked to file sizes about whether to download directly to the PDA or whether to download to their desktop PC and transfer the new files across to the PDA via its USB connection 'cradle'.

Web based logs, known as blogs, for recording teaching reflections were even less popular with only one student contributing to one regularly though a second kept a blog of PDA use for a short while. However, the students reported that having the word-processor or note recorder on their handheld was actually serving the purpose of recording reflections on teaching and storing them for later use in written assignments or in tutorials with their school based mentor or university tutor. There appeared to be little desire to put up a blog publicly online for tutors to read and add to.

For the students that gave up on using the PDA the following reasons were identified during exit interviews.

- Loss of data when not recharged for a lengthy period – this happened to at least 3 individuals during vacations and was very disheartening.
- Lack of time to continue to explore the use of the PDA under the pressure of teaching, planning for teaching and researching for and writing up university assignments. One student reports “I just don't have the time to be playing with it - I am simply trying to get to grips with teaching!!” and another says “with all the planning, essays etc. I haven't had the time to set up other uses for it.” This was the most commonly cited reason.
- Lack of available hardware or access to suitable computers within school to synchronise the PDA so that students' files could be made available on the school network or for data projection. One student describes his situation “I like the idea but as no computers at school are available to synchronise it with then it's easier to just use a memory stick.”
- Embarrassment at the attention the PDA caused – difficult to handle when still learning how to handle a class.
- Worry about taking the PDA into school where mobile phones are regularly stolen.
- Having purchased a laptop and preferring to use that.

Discussion

It is clear that the PDA and its information management and communications functions have great potential to support students in initial teacher training. The most popular applications throughout the year were the calendar or diary used mainly for appointments but occasionally for timetabling, email to maintain contact with other students and the university tutor, the web browser to access information both in class and for personal reasons, the word processor to make notes from meetings, on lesson observations for essays and to record lesson evaluations and the spreadsheet management system to record pupils' attendance and grades. However, only three of the 14 students used the PDAs on a regular basis throughout the year, most used theirs intermittently and another three gave theirs up.

The level of use appeared to be governed by four main factors:

- the socio-cultural context of the school environment;
- the pressure of work on a PGCE course;
- other hardware availability and
- certain 'killer applications'.

A central aspect of socio-cultural theory (Vygotsky, 1978, Wertsch, 1998) is the claim that all human action is mediated by tools which may be technologies and artefacts such as the PDA or desktop computer, semiotic systems such as language including diagrams, social interactions such as those between student and class or student and class teacher and institutional structures such as school ICT policy. Within this context the idea of 'person-acting-with-mediational-means' (Wertsch, 1991) both implies expanded capability for the student teacher through having the PDA and also suggests that their situated and mediated actions will be constrained by the social and cultural context.

For instance, 8 of the students, who used the PDAs intermittently throughout the year were most affected by the sociocultural context of being a student in a school. Whilst recognising that having Internet access on the PDA extended their capability to answer questions and plan lessons and having Word enhanced their recording of their observations for later assignments, they tended to feel uncomfortable about using the PDA in class or about asking the school to resolve hardware issues. For these students personal use of the PDA appeared to support their intermittent use of it for the PGCE, where students could see that the PDA applications were personally relevant they continued to use the Internet and Word in particular to support their teaching and learning. They were also more likely to view the PDA as creating work rather than saving it. Killer personal applications included using the PDA as an alarm clock, as a remote control, for SMS (text) messaging and MSN, taking pictures of significant events, online shopping, checking bank balances and having information such as recipes and maps on hand when needed.

The three students that maintained regular use of the PDAs were all men who used Excel or Spreadsheet to Go everyday to keep tabs on their classes. One of these students also regularly used the voice recorder to record lesson evaluations for later transcription. They acknowledged the distraction factor of the PDA cited by other students but pointed out that as they used it everyday the novelty had worn off for their classes. Also these students were at schools where staff were less concerned about viruses and malicious software and allowed the PGCE students to link to school computers. They also made a variety of personal uses of the PDA including, for two of the three, games.

Of the three students who withdrew from the study and handed back their PDA, two gave frustration at the PDA's apparent inability to operate in the way they wished it to as their main reason, in particular a Treo incited one student to uncharacteristic hatred, and the third cited a preference under the pressure of increased teaching in the main teaching practice to work with pen and paper rather than to use the PDA which she viewed as more time consuming.

Conclusions

There appear to be three applications on the PDAs that are proving key to managing students' learning of how to teach in the field. These are the calendar or diary scheduler for organising yourself, the spreadsheet of attendance or mark book for organising your pupils and the use of a word processor to make notes on information and events immediately they are encountered. This information which often contained reflections on the teaching process can then be incorporated quickly and easily into the assessed components of the PGCE course.

However, the communications capability of the PDA was also essential to its success. Having the internet available as a portable resource was very welcome, it was the software application that the PGCE students considered to be most helpful to both teaching and learning. It is our conclusion that, having the Internet literally 'in your hand' enables the PDA to act as a distributed memory system. The wealth of information on the internet means you can use it to answer virtually any question and whilst the GPRS signal was not as fast as a broadband connection the delay was acceptable both to the PGCE students and their pupils. It was discovered that you can even use a PDA surreptitiously in a lesson or meeting to look up the topic under discussion or to 'chat' with experts without overtly appearing absent minded or particularly unintelligent. Pea (1993) described these activities well in his concept of 'Person Plus', which is the concept of cognition being distributed between the person and their environment, and associated artefacts. Finally, email for keeping in touch with the university tutor, other students, family and friends is well used and provides a valued support for students who are working in school away from the rest of their peers.

Whilst all the PDAs have similar functionality it was clear that the students with the Pocket PC based systems got further more quickly in the training sessions and have reported fewer difficulties to the project team. Though student familiarity with Windows based products is obviously a factor, web pages and documents did not initially appear as readable on the Palm based systems as they did on the Pocket PC based ones. Nor is the internet connection 100% reliable for either system with 6 of the students reporting occasional difficulties getting online. Two of the three students who gave up on their PDAs cited the difficulty they had in using a Palm based device.

Other factors to be considered include the socio-cultural context of PDA use, currently PDAs are rare in schools. One student found the interest it generated amongst the pupils detracted from her teaching and a number of them have reported a feeling of no-one to share their mlearning practice with in the classroom. Also an ITT course is an extremely busy time – the students that gave up on the PDAs described the course demands as preventing them from devoting time to necessary exploration of the PDA functionality. One issue that prevented more students taking pictures to use in their teaching was concern about the number and level of permissions required to photograph children.

However, looking to the future, as PDA prices are already coming down it is clear that personal ownership of internet enabled PDAs whether wireless or mobile phone is on the increase. The personal computer and mobile phone are merging with the PDA on one side and the Smartphone on the other. Where universities are aiming to deliver course based content to students such as teacher, nurse, veterinary and medical trainees in the field or supporting students on sandwich courses during their industrial placement this small scale study shows there is great potential for enhancing student learning by making the course content accessible via any or all of these

handheld devices. It is anticipated that many students coming on such courses within the next 5 years will already have PDAs or equivalent devices so that many of the teething and resourcing problems encountered in this study will be alleviated.

In particular, recommendations for future development of PDA use by teachers and trainee teachers include:

- ensuring 'always on' internet access;
- investing in a larger community of practice;
- enabling connection with the classroom data projectors;
- designing bespoke software that allows both timetabling and personal appointments;
- allowing synchronisation with the school network computers;
- more use of images;
- encouraging personal use and
- focussing on making students comfortable with 'killer applications' such as attendance registers, markbooks and maintaining an online audit of Qualified Teacher Status standards.

References

Becta (2003) *Handheld Computers PDAs in Schools*. Coventry: British Educational Communications and Technology Agency. Available at <http://www.becta.org.uk/research/reports/docs/handhelds.pdf> [accessed 29.9.04]

Manhattan Research (2002) *Taking the Pulse: Physicians and Emerging Information Technologies*. Available from www.manhattanresearch.com.

Pea, R. D. (1993). Practices of distributed intelligence and designs for education. *Distributed cognition*, in G. Salmon (ed), *Distributed Cognition*, : 47-87.

Ramsden, A. (2003) Evaluating a Low Specification Wirelessly Connected PDAs as a Means Supporting Learning. Paper presented at LTSN-ICS Mobile-Learning, Telford, UK. Available at http://www.ics.ltsn.ac.uk/pub/m_learning/ [accessed 27.4.05]

Vygotsky, L.S. (1978) *Mind in Society: The Development of Higher Psychological Processes*, Harvard University Press, Cambridge, Massachusetts

Wertsch, J. (1991) *Voices of the Mind: A Sociocultural Approach to Mediated Action*, Harvester, London.

Wertsch, J. (1998) *Mind as Action*, Oxford University Press Inc, USA.

Field Code Changed