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Learning with Mobile Devices

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Chapter 62
Learning With Mobile Devices

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ABSTRACT

The concept of learning with small portable computers was developed by Alan Kay in 1972. Since that early conception, scholars, such as Traxler, Sharples, and Soloway are the pioneering scholars who paved the way to a better understanding of the philosophical, pedagogical, and conceptual underpinnings of mobile learning today. In this chapter, an overview is provided to explicate the initial foundations of the emerging field of mobile learning (mlearning). Next, current scientific knowledge is delineated with explicit references to the early scholars. This chapter concludes with a preview of the future research directions in mobile learning.

INTRODUCTION

Mobile devices are being used to extend learning in both the global north and the global south. The launch of the International Journal of Mobile and Blended Learning is one of several indicators that mobile learning globally is reaching a critical and sustainable momentum and identity. The past decade has seen a host of pilots and initiatives across sectors and across countries. Mobile learning is being used to extend pedagogies to develop new ways of learning more aligned to empirical understandings of how students learn. Mobile learning is also taking learning to individuals, communities and countries where access to learning was challenging or problematic.

Environmental factors have meant that this development has often been haphazard. As researchers try to examine these new learning opportunities they are faced with a set of methodologies that were developed for use with tethered technologies with learning and evaluation methods being static (Sharples, Sanchez, Milrad, & Vavoula, 2009). In mobile learning context can vary significantly. This has expanded the field of mobile learning to have researchers examining learning that happens in a formal typical educational setting, non-formal non-intended serendipitous environments (Crompton; 2013a), and informal atypical settings (e.g. museums and science centers: National Research Council, 2009). With

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learning that happens in personal contexts, the researcher has the added difficulty in collecting valid research data without interfering with the learning happening in those contexts Beale's (2007). This is becoming increasingly difficult in recent years with the pervasive ubiquitous nature of the devices today.

As the scholarly understanding of mobile learning is still relatively new and emerging, the mobile learning community is also now faced with broader challenges of scale, durability, equity, embedding and blending in addition to the earlier and more specific challenges of pedagogy and technology, but these developments take place in the context of societies where mobile devices, systems and technologies have a far wider impact than just mobile learning as it is currently conceived.

BACKGROUND

The concept of learning with small portable computers was developed by Alan Kay in 1972. Since that early conception, scholars, such as Traxler, Sharples, and Soloway are the pioneering scholars who have paved the way to a better understanding of the philosophical, pedagogical, and conceptual underpinnings of mobile learning today. Kay began with the initial idea of a portable device for learning. Traxler, Sharples and colleagues have explored the emerging theoretical frameworks of mobile learning to provide us with a better understanding of this field. Soloway and Norris have focused their work on how the affordances of mobile learning can extend traditional classroom pedagogies.

Defining Mobile Learning

We need to define what we mean by 'mobile learning', not merely as a way of establishing a shared understanding but also as a way of exploring the evolution and direction of mobile learning and as a way of identifying the community of practitioners and researchers. In discussing how we define mobile learning we address many wider issues in terms of explaining, understanding and conceptualising it.

'Mobile learning' is certainly not merely the conjunction of 'mobile' and 'learning'; it has always implicitly meant 'mobile e-learning' and its history and development have to be understood as both a continuation of 'conventional' e-learning and a reaction to this 'conventional' e-learning and its perceived inadequacies and limitations. Over the last ten or so years this 'conventional' e-learning has been exemplified technologically by the rise of virtual learning environments (VLEs) and the demise of computer assisted learning (CAL) 'packages', and pedagogically by the rise of social constructivist models of learning over the behaviourist ones, by the growth of the learning object approach, by expectations of ever increasing multi-media interactivity and of ever-increasing power, speed, functionality and bandwidth in networked PC platforms. These are some of the points of departure for mobile learning. They refer back to 'conventional' e-learning and perhaps this is the mark of early 'mobile learning immigrants' and not the mark of the growing number of 'mobile learning natives'.

We have to recognise that attempts at identifying and defining mobile learning grow out of difference, out of attempts by emergent communities to separate themselves from some older and more established communities and move on from perceived inadequate practices. Interestingly, at the first mLearn conference in the spring of 2002, in Birmingham UK, a key-note speaker predicted that mobile learning would have a separate identity for perhaps five years before blending into general e-learning. This has still yet to happen and mobile learning continues to gain identity and definition rather than lose it.

Irrespective of the exact definition, personal mobile and connected technologies, including handheld computers, personal digital assistants, camera phones, smartphones, graphing calculators, personal response systems, games consoles and personal media players, are ubiquitous in most parts of the world and have led to the development of 'mobile learning' as a distinctive but ill-defined entity (see for example the reviews by Cobcroft 2006, and Naismith et al. 2004).

Early approaches at defining mobile learning focused on technology, for example saying it was "any educational provision where the sole or dominant technologies are handheld or palmtop devices" (Traxler, 2005), or on the mobility of the technology, describing mobile learning as, "elearning through mobile computational devices: Palms, Windows CE machines, even your digital cell phone." (Quinn, 2000). Another view of mobile learning says it involves: "Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies" (O'Malley et al., 2003), whilst Desmond Keegan took a similar position in 2005, saying that the focus should be on mobility and mobile learning should be restricted to learning on devices which a lady can carry in her handbag or a gentleman can carry in his pocket. He defined mobile learning as 'the provision of education and training on PDAs/palmtops/handhelds, smartphones and mobile phones and the characteristics of mobile learning is that it uses devices:

- Which citizens are used to carrying everywhere with them,
- Which they regard as friendly and personal devices,
- Which are cheap and easy to use,
- Which they use constantly in all walks of life and in a variety of different settings, except education." (Keegan, 2005:3)

The MoLeNET initiative, a £6m programme across the UK vocational sector, still takes this approach, defining mobile learning as, "exploitation of ubiquitous handheld hardware, wireless networking and mobile telephony to enhance and extend the reach of teaching and learning" (MoLeNET, 2007). These definitions were too technocentric and imprecise. The transience and diversity of the devices, systems and platforms means that these definitions are also highly unstable. They merely put mobile learning somewhere on e-learning's spectrum of portability (ending perhaps in ubiquitous, pervasive and wearable learning).

Whilst these attempts at definition use specific technical attributes to consolidate a definition of mobile learning in order to help us reason about it, other technical attributes, notably connectivity, usability and latency, have the very opposite effect and disrupt the notion that there is such a thing as mobile learning as an artifact of mobile technologies.

The uncertainty about whether laptops and Tablets deliver mobile learning – because of the lack of spontaneity in carrying them and starting them up - illustrates the difficulty with this kind of definition and the emergence of the UMPC (Ultra-Mobile PC) and netbook formats and the low cost XO systems will further trouble this boundary (Crompton, 2014a). They do however hint at the underlying challenge, that of conceptualising mobile learning in a way that recognises its origins and practices in specific technological systems but is abstract enough to be durable and to act as a stable platform for theorising about education and learning.

Crompton (2013b) looked beyond just the technical attributes to develop a definition of mobile learning from consolidating what she described as the four central constructs to mobile learning: pedagogy, technological devices, context, and social interactions. This resulted in mobile learning being defined

as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (p. 4). This is the most accepted current definition of mobile learning at this time, but will undoubtedly be modified in the future within this rapidly changing field.

CURRENT SCIENTIFIC KNOWLEDGE IN MOBILE LEARNING

There have been a few pioneering scholars in the field of mobile learning (e.g., Kay, Traxler, Sharples, Soloway & Norris) who have extended the literature in mobile learning. In the 1970s, Kay had the idea of developing a small portable device that students could learn from. Such a device did not prove to be feasible at that time, but due to more recent technological advancements, the mobile learning of today bears a good resemblance to Kay's initial ideas.

As mobile learning started moving into fruition, scholars, such as Traxler and Sharples have provided us with an evolving theoretical framework that has enabled us to use gain a better understanding of this new form of learning. Soloway and Norris have focused on how mobile learning is changing the way students learn. While, the work of these scholars has significant overlap, for the purpose of this chapter, these two strands (theories and pedagogy) have been dichotomized to provide a more in-depth look at each of these topics.

Kay's Dynabook

In the 1970's Kay (1972) created the concept model of the Dynabook, which he described as a personal computer for children of all ages. This personal computer would have a number of unique features:

Imagine having your own self-contained knowledge manipulator in a portable package the size and shape of an ordinary notebook. Suppose it had enough power to outrace your senses of sight and hearing, enough capacity to store for later retrieval thousands of page-equivalents of reference materials, poems, letters, recipes, records, drawings, animations, musical scores, waveforms, dynamic simulations, and anything else you would like to remember and change. (Kay & Goldberg, 1977/2001, p. 167).

These ideas were a little beyond that time and the Dynabook was never created; however, those seeds of ideas were sown and mobile learning of today has surpassed Kay's initial ideas of learning with a mobile device.

Theories of Mobile Learning

As mobile learning emerged from Kay's ideas, Traxler, Sharples, and colleagues have further explored the theoretical underpinnings of their emerging field. Kukulska-Hulme and Traxler (2007) saw a number of emergent categories that come from reviewing the mobile learning literature, see Table 1.

These may be innovative or conservative technically or pedagogically by virtue of their place in the classification. Of course, this attempt to define mobile learning by making instances – definition by denotation rather than by connotation as we tried earlier – is potentially problematic since in choosing the instances we create a circular definition but it nevertheless takes us a bit further forward. Niall Winters (2006) provides a similar taxonomy which gives us an additional perspective on what might characterise

Table 1. Emergent categories from mobile learning

1	Technology-driven mobile learning – a specific technological innovation is deployed to demonstrate technical feasibility and pedagogic possibility, perhaps the iPhone and iPad.
2	Miniature but portable e-learning – mobile, wireless and handheld technologies are used to re-enact approaches and solutions found in 'conventional' e-learning, perhaps porting an established e-learning technology, such as the VLE or e-portfolio, onto mobile devices.
3	Connected classroom learning – the same technologies are used in a classroom setting to supported static collaborative learning, perhaps connected to other classroom technologies; personal response systems, graphing calculators, PDAs linked to interactive whiteboards etc.
4	Mobile training and performance support – the technologies are used to improve the productivity and efficiency of mobile workers by delivering information and support just-in-time and in context for their immediate priorities, roles and duties
5	Large-Scale Implementation – the deployment of mobile technologies at an institutional or departmental level to learn about organisational issues.
6	Inclusion, assistivity and diversity – using assorted mobile and wireless technologies to enhance wider educational access and participation, for example personal information management for students with dyslexia.
7	Informal, personalised, situated mobile learning – the same core technologies are enhanced with additional unique functionality, for example location-awareness or video-capture, and deployed to deliver educational experiences that would otherwise be difficult or impossible; for example, informal context-aware information in museum spaces.
8	Remote, rural and development mobile learning – the technologies are used to address environmental and infrastructural hurdles to delivering and supporting education where 'conventional' e-learning technologies would fail. This classification is not purely theoretical. It has implications for the objectives and methods of evaluation and for the techniques and objectives for implementation; it may also imply the presence or otherwise of different underlying models of pedagogy and learning.

different types of mobile learning, saying, "Current perspectives on mobile learning generally fall into the following four broad categories: (1) Technocentric. This perspective dominates the literature; (2) Relationship to e-learning. This perspective characterises mobile learning as an extension of e-learning; (3) Augmenting formal education; and (4) Learner-centered." This echoes our earlier points. Another classification of mobile learning that might help us towards a definition is due to Naismith et al. (2004) who suggest that mobile technologies can relate to six types of learning, or 'categories of activity', namely behaviourist, constructivist, situated, collaborative, informal/lifelong, and support/coordination. The mobile learning may be manifest in the following ways: For behaviourist-type activity, it is the quick feedback or reinforcement element, facilitated by mobile devices, that is most notable; For constructivist activity, mobile devices enable immersive experiences such as those provided by mobile investigations or games; For situated activity, learners can take a mobile device out into an authentic context, or use it while moving around a context-aware environment in a specially equipped location such as a museum; For collaborative learning, mobile devices provide a handy additional means of communication and a portable means of electronic information sharing; For informal and lifelong learning, mobile devices accompany users in their everyday experiences and become a convenient source of information or means of communication that assists with learning, or records it on the go for future consultation; Support, or coordination of learning and resources, can be improved by the availability of mobile technologies at all times for monitoring attendance or progress, checking schedules and dates, reviewing and managing, activities that teachers and learners engage in at numerous times during the day.

An attempt by Sharples, Taylor and Vavoula (2005:4) suggested that a theory of mobile learning should be assessed against the following five criteria as in effect their perspective on the defining characteristics of mobile learning: (1) Is it significantly different from current theories of classroom, workplace or lifelong learning? (2) Does it account for the mobility of learners? (3) Does it cover both formal and

informal learning? (4) Does it theorise learning as a constructive and social process? (5) Does it analyse learning as a personal and situated activity mediated by technology?

Ann Jones (Jones et al 2006) makes a similar contribution based on the motivational or affective aspects of mobile learning as defining characteristics. These are both important in themselves and often cited anecdotally as major factors behind decisions to deploy a mobile learning strategy. They are control (over goals), ownership, fun, communication, learning-in-context, and continuity between contexts.

There have also been attempts to define mobile learning and thus to distinguish it from 'conventional' e-learning in terms of the learners' experiences. One view (Traxler, 2006) in looking at characterisations of mobile learning found in the literature finds words such as 'personal', 'spontaneous', 'disruptive' 'opportunistic', 'informal', 'pervasive', 'situated', 'private', 'context-aware', 'bite-sized' and 'portable'.

These are contrasted with words from the literature of 'conventional' e-learning such as 'structured', 'media-rich', 'broadband', 'interactive', 'intelligent' and 'usable'. We can use these to make a blurred distinction between mobile learning and 'conventional' e-learning. However, this distinction, based on the learners' experiences of the two different modes of learning, misses a greater distinction. 'Conventional' e-learning nearly always takes place in situations where the learners' time and space have been dedicated and committed to e-learning, facing their computer, sat with their back to the world, with e-learning taking centre-stage (Crompton, 2013a).

Mobile learning in the sense that we have been talking about it takes place woven into a host of daily tasks, places, groups, interactions and situations. The associations that learners generally have with these two technologies, the static and the mobile, must also be vastly different. This distinction based around learner experience is however not only blurred but in part is also only temporary.

Many of the virtues of 'conventional' e-learning are the virtues of the power of its technology (and the investment in it) and these virtues will be accessible to mobile devices too as market forces drive improvements in memory size, interface design, processor speed, battery life and connectivity bandwidth. Nevertheless, this approach underpins a definition of mobile learning in terms of the learners' experiences and an emphasis on 'ownership', informality, spontaneity, mobility and context that will always be inaccessible to 'conventional' e-learning. We should add that the reported learner experience of mobile learning may depend on where the specific project fits into the earlier taxonomy.

The communities cohering around mobile learning may still feel the need for a theory of mobile learning as well as a definition, for example because of the ability of theory to define a research agenda or produce useful predictions and generalizations (although in a postmodern era, the role of theory as an informing construct is under threat). Such a theory may however be particularly problematic since mobile learning is an inherently 'noisy' phenomenon where context is everything and confounding variables abound, and if theory is something generated by abstracting upwards from practice and experience, then perhaps mobile learning has yet to reach the critical mass of experience and practice that justify such abstraction and has been too fragmented to justify transferable generalisations.

The work of Kuhn (1962) on the structure of intellectual change provides some insights into the role of 'theory' in relation to the professional activities of researchers (though not one without its critics) 'Conventional' e-learning has certainly gained credibility and status from the work of, for example, Laurillard (2002) and Salmon (2000) but there is currently insufficient work in mobile learning generally to underpin much theory building. Theories of 'conventional' e-learning rest on the experience of stable technology platforms; the dominant and enduring nature of Windows, QWERTY, IP, HTML and WWW means that theorising about 'conventional' e-learning can take place in a technology environment that

is consistent, homogeneous and transparent – the technology no longer gets in the way. The technology platform upon which mobile learning theory might rest is by comparison volatile, inconsistent and haphazard and so must impede the work of understanding mobile learning itself. Mobile learning needs a 'theory of technology'. We could argue that the mobile learning community in looking for theory is – to oversimplify - faced with three different options and dilemmas: (1) Import theory from 'conventional' e-learning and worry about transferability, (2) Develop theory ab initio locally and worry about validity, and (3) Subscribe to some much more general and abstract theory and worry about specificity and granularity.

Diana Laurillard's recent recognition of the impact of mobility and mobile technologies on the Conversational Framework (Laurillard, 2007) is an example of taking the first option. She discusses the possibilities of increasing interaction between the learner and the environment but also how problematic or unproductive this might be in informal learning or unsupervised learning (for example, in museum spaces) where a teacher is neither in a position to set appropriate tasks nor to provide meaningful feedback.

This is within more general remarks about the use of the Conversational Framework to support "a rigorous approach to working out how to support all the component learning activities, in remote locations, with learners guided only by the tasks set, the information available online, the characteristics of the world they are in, and peer support." This is a case of mobile learning looking to challenge and extend an accepted e-learning theory. The emerging theories of 'connectivism' (Siemens, 2004) and 'navigationism' (Brown, 2005) are nearer to the second option.

People are now learning "through communities of practice, personal networks, and through completion of work-related tasks" in an environment in which "know-how and know-what is being supplemented with know-where (the understanding of where to find knowledge needed)" (Siemens, 2005). Thirdly, it is fair to say that many of the more theoretically inclined members of the mobile learning community (see for example Sharples et al, 2005) subscribe to versions of Yrjö Engeström's 'Activity Theory' (1987) and this would be the most obvious example of the third option, an analysis of much purposive human activity. Engeström and his colleagues refers to Activity Theory as a "commonly accepted name for a line of theorizing and research initiated by the founders of the cultural-historical school of Russian psychology." whilst others (Er and Kay, 2005) say that the underlying philosophy of the theory is to explain human activity and behaviour.

Learning is analysed as a cultural-historical activity system, mediated by tools that constrain and support the learners in their goals of transforming their knowledge and skills. This is not an attempt to explain or assess Activity Theory but merely to position it as a broad and abstract account of more than just learning and technology. Returning to the issue of definition, Josie Taylor (2006) comes at it from a high level, seeing the question as whether 'mobile learning' signified a) learning mediated by mobile devices or mobility of learners (regardless of their devices), or b) mobility of content/resources in the sense that it can be accessed from anywhere.

In this account her audience preferred the broader concept of learning taking place in the 'mobile age', rather than the use of the narrower term 'mobile learning'. Focusing on defining mobile learning in an age where actually nothing stays still is perhaps missing the point; the question, 'what is mobile learning?' must be replaced by the questions, 'what is learning in a mobile age?' or perhaps 'what is mobile learning?' Our societies are changing as mobile devices, systems and technologies become universally owned, accepted and used, and as a consequence the meaning and significance of learning are changing too. Perhaps 'learning with mobile devices' was adequate all along.

Extending Pedagogies

In the early 2000's, Soloway and Norris (2003a, 2003b, & 2004) called for educators to see beyond 1:1 computing with laptops and to consider the use of personal computers that can fit into the palm of their students' hands. These devices would revolutionalise learning. This change is evident today as mobile learning is extending the boundaries of traditional pedagogies with learning that is personalized, contextualized, and unrestricted by time and environment (Crompton, 2013a; 2014).

Mobile devices, and their technologies and systems, are eroding established notions of time as a common structure that had previously underpinned social organisation and the consensual understanding of the world. Time-keeping is being replaced by the 'approx- meeting' and the 'multi-meeting' (Plant, 2000), 'socially negotiated time' (Sørensen et al, 2002), the 'microcoordination of everyday life' alongside the 'softening of schedules' (Ling, 2004) afforded by mobile devices and Nyíri (2006:301) says, "with the mobile phone, time has become personalized". Whereas previously our social and business relations had to be organized and synchronised by absolute clock time, now mobile technologies allow us to renegotiate meetings and events on-the-fly.

Mobile devices are also eroding physical place as a predominant attribute of space. It is being diluted by "absent presence" (Gergen, 2002), the phenomenon of physically co-located groups all connected online elsewhere – everyone in the room is online elsewhere - and "simultaneity of place" (Plant, 2002) created by mobile phones, a physical space and a virtual space of conversational interaction, and an extension of physical space, through the creation and juxtaposition of a mobile "social space". Ironically, many conversations on the mobile phone, the device to demolish locatedness, start with, "I'm on the train". Clearly we are still adjusting to the disembodied world of mobility.

Mobile devices are reconfiguring the relationships between spaces, public ones and private ones, and the ways in which these are penetrated by mobile virtual spaces. This is documented in the literature of mobilities, for example Plant (2000), Katz and Aakhus (2002), Ling (2004) and Brown et al (2004). Virtual space, and its tasks and relationships, that used be occupied by people sat down, monopolising their attention and partitioning them from the other people and the physical spaces around them moving, now moving amongst these other people and spaces and amongst other tasks and relationships.

This is accompanied by what goes on in those spaces; Cooper (2002) says that the private "is no longer conceivable as what goes on, discreetly, in the life of the individual away from the public domain, or as subsequently represented in individual consciousness", Sheller and Urry (2003) argue "that massive changes are occurring in the nature of both public and private life and especially of the relations between them," and Bull (2005) writing about the iPod says "The use of these mobile sound technologies informs us about how users attempt to 'inhabit' the spaces within which they move.

The use of these technologies appears to bind the disparate threads of much urban movement together, both 'filling' the spaces 'in-between' communication or meetings and structuring the spaces thus occupied." Earlier work on the Sony Walkman came to similar conclusions, "the Walkman disturbed the boundaries between the public and private worlds" (Du Gay et al 1997: 115) Mobile devices are redefining discourse and conversation. Goffman (1971), for example, noted the phenomenon of 'civil inattention', where in certain situations it is customary not only to not speak to others but to avoid looking directly at others. This management of gaze is one way in which the boundary between public and private is negotiated and is now often a characteristic of creating a private space for mobile phone conversations in a public setting; a similar concept is the 'tie-sign', those signs that keep a face-to-face encounter live and 'in play' whilst servicing an interruption caused by a mobile phone call. The recipient of the call is

obliged to "play out collusive gestures of impatience, derogation, and exasperation" according to Goffman. Murtagh (2002) describes a wide set of non-verbal actions and interactions with the mobile phone in public, and these are part of a wider transformation of discourse and social interaction as society engages with mobile technologies.

Alongside these evolving patterns of behaviour, mobile devices help communities and sub-cultures define themselves by affording new forms of language, txt-speak being the obvious example of a language that helped its original users mark themselves out as different from non-users, usually their parents. Mobile devices are creating communities and groupings, sometimes transient and virtual ones, arguably at the expense of existing and traditional ones, captured in Howard Rheingold's (2003) defining book. With these groupings come new norms, expectations, ethics and etiquettes (for example, see Ling (1997, 2004) for a discussion of ethics in a mobile context; and shifting ideas about the self and identity.)

Geser (2004:11) points out that, "the cell phone helps to stay permanently within the closed social field of familiar others: thus reinforcing a unified, coherent individual identity." These are the contexts of 'learning in a mobile age'. Clearly there is much here for educators and learning technologists to digest, from the changes in expectations and practices of interpersonal behaviour in the tutorial, seminar and lecture to the expectations of universities, schools and colleges in specifying the times and places to deliver education. Obviously, mobile devices, systems and technologies are also dramatically changing the economy, thus changing our ideas about artifacts and assets, and the jobs and organisations needed to create, distribute and trade them, and dramatically changing the nature of work itself. Educators must digest these too in their role preparing learners for employment.

Mobile devices, systems and technologies also have a direct and pervasive impact on knowledge itself, and how it is generated, transmitted, owned, valued and consumed in our societies. At the most superficial level, they do finally deliver on the 'anywhere, anytime' promise and apparently on other slogans too, namely 'just-in-time', 'just-for-me', 'here-and-now'. These may be however less simple and benign than they seem. Firstly, knowledge is not an absolute. It has been argued that it is socially determined and socially constructed but it has also always been mediated by its container, its medium, its repository. Mike Sharples (2005:1) says, "Every era of technology has, to some extent, formed education in its own image. That is not to argue for the technological determinism of education, but rather that there is a mutually productive convergence between main technological influences on a culture and the contemporary educational theories and practices.

The teacher is no longer seen as the holder of information but students are now provided with the opportunity to access this information for themselves (Norris & Soloway, 2011). In the era of mass print literacy, the textbook was the medium of instruction, and a prime goal of the education system was effective transmission of the canons of scholarship. During the computer era of the past fifty years, education has been re-conceptualised around the construction of knowledge through information processing, modelling and interaction. For the era of mobile technology, we may come to conceive of education as conversation in context, enabled by continual interaction through and with personal and mobile technology."

The earliest formats, the book and the lecture, originally constrained knowledge to a linear format, the book having at least usually some facilities of graphics, review and organisation and more recently, computers provided web-based hyperlinked information. This was delivered with greater multi-media richness than books but in smaller chunks governed by the heuristics of usability and increased nonlinear navigational complexity. Mobile devices can now deliver information in far smaller chunks but with a vastly increased navigational overhead.

Clearly, these different formats must each have an effect on information and on knowledge in their different ways, on what is accessible and what is valued. With mobile devices, there is a concern that they serve up vast amounts of information and knowledge in small disconnected and trivial chunks. As T. S. Elliott (1934) said, "Where is the Life we have lost in living? Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?" Search engines and knowledge bases can now serve up information that is uniquely customised to the user and their context, meaning their history, their location, their interests, their preferences and their environment.

Whilst this level of personalization seems attractive and desirable, there is also concern that knowledge and information become individualised, a 'neo-liberal nightmare' where each user exists in their own unique information world, fragmenting learners in a 'fragmented society', to use Bauman's (2001) phrase in an accurate but narrower sense than he intended. User-generated content, meaning in user-generated knowledge and user-generated information, is widely available on mobile technologies. Google and Wikipedia, both now location-specific, are examples and they both allow learners control over what they learn, unmediated by any formal institutional learning.

They also allow learners to participate in creating learning through their contributions. This can take place through such systems as Wikipedia but most conspicuously with mobile technologies through the activity of citizen-journalism (Owen, 2005), where members of the public using camera-phones capture images of breaking news and post them straight onto shared file-spaces such as Flickr or YouTube. Journalism has been called the first draft of history and here we see it generated without the intervention of professional journalists or centralised and controlling organisations, perhaps from the perspectives of a mobile culture or particular mobile subcultures.

This generation of new knowledge intrudes a new protagonist into the debate and dichotomy between utilitarian and liberal views of education, and challenges the idea of a common curriculum or universal canon of accepted and useful knowledge that an education system must deliver. It challenges too formal learning, its institutions and its professionals, in their roles as society's gate-keepers to learning and technology for disadvantaged individuals and communities.

CONCLUSION

This chapter puts the work and evolution of mobile learning into the broadest possible context and explores the significance of ideas about 'learning in a mobile age' in the context of the current development of mobile learning. The mobile learning community has an increasingly clear sense of its achievements and its direction but looking beyond the immediate community reveals a far more complex and changing situation. At this point, we can only sketch parts of the evolving picture, guess how society, its conception of learning and the role of mobile technologies in supporting that conception will fit together and wonder at the place of our current work. The challenge for the mobile learning community is the balance between facing inwards, to develop its work, and facing outwards, to understand the context and importance of that work.

FUTURE RESEARCH DIRECTIONS

In looking back at this chapter and attempting to revise it, the main sense and direction of it remains valid and true but a complementary and more critical account (Traxler 2010) sits alongside it. Taken together, these neatly encapsulate mobile learning research and its wider significance.

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KEY TERMS AND DEFINITIONS

Mobile Learning: Mobile learning is defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (Crompton, 2013, p. 4).

Pedagogies: Methods of teaching.

Personal Computers: Another term typically used to describe mobile devices.

Tethered Technologies: Digital Technologies that typically require a constant electrical source, such as desktop computers.

User Generated Content/Information: This term is used to describe content/information created by consumers or end –users, such as video, digital images, audio files, and blogs.

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