PDAS as workplace tools for science teachers

Conference or Workshop Item

PDAS AS WORKPLACE TOOLS FOR SCIENCE TEACHERS

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ABSTRACT

This paper reports on work in progress on a project investigating the use of personal digital assistants (PDAs) to help students make use of knowledge gained during the study of a Masters course in science education in their professional practice. We report on a review of the literature on mobile technologies as learning tools in workplace settings. We analyze this literature to suggest possible hypotheses for our study. Our aim is to understand the ways in which mobile devices influence the use of open and distance learning course material in workplace contexts, and to investigate how the link between knowledge about science communication, education and practice can be influenced by the use of mobile devices. We also describe the selection and design of activities for use on the PDAs, the evaluation strategy based on an activity theory augmented approach for the project and the issues arising during the project.

KEYWORDS

PDAs, science education, practice based professional learning, mobile learning

1. INTRODUCTION

Mobile technologies are providing new opportunities for teachers and learners to engage interactively with science learning materials. Technological developments such as the use of handheld mobile devices may impact on the experiences of science learning for the learner (see, e.g. Scanlon *et al*., 2005). In this paper we focus on the experiences of science teachers who are studying a postgraduate course in science education. The use of handheld devices in workplace settings has been explored by Waycott and Kulkulska-Hulme, 2003; Waycott *et al*., 2003. In this paper we describe work in progress to examine how a group of science Masters-level students, including science teachers make use of these devices in their workplace. The particular aspect we wish to explore is how the technology offers to provide new ways for teachers to engage with mixed media science learning materials. This project was funded by the Open University's Practice-based Professional Learning (PBPL) Centre for Excellence in Teaching and Learning (CETL).[1] Our focus is the investigation of how science teachers studying the Masters-level course *Contemporary issues in science learning* use mobile technologies in school science classrooms. In particular, we hope to better understand the ways in which mobile devices influence the use of open and distance learning course material in workplace contexts, and to investigate how the link between knowledge about science communication, education and practice can be influenced by the use of mobile devices.

[1] For more information about the PBPL CETL see http://www.open.ac.uk/pbpl/.

Our review of literature relating to mobile technologies identified three sources of relevant studies: current uses of mobile technologies as learning tools in corporate settings, studies that have examined the use of mobile technologies in healthcare settings and finally studies on teacher training and professional development involving mobile technologies. There are a number of studies and projects in which mobile technologies have been used to support workplace learning. In addition to academic sources, some accounts appear on the websites of training organizations that incorporate mobile learning particularly for corporate training (e.g. Kaplan-Leiserson, 2005 on work at General Motors). Mobile technologies have been used both in corporate training settings and in academic courses that involve a large element of 'on the job' training, such as medical and teacher education. PDAs and other mobile technologies have perhaps been most widely used and well documented in healthcare settings, although not only for learning purposes. PDAs have been widely adopted as learning tools in healthcare and medical education and are reviewed in the medical informatics literature although the focus is not always on their use as learning tools (e.g. Turner *et al*., 2005). Johnston *et al*., 2005 report on some limited success in supporting medical students' learning with mobile technologies in a project at the University of Hong Kong. The students used clinical decision support software loaded on iPAQs while attending to patients but only for 20% of the time. Smordal and Gregory (2003) report on the use of PDAs to access learning materials while on work placements in hospitals but although they demonstrated that this was technically possible they report lack of use.

There have also been a number of projects exploring the use of mobile technologies to support teacher education and professional development. Seppala & Alamaki (2003) and Seppala *et al*. (2002) report on using Nokia phones and digital cameras to support student learning experiences while training in school settings in Finland. They report on the successful use of digital photos as shared objects of reflection between teachers and students. Divitini, Haugalokken & Morken (2005) describe how Norwegian students used a blog to share information and reflect on their learning when undergoing teacher training in schools, exploring the potential of mobile technologies for the storing and sharing of reflective notes Although there was limited use of blogging, a later report of the same study described how face to face 'takeover' meetings which the students were able to attend fulfilled some of the potential role of the blog. A study at the University of Bristol examined the use of PDAs in a year long Post Graduate Certificate of Education course. The study involved 14 trainee teachers (Wishart *et al*., 2005). Notetaking and word processing facilities for making reflective notes were used but the students did not wish to make their notes public and put them on a blog. Leach *et al*. (2004) report on the Digital Education Enhancement Project (DEEP) which explores the potential of enhancing the professional development in rural Africa using technology enhanced learning. This study, and a further report by Leach *et al*. (2005), describe a very positive uptake of handheld computers over a variety of uses. (The teachers involved in this study had very limited experience of ICT and none had previously used a handheld.)

So, studies have shown mixed results regarding the usefulness and success of different mobile learning resources and applications. In some contexts – such as the rural African setting that was the focus of the DEEP project, as described in the handheld computers have had a dramatic positive impact. In other settings, however, they were not as successfully employed (e.g., Johnston *et al*., 2004, Smordal & Gregory, 2003, Wishart *et al*., 2005).

2. THE PROJECT

This is a two-year project, involving Masters-level students studying *Contemporary issues in science learning* as part of the 2007 and 2008 presentations of the course. One of the associate lecturers for the course has agreed to tutor students who volunteer to participate in the project. The course is part of the Science studies strand of the MSc in Science. The overall aim of the course is to examine different aspects of the learning of science in a range of formal educational settings, from science in the early years, right through to science at tertiary level. It also considers how science learners are supported in their studies by different types of resource, including information and communications technology (ICT). This course attracts those engaged in teaching science at all levels, and for science graduates who seek more understanding of

contemporary science education and wish to reflect on their own experience of learning. ICT is used heavily in the teaching of the course, and it is considered in detail as a vehicle for science teaching and learning.

Some of the issues discussed in the course include: What purposes are served in teaching science at all levels of education? What role can ICT play in learning science? How are current theories of learning influencing the development of science education? How does context influence the way in which science is learnt? What methods are appropriate for investigating and researching learning in science?

Resources available for the course include a large amount of video footage of classroom lessons, audio interviews, and ICT resources which students develop use and evaluate while participating in web based forums. The activities we designed allow students to use their PDAs in a variety of ways. In addition we have designed a series of short study periods – three in total - where students will use the PDA we have provided to study the course materials intensively. During these study periods the topics covered include some work on the intellectual and pedagogic challenges in delivering a syllabus driven by the demands of scientific literacy including the collection of data in the form of audio interviews with science teachers, the challenges in learning science from practical work including working with video extracts from science classrooms and television programs linking theories of science learning including socio-cultural approaches and how Information and Communication Technology (ICT) resources have been used to teach and learn science in a range of contexts involving a strategy for students to collaboratively evaluate such resources.

For these intensive study periods we have made minor revisions to the study commentary for the course, e.g. in terms of the formatting, so that it reads more easily on a PDA. We have also provided the study commentary in the form of a dynamic document, allowing students to click on hyperlinks to move directly to the required readings, audio sequences and optional additional web-based materials to view. Our hypothesis is that the provision of such resources on PDAs will aid the students in making use of course materials in their professional settings.

The project is split into three main phases, which are listed below. In the first phase of the project we will document the experiences of revising existing mixed media open and distance learning materials for use on mobile devices, and the development and trialling of familiarisation activities and data collection techniques. In this phase we have documented the preparation of a range of mixed media materials for mobile devices. In the second phase of the project we are investigating how science teachers use mobile devices to enhance their learning experience, also how they use mobile devices within workplace settings. Our evaluation is based on the activity theory approach developed by Scanlon and Issroff (2005) and the tool appropriation model developed by Waycott *et al*. (2003). This is described in detail below. It is our intention to use the results of the first and second phases in the third phase of the project where we will investigate student use of mobile devices with a new cohort of students and continue our observation of our first cohort in new settings.

We have found in our previous work that Activity Theory based methods are particularly suitable for the investigation of technology enhanced learning settings (Scanlon and Issroff, 2005). Using an Activity System perspective, highlighting the underlying interactions between rules, community and division of labour is helping us to make sense of the complex learning situations we are evaluating. One of the advantages for activity theory in this particular project is its emphasis on the historical nature of activities and the ways in which they develop over time. Our method is specifically designed to look at activity systems for the whole course as well as the ways in which individuals and activities develop over time.

For the data collection phase therefore we had to make decisions about granularity, and time frames. In terms of method, every week, students will be presented with a mini questionnaire on the PDA. The questionnaire is comprised of questions on their use of the main functions of the PDA and also their emotions evoked by the use of the device. Students are asked to produce audio diaries to tell us about the project activities they are carrying out rather than writing them up. An online questionnaire at the beginning of the course and interviews or e-mil interviews at the end of the project will provide us with data on students professional background, technical skills, attitudes towards the use of the PDA, expectations from the project, their use of the facilities offered by the PDA, effect of the PDA use on their professional life, and any changes in their attitude. For the first phase of the project we have recruited 12 students who are currently studying the module, 9 of whom have teaching positions and a further 2 work in educational administration and one in a freelance role.

A number of difficulties were encountered in versioning the material for the PDA; firstly with regards to the study commentaries which are usually supplied to students as a printed item. These documents are normally printed from a pdf file. These pdf files had to be turned into html files in order to create the dynamic documents. The html files were designed to have as little formatting as possible in order to ensure that the appearance on the PDA was acceptable, and hyperlinks were added so that video and audio files could be accessed directly. Secondly with regards to electronic documents which are normally supplied to students on the course DVD-ROM as pdf files. It was again necessary to simplify some of the formatting in order that the documents would 'reflow' once they had been transferred to the PDA. Reflow means that the text is wrapped to fit the screen rather than the user having to use a horizontal scroll bar to view the whole page width. Finally the audio and video files on the course DVD-ROM were in a format that was incompatible with the media player on the PDA, so these had to be processed using conversion software.

3. CONCLUSION

This research so far has shown that there are a number of potential applications of mobile technologies in workplace learning settings which are particularly applicable to the activities of science student/teachers. So far on this project we have developed activities for use and developed an evaluation plan influenced by Activity Theory. This research will also help us to evaluate what use students make of more recent technologies and innovations such as podcasting, blogging and video broadcasting in their studies and their workplaces.

ACKNOWLEDGEMENT

Our thanks are due to the volunteers who have participated in our research, and to the Open University's PBPL CETL who have provided resources for the project.

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