Anywhere, Anytime Learning Using Highly Mobile Devices

Mark van 't Hooft
Kent State University, USA

Graham Brown-Martin
Handheld Learning, London, UK

Karen Swan
Kent State University, USA

INTRODUCTION

In a world that is increasingly mobile and connected, the nature of information resources is changing. The new information is networked, unlimited, fluid, multimodal, and overwhelming in quantity. Digital technologies, such as mobile phones, wireless handheld devices, and the Internet, provide access to a wide range of resources and tools, anywhere and anytime. This type of access and connectivity has also had an impact on how we collaborate on projects and share media and therefore, greatly increases opportunities to learn inside *and* outside institutionalized school systems. Learners now have the tools to take learning beyond classrooms and the school day.

The development of handheld devices can be traced back to Alan Kay's vision of the Dynabook. As early as the 1970s, Kay envisioned a mobile, kid-friendly, notebook-sized computer with artificial-intelligence capabilities that would support children's learning inside and outside of school. Similar ideas soon followed in the form of devices such as the Psion I (1984), the GRiDPaD (1988), Amstrad's PenPad, and Tandy's Zoomer (1993), the Apple Newton (1993-1995), and the eMate (1997-1998). During the 1990s and early 2000s, Palm developed a series of handheld devices that defined the handheld market in North America, while Microsoft developed several versions of its Windows Mobile software that could be found on mobile devices made by such companies as HP, Dell, and more recently, Fujitsu Siemens (Bayus, Jain, & Rao, 1997; HPC Factor, 2004; Williams, 2004).

There are also many devices whose primary function is entertainment or communication, including media players such as Apple iPods, portable gaming devices like the Sony PSP and the Nintendo DS, and, of course, mobile phones. These types of devices are becoming increasingly popular and multifunctional, with iPods being able to store and play music, pictures, and video; portable gaming devices sporting wireless capabilities for interaction between devices (and in the case of the PSP, Internet access); and mobile phones being used to shoot pictures and video, upload content to the Web or e-mail it elsewhere, do text messaging, and make phone calls. Whatever the device, convergence seems to be increasingly important, and growing numbers of young people are using these mobile, digital, and connected tools daily, whenever and wherever they need them, and this includes schools.

BACKGROUND

Mobile computing enthusiasts have advocated the use of highly mobile devices for teaching and learning to get closer to a ubiquitous computing environment, defined in 1991 by Mark Weiser as a setting in which "a new way of thinking about computers in the world … allows the computers themselves to vanish into the background" and become indistinguishable from everyday life (p. 94). Weiser emphasized that ubiquitous computing does not just mean portability, mobility, and instant connectivity, but also the existence of an environment in which people use many computing devices of varying sizes that interact with each other, combined with a change in human psychology, to the point where users have learned to use the technology well enough that they are no longer consciously aware of its presence and do not have to be. This version of ubiquitous computing has recently been revisited by

scholars such as Yvonne Rogers (2006), who proposes a modified version in which

UbiComp technologies are designed not to do things for people but to engage them more actively in what they currently do (p. 418);

and Bell and Dourish (2007), who argue that ubiquitous computing is characterized by power-geometries (the ways in which spatial arrangements, access, and mobility reflect hierarchies of power and control); heterogeneity (as opposed to standardization and consistency in technology, use, and regulation); and management of ubiquitous computing that is messy.

Weiser's somewhat revised vision of ubiquitous computing fits well with current visions of technology integration in education and its potential impact on teaching and learning. Academic research has shown that computer use and student learning gains are "closely associated with having computers accessible to all students in teachers' own classrooms" (Becker, Ravitz, & Wong, 1999; see also Shin, Norris, & Soloway, 2007). Highly mobile devices provide a solution because of their small size and comparatively low cost in acquisition and ownership (Norris & Soloway, 2004; Sharples, 2000a), and they supplement the existing technology infrastructure. Some scholars have defined the resulting learning environment as "handheld-centric," "providing all students with access to valuable resources on a shared but timely basis," where each tool has been earmarked for its intended use (Norris & Soloway, 2004; Tatar, Roschelle, Vahey, & Penuel, 2003). Another group of scholars is looking at learning with highly mobile devices from a broader perspective. They have coined the term m-learning, "the processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" (Sharples, Taylor, & Vavoula, 2007).

Highly mobile devices are also altering the nature of technology integration in teaching and learning, and can act as catalysts for radical changes in pedagogical practices (Fung, Hennessy, & O'Shea, 1998). Their fundamental difference from more traditional desktop computing environments lies in the fact that users "interacting with a mobile system interact with other users [and] interact with more than one computer or device at the same time" (Roth, 2002, p. 282; see also Cole & Stanton, 2003). Consequently, highly mobile devices lend themselves well for both individual and collaborative learning, if used appropriately. Roschelle and Pea (2002), for example, highlight three ways mobile devices have been used to enhance collaborative learning–classroom response systems, participatory simulations, and collaborative data gathering–and suggest there are many more uses (see also Roschelle, 2003).

Moreover, because of their small size, portability, and connectivity, highly mobile devices do not constrain users like desktops and laptops do. As such, they encourage learners to use technology across the curriculum and in everyday activities, and embrace it as a lifelong-learning tool to be used anywhere and anytime (Inkpen, 2001; Sharples, 2000b), eventually leading to the type of ubiquitous computing that Weiser envisioned and Rogers, and Bell and Dourish advocate.

TEACHING AND LEARNING WITH MOBILE DEVICES

Highly mobile devices possess certain characteristics that allow for frequent and immediate access to a variety of tools and information sources for teachers and students, and their use in classrooms and other learning environments is bringing about many changes. However, it is important to understand that simply putting more digital tools in schools is not the solution to making technology use for teaching and learning meaningful and effective. Rather, teaching, learning, and technology need to be reconceptualized before the full educational possibilities inherent in small, versatile, and mobile digital technologies can be realized.

In *The Educators Manifesto* (1999), McClintock proposes that digital technologies change what is pedagogically possible. To take advantage of these possibilities, teaching must be continuously redefined within the changing context that new tools such as handheld computers create. Teaching should be reconceptualized as "conducting learning," thereby putting more responsibility for learning on the learner. Second, teaching must no longer be thought of as restricted by the spatial and temporal boundaries that current educational systems impose. Third, the content and focus of teaching must be redefined to meet the needs of the 21st century world (Swan, Kratcoski, & van 't Hooft, 2007).

If teaching is to be reconceptualized to take full advantage of mobile tools, so should learning. As digital