Chapter 3
Ubiquitous Computing Does Not Guarantee Ubiquitous Learning in Schools: The Case of Handheld Computers

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ABSTRACT
In this chapter, I will argue that ubiquitous computing is a necessary, but not sufficient condition for ubiquitous learning. I will propose definitions that clarify some of the contextual features that shape both terms when they are applied in a school context. Using data and experiences derived from a year-long project with primary and secondary schools in Victoria, Australia, examples of classroom activities are analysed to illustrate how the presence of ubiquitous computing did not guarantee ubiquitous learning. These activities are compared to articulate the key features of ubiquitous learning and develop a model that shows how the contribution of ubiquitous computing to ubiquitous learning is constrained by pedagogic frameworks that shape the relationship between handhelds, other elements of the technological suite and learning.

INTRODUCTION
Handheld technology and its frequent synonym, mobile technology include portable computer-based devices such as mobile phones, tablet PCs, personal digital assistants (PDAs), iPods, MP3 players, smartphones, graphics calculators, probewares, digital cameras, digital video recorders and games consoles. This multitude of portable devices can be used to create ubiquitous computing, a term first used by Weiser in 1988 (Weiser, Gold & Brown, 1999). Weiser asserted that the most profound technologies associated with ubiquitous computing are those that disappear as they weave themselves into the framework of our everyday lives. Weiser described computing in three waves. The first wave of computing saw the use of one mainframe computer by many people; the second wave saw a 1:1 computer to human ratio where individuals were connected to desktops or laptops. We are now in the third wave of computing where an individual possesses or is served by many computers dispersed throughout

DOI: 10.4018/978-1-61692-849-0.ch003
the physical environment. As these technologies recede into the background of people’s lives, they are being used unconsciously for various tasks (Weiser, 1991; 1996). As they do this, they become ‘calm technology’ (Weiser and Brown, 1996). When technology becomes ‘calm’, it does not occupy the learners’ attention all the time but is able to move seamlessly and effortlessly between the learners’ periphery and centre of attention.

More recent discussions of ubiquitous computing (Hwang, Tsai and Yang, 2008, p.82) have identified ubiquitous computing with access to a range of context-aware technologies.

From the system designer’s point of view, physical integration and spontaneous interoperation are the two main characteristics of ubiquitous computing systems (Kindberg & Fox, 2002). Physical integration means that a ubiquitous computing system involves some integration between computing nodes and the physical world. For example a smart coffee cup, such as Media-Cup (Beigl et al, 2001), serves as a coffee cup in the usual way, but also contains sensing, processing and networking elements that let it communicate its state (full or empty, held or put down) ...

In the general school context, this identification demands too much since tools such as Radio Frequency Identification chips and sensors cannot be universally implanted or accessed within the resources of most schools. So, in this article, I restrict the concept of ubiquitous computing to one that is more realistic for students and schools—universal access to a suite of technologies that includes mobile and internet connected devices.

The general claim within the literature is that once the computing becomes ubiquitous, it begins to have the capacity to support ubiquitous learning. Hwang et al (2008) argue:

... by employing this new technology in education, the learning system is not only adapted to the individual’s needs, but is also actively involved in his or her learning activity (p. 82) ... [so that there can be] ... a special definition of u-learning that employs mobile devices, wireless communications and sensor technologies in learning activities, called “context-aware u-learning” ...

The above is a view of learning that is personal and able to occur regardless of time or place. However, context-aware u-learning focuses on the technology rather than on the nature of the learning process that occurs with the technology. A similar gap is in the more general sense of ubiquitous learning that is regarded as ‘anywhere at any time’. I will argue that for the purposes of looking at beneficial learning in schools, we need also a view of how the learner’s relationship with the object of learning changes such as it is not only personal, but also (at least potentially) transformative (Keamy & Nicholas, 2007).

Ubiquitous computing in the less technologically-intense sense defined above is, therefore, a necessary but not sufficient condition for ubiquitous learning since ubiquitous learning requires two additional features: the systematic presence of and interaction between handheld and other forms of computing and systematic pedagogic design that creates opportunities for transformative experiences i.e. pedagogies that acknowledge the learner (aided by technology) as a source of knowledge with the capacity and space to question and reframe the knowledge, behaviour or attitudes/values presented by the teacher.

The relationship between ubiquitous computing and ubiquitous learning with school students using handheld computers will be explored. Using the result of the exploration, a framework for ubiquitous learning that encompasses and positions ubiquitous computing will be outlined. The particular handheld computer alluded to in this paper is the PDA, sometimes also referred to as a palmtop computer or pocket PC. Within the context of Victorian schools in Australia, where handheld computers in schools are still a new phenomenon, a ubiquitous learning framework