

Open Research Online

The Open University's repository of research publications and other research outputs

What have we learnt about mobile LifeLong Learning (mLLL)?

Journal Item

How to cite:

Seta, Luciano; Kukulska-Hulme, Agnes and Arrigo, Marco (2014). What have we learnt about mobile LifeLong Learning (mLLL)? *International Journal of Lifelong Education*, 33(2) pp. 161–182.

For guidance on citations see [FAQs](#).

© 2013 Taylor Francis

Version: Accepted Manuscript

Link(s) to article on publisher's website:
<http://dx.doi.org/doi:10.1080/02601370.2013.831954>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

What have we learnt about mobile LifeLong Learning (mLLL)?

Luciano Seta, Agnes Kukulska-Hulme and Marco Arrigo

Abstract

Mobile technologies are becoming ubiquitous in education, yet the wider implications of this phenomenon are not well understood. The paper discusses how mobile lifelong learning (mLLL) may be defined, and the challenges of forging a suitable definition in an ever-shifting technological and socio-economic landscape. mLLL appears as a ubiquitous concept that puts together mobile learning, essentially an ensemble of didactic practices based on the use of mobile technologies, and lifelong learning, a general vision of education in the knowledge society. Starting from the results of an EU-funded project, MOTILL, the paper situates mLLL within the more complex framework of the network society. This illuminates the difficulties in formulating a comprehensive definition, but also the relevance of this concept in the future of learning. We conclude that the future of mLLL can be understood only as a 360 degree vision that is able to take into account a range of pedagogical, managerial, political and ethical issues.

Introduction

The use of mobile and wireless technologies has been considered by many researchers as one of the key components in the future of learning (Attwell, 2007; Bradford 2010; Shih & Mills, 2007), or as an integral part of any form of educational process in the future (Mauger, 2009). The widespread diffusion of mobile and wireless technologies, although on a global scale, is certainly not uniform and independent of economic and cultural factors, and offers an opportunity to develop education policies aimed at increasing participation in education, considering that the use of mobile devices, in some respects, transcends age, social status, economic level, gender and ethnic origins. At the same time, Castells et al., (2007) highlighted that ‘alongside the development of trends in mobile communication that could be considered global, other trends unique to individual ethnic, cultural, or national characteristics are also found’ (Castells et al., 2007, p. 74).’ Therefore, local, societal embedding of mobile learning must be also considered.

When the impact of mobile and wireless technology on lifelong learning (LLL) is discussed, the specialist literature suggests many possible positive influences: increased flexibility, engagement, critical thinking, collaboration and communication (Cobcroft, 2006). However, there is still limited evidence for all these improvements, which is also true of other innovative technologies in the field of e-learning (Zemsky & Massy, 2004).

Often, in these discussions, aiming to understand ‘how mobile communication technologies are incorporated into the routine lives of users’ (Castells et al., 2007), stereotypical characterizations prevail, based on limited data and, as a consequence, the conclusions are only preliminary. For example, mobile technologies seem able to promote social inclusion (Attwell & Savill-Smith, 2003; Chigona et al., 2009; Liaw et al., 2010), mainly by increasing participation in learning, expanding learner choice, and favouring flexible or personalised learning programmes, which can take place everywhere and at any time. Moreover, mobile technologies have been shown to be particularly effective at reaching

learners who are often overlooked by traditional forms of technology-enhanced learning: for example, mobile workers and learners in the developing world (Donner, 2008; Edwards, 2005; Luo et al., 2006), and can therefore contribute to meeting lifelong learning targets (Dimakopoulos & Magoulas, 2009; Ryu, 2007; Sharples, 2000; Waycott et al., 2002). However, in order to maximize the benefits of mobile technologies for increasing and widening participation, learners, and especially adult learners, need to be given adequate support when developing their use of mobile technologies (Dimakopoulos & Magoulas, 2009). Moreover, suitable technological infrastructures are also needed. To date, there is still no overall model able to describe the relations which link adoption of mobile technologies and enhancement of LLL. A promising step in this direction is the literature review by Wong and Looi (2011) on the related concept of ‘mobile-assisted seamless learning’, which identifies certain features that characterize such learning. In the authors’ definition, a ‘seamless learning environment’ bridges private and public learning spaces where learning happens as both individual and collective efforts and across different contexts (Looi et al., 2010). However, only a few of the papers reviewed by Wong and Looi are concerned with longer-term learning programmes or development of the socio-technical infrastructures that support such programmes. The enhancement of LLL, although mentioned by an increasing number of authors, still seems a distant aim.

These considerations suggest that the impact of mobile technologies on LLL is largely mediated from pedagogical variables, such as participation, choice, flexibility and personalization (McFarlane et al., 2007). Potentially, this impact can increase the number and extend the typology of people involved in LLL. However, this effect can be moderated by contextual variables as well, for example, the level of support in the use of new technologies. Another important moderator to consider is the national political framework aiming to encourage LLL.

These observations became the impetus for the MOTILL project (Mobile Technologies in Lifelong Learning: Best Practices, 2009–10), which was a collaboration between four European institutions. The main aim of the EU-funded MOTILL project was to explore the role of mobile technologies in empowering LLL, with special reference to national policies. For this to happen, one of the most important aspects of the MOTILL project was the involvement of policy-makers (relevant agencies in the areas of LLL and technologies in education, as well as researchers in these fields) to promote local and national targets for LLL in line with European benchmarks and strategic objectives. In fact, policy-makers play a crucial role because of their capacity to promote the benefits of mobile lifelong learning (mLLL) by making the best use of the efficiency of mobile working, learning and teaching in their countries and sometimes in institutions where they exert an influence. However, to do this, policy-makers need strong evidence from research and practice.

Before discussing some results of the MOTILL project, the relation between mobile learning and lifelong learning will be briefly examined with the intent of proposing a definition of mobile lifelong learning (mLLL).

Mobile technologies and lifelong learning

In this section, the concept of mobile lifelong learning (mLLL) will be introduced, at the nexus between technology, education and society. The expression ‘mobile lifelong learning (mLLL)’ has its origin in a chiasmus of ‘mobile learning’ and ‘lifelong learning’ and, as a consequence, the first step to clarify the meaning of mLLL has to be to define these two components. However, this step is not so simple. Even though these two concepts are used throughout the specialized literature, a broad consensus about their meanings has not yet

emerged. Generally, mobile learning (mL) is the use of mobile and wireless technologies for a range of learning experiences. An early definition of mL was the following:

[the] intersection of mobile computing and elearning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment. Elearning independent of location in time or space (Quinn, 2000, para 8).

The merit of this definition is its simplicity, but it now appears outdated. New features seem more relevant to characterize mL: the informal and situated nature of the learning; the prominent role played by communication processes; the locus of control centred on the learner (Kukulka-Hulme & Traxler, 2007; Nyíri, 2002; Traxler, 2009). Moreover, some scholars have highlighted the experiential character of this modality for learning, in which practices are more important than technology (Pettit & Kukulka-Hulme, 2011), and in which the technologies are not only prosthetic artificial devices, or tools to manage information, but they are also instruments to access and construct augmented realities (Arrigo et al., 2007; Klopfer et al., 2008; Klopfer, Squire, & Jenkins, 2002).

When lifelong learning (LLL) is considered the situation is not very different. The most common definition, at least in Europe, can be extracted from European Parliament and Council documents:

‘lifelong learning’ means all general education, vocational education and training, non-formal education and informal learning undertaken throughout life, resulting in an improvement in knowledge, skills and competences within a personal, civic, social and/or employment-related perspective. It includes the provision of counselling and guidance services. (European Parliament and Council, 2006).

This definition is sufficiently wide to include personal, social, economic and civic demands, even if it appears weak from a pedagogical point of view. Learning, independently from the means used to deliver or organize it, is here in an ancillary position with respect to the true objective: the creation of skilled workers, who are able to improve the competitiveness of our societies and economies, helping to construct the knowledge society (Biesta, 2006; Brine, 2006; Coffield, 1999). Barron (2006), criticizing this vision, proposed to consider LLL as aiming to support learners in their transitions across certain borders: from school to workplace, and vice versa; from formal to informal learning; from individualized to socialized learning.

Analysing the discussion above, it is possible to note that mL and LLL have something in common: namely, that both are ‘ubiquitous’. mL is relatively ‘independent of location in time or space’, and LLL is learning ‘undertaken throughout life’. They are not constrained to fixed and static spaces devoted to learning, and they may even have no need of institutions. In a sense, they both inhabit an interior space within the single subject, the learner. This space is populated by prior knowledge, practices, social norms, attitudes, emotions and cognition. Considering all these factors, the learner leads and controls her learning process, she establishes its grain and pace (Green 2002; Pettit & Kukulka-Hulme, 2007), and often the subject’s time does not flow with the same pace as in the public sphere. Regarding the public sphere, Hubert L. Dreyfus (2001) affirmed that:

The public sphere promotes ubiquitous commentators who deliberately detach themselves from the local practices. (2001, p. 75)

Whereas mobile technologies seem to open up a different direction, in which local practices assume a new relevance, tethering users to them (Turkle, 2008).

Considering similarities between mL and LLL, some researchers have written about ‘convergence between new personal and mobile technologies and the new conception of lifelong learning’ (Sharples, Taylor, & Vavoula, 2005). Due to the all-encompassing character of LLL, it is possible to choose, in correspondence with some features characterizing mobile technologies, specific features of LLL that sound similar. The risk in this procedure is to disregard other features of LLL, not so easy to reconcile with mobile technologies. LLL needs long-lasting memories, for example to retrieve learning materials gathered throughout life, and this contrasts with the short-lived nature of mobile devices and applications (although cloud computing alleviates this limitation when content is not tied to a specific device). Moreover, LLL is often described as an individual process that takes place in a competitive world, and this vision conflicts with some singular features of mobile technologies, devoted to supporting communication processes in collaborative frameworks (Gentile et al., 2007; Lewis et al., 2010). However, it is probable that the situation is even more complex, as we face an increasingly changeable educational landscape (Hodgson & Spours, 2009; Weaver-Hightower, 2008).

In conclusion, to see the convergence we have to look more at practices than technologies: the convergence is toward situated practices, and toward common ways to use mobile technologies for work, study and entertainment (Fortunati & Manganeli, 2008; Pettit et al., 2011).

A proposal for an evolving definition of mLLL

The previous discussion can help us toward a definition of mobile lifelong learning. mLLL could be defined as seamless work carried out by the lifelong learner. This work aims to construct the person as a developing subject, able to learn, improve and change. The work can be fuelled by desire, driven by necessity, constrained by censorship, or promoted by personal freedom, but in any case the subject has to perform it continuously, independently of space and time, context and institutions. To attain this objective the subject uses or devises possible tools. In this respect, tools that are portable, wearable, small and mobile are preferred.

This definition recalls in many respect the Personal Learning Environment (PLE) approach (Attwell, 2007; Buchem, Attwell, & Torres 2011), even though our focus is more on the learner’s work to adapt every on-hand object and tool for new learning experiences, while the PLE vision appears more focused on the design of flexible environments, based on specific technologies, able to sustain a learner’s control of the development and sharing of his/her ideas (Attwell, 2007).

The problem with the proposed definition is that it regards the subject as an isolated individual, autonomous and independent. This definition underestimates the social and collaborative dimension of learning, as well as political and cultural constrains, whereas, on the contrary, mLLL is the opportunity to learn in connection with other people and artefacts, thanks to the communication processes favoured by mobile devices, while also being strongly situated in space and time.

mLLL can be thought of as a learning niche, that is, using Gibson’s words:

[A niche] is not quite the same as the habitat of the species; a niche refers more to how an animal lives than to where it lives. I suggest that a niche is a set of affordances. [...] In ecology a niche is a setting of environmental features that are suitable for an animal, into which it fits metaphorically. (Gibson, 1986, pp. 128–129)

In our case, the ‘animals’ are the lifelong learners and mobile technologies offer them new possibilities. Thus, the relationship between mobile technologies and lifelong learners determines a new set of affordances. In this niche, learners wear small devices and live surrounded by wireless connections. Thanks to portability and connectivity, the whole landscape of LLL is changing and, consequently, it is changing also what people can study and learn. In this landscape the learner is now able to recognize new resources, new study-on-able and learn-about-able objects, speaking in the manner of Gibson.

To avoid confusions (Oliver, 2005), the term affordance is used here only incidentally, mainly to distinguish between environment and niche: the environment is a deployment of tools, objects, rules and division of labour processes (to use the activity theory jargon), more or less favourable for learner development; the niche is the ‘whole rich world around’ the learner. Jakob von Uexküll (1934) spoke of Umwelt and evolutionary biologists, starting from the seminal work of Sewall Wright (1932), of fitness landscape. In all cases it is a relationship between environment features and subject traits.

There are further insightful discussions about the objective or subjective nature of affordances (Boyle & Cook, 2004; Conole & Dyke, 2004b; McGrenere & Ho, 2000; Warren, 1995), if they are independent of the actor’s experiences and culture (Oliver, 2005), if it is possible to generalize the concept considering also social affordances (Kreijns & Kirschner, 2001), affordances for learning (Laurillard et al., 2000) or affordances for communication and collaboration (Conole & Dyke, 2004a), but lack of space prevents us from developing them here.

In any case, the sustainability of a mLLL niche requires us to take into account the following words:

Behavior affords behavior, and the whole subject matter of psychology and of the social sciences can be thought of as an elaboration of this basic fact. Sexual behavior, nurturing behavior, fighting behavior, cooperative behavior, economic behavior, political behaviour - all depend on the perceiving of what another person or other persons afford, or sometimes on the misperceiving of it. (Gibson, 1986, p. 135)

From this deep insight, the relevance of political, organizational and institutional issues emerges naturally, and so it is possible to understand the weakness of some frameworks used to analyse and design mobile learning (Nordin et al., 2010; Ryu & Parsons, 2008), in which some of these issues are absent or undervalued.

In the case of LLL, its governance is often demanded in top-down performance management and markets: see Coffield et al., (2008) for a critique of this approach in England, and in Italy, Zagardo (2010) and Associazione TreeLLLe (2010). By cultivating relationships across a broader landscape, including policy and decision-makers, at state, regional and local level, institutions and educational providers can have a strong impact in determining positive affordances and avoiding negative ones.

In the next part of this paper, the suggested definition of mLLL will be enlarged, also in the light of the results of the MOTILL project and, in particular, management, pedagogy, policy and ethics will be discussed as the main dimensions to pay attention to in order to understand the real impact of mLLL in western society.

mLLL in the MOTILL project

The MOTILL project brought good mobile learning practices and methodologies to the attention of policy-makers and other organizations involved in the LLL process. In the

following, when we speak about policy-makers we mean a wider ecosystem, in which are included national, regional, local and institutional governance, education providers, local communities, the third sector, unions and enterprises.

To achieve the goal of promoting understanding of mLLL among these actors, the MOTILL project partnership introduced them to the state of the art on how mobile technologies can best support LLL, as well as good practices in this field resulting from the main activities carried out in the partner countries. Finally, partners signed national agreements as ‘declarations of intent’ with national agencies, research institutes, universities and other policy-makers to promote new national initiatives in which mobile technologies will play a crucial role in LLL strategies. The principal outcomes of the MOTILL project are depicted in figure 1.

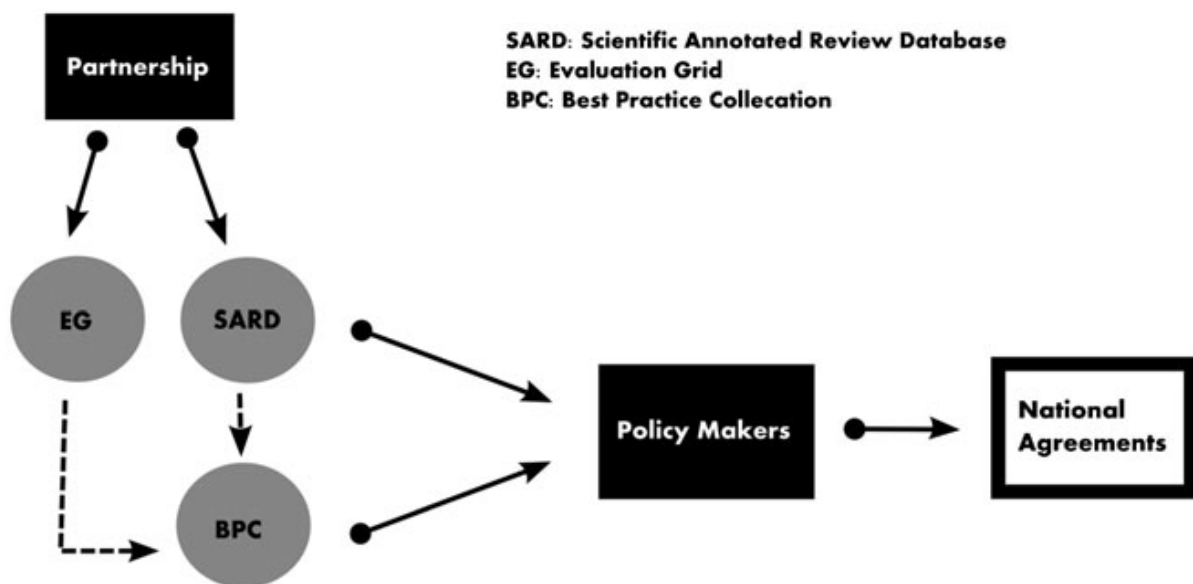


Figure 1. Main MOTILL outcomes

After a first phase intended to establish a common background between the partners, the work was focused on collecting some relevant experiences in which mobile technologies were applied in LLL. To obtain this result, the partnership developed a framework to analyse and describe specific good practices. Finally, the project activities were dedicated to involving policy-makers and educational agencies in the project outcomes.

The main idea of the MOTILL project (Arrigo, Kukulska-Hulme, Arnedillo-Sa´nchez, & Kismihok, 2013) was to construct an ensemble of shared resources that stakeholders and policy actors can consult to find relevant information about opportunities and initiatives relating to the use of mobile technologies in LLL, based on published research and investigation of best practices:

- The SARD is a Scientific Annotated Review Database that provides a comprehensive set of references to the major research initiatives concerning the use of mobile technologies in LLL.
- An Evaluation Grid (EG) was conceived as a tool that would enable MOTILL project partners to work in a consistent manner to identify ‘best/good practices’ in the use of mobile technologies for lifelong learning, whilst taking national and local contexts into consideration.

- The Best Practices Collection (BPC) represents the most relevant mobile learning projects identified following the guidelines defined by means of the EG, and presents them in the form of eleven case studies.

What have we learnt?

In this section we discuss how mobile technologies can best support LLL in relation to the four dimensions of management, pedagogy, policy and ethics. The idea is to situate the mLLL within a more complex framework, to better understand the strengths and weakness of this educational paradigm. Results presented in this section arose from a systematic comparison of the case studies analysed during the MOTILL project. In fact, within the MOTILL project the partnerships identified 25 relevant projects concerning mLLL. From among them, 11 projects that we considered the most representative for the objective of the MOTILL project were selected and analysed. It should be noted that projects were seldom explicitly focused on mLLL, but they represented mLLL in that they described the use of mobile and wireless technologies for learning in largely non-traditional settings. The learning was frequently informal or semiformal, and it was not taking place in classrooms or lecture halls. In particular, we have analysed the following projects: MoULe, Federica and ENSEMBLE in Italy; Bletchley Park, BathSMS and WoLF in United Kingdom; FO'N, Mobile Mood Diary, MobileDNA in Ireland; Contsens, LOGOS in Hungary. A detailed introduction to these projects and an analysis, based on the MOTILL Evaluation Grid, is available in the MOTILL results booklet (Arrigo et al., 2010).

Management

This section is devoted to illustrating the approach to management issues that seems to characterize mobile learning projects, based on the analysis of experiences carried out during the MOTILL project. It is interesting to note that the mobile learning practitioners interviewed for MOTILL were rarely able to contribute evidence on some relevant aspects that are usually highlighted in literature devoted to the management of educational projects. In discussions about the diffusion of innovative technologies in educational contexts, the specialized literature has often emphasized the relevance of instructional design issues and described the main processes, competencies, and skills needed to improve the integration of technologies (IBSTPI, 2000; Richey et al., 2001). Also, adoption of a project management perspective has been deemed important for the evaluation of educational initiatives, especially if these initiatives are largely based on new technologies and multimedia languages (Williams van Rooij, 2010).

However, analysing the various interviews with project leaders that were conducted in MOTILL, we can see that these aspects are rarely stressed. In this respect, the difference between mobile learning and elearning is manifest. In the literature devoted to elearning, issues related to human resources, quality, cost and time management are often discussed at length. It is rare to start an elearning project without a careful evaluation of these aspects, and staff are often well aware of the necessity to describe the main processes and monitor them continuously. The project management approach is not yet totally adopted and accepted within educational organizations; but the discussion around this issue is ongoing (Li & Shearer, 2005; McDaniel & Liu, 1996; Williams van Rooij, 2011; Yang et al., 1995). These aspects are often left aside when mobile learning is considered. This is a consequence of many factors, some typical of the mobile learning framework, and others more general. Some of these will be briefly discussed below.

First, mobile learning, as an instructional methodology, has not yet reached a mature stage. Many practitioners borrow theories and practices from elearning, and rarely feel the necessity to develop specific management approaches, tailored to the use of mobile technologies in education, and especially in LLL. As a consequence, management issues are generally underestimated.

Another cause can be identified in peculiar subcultures characterizing many mobile learning communities of practice. As Hoppe et al., (2003, p. 258) emphasized, ‘the introduction of new technological tools takes place in an existing social environment having their patterns of interaction, their own culture’. Within mobile learning communities, it is usual to frame this instructional approach inside naturalistic settings (Barab, 2002; Lundin & Magnusson, 2003), within enlarged visions of learning as informal and contingent, and using ecological metaphors (Pachler et al., 2010). For practitioners engaged in mobile learning, it is often deemed to be a bridge connecting everyday life activities with generic learning activities, short in duration and purpose-driven (Gu et al., 2011). Thus, mobile learning is seen as a means to transform almost any life situation into a learning experience, able to elicit specific attitudes and activate particular habits in the learners (Shih et al., 2011). As a consequence, mobile learning is rarely designed as an ensemble of structured activities, and the principal design questions arise from the difficulty in reconciling pedagogical flexibility and technological reliability.

It is interesting to note that possible impacts of mobile technologies on learning and on specific subcultures are common in educational and in work-place contexts (Lundin & Magnusson, 2003; Smith & Cap, 2008). This suggests that it is possible to analyse mobile and lifelong learning as two quite singular ways to translate into the knowledge management context a more global paradigm characterizing contemporary societies. This paradigm has been described by many scholars using different terms: ‘network society’ in Castells (1996); ‘rhizome’ in Deleuze and Guattari (1980); ‘Actor–Network Theory’ (ANT) in Callon (1986) and Latour (2005); ‘projective city’ in Boltanski and Chiapello (1999). All these concepts are dominated by the metaphor of the network, in which the purpose of efficiency, typical of the traditional management approaches, has been substituted by the imperative of making connection, putting people in contact (Boltanski & Chiapello, 1999).

This vision echoes many reports of the mobile learning practitioners interviewed in the MOTILL projects. The use of handheld devices as tools to construct new relations (between people, people and places, people and artefacts, places and artefacts and, finally, between people, places, and artefacts) was common to almost all analysed projects.

Boltanski and Chiapello (1999, p. 112) have observed:

Even at the peak of engagement, enthusiasm, involvement in a project, people at ease in a network remain “adaptable, physically and intellectually mobile”, prepared for change and capable of new investments, in order to increase their “ability to respond to a changing world”.

This concept of mobility is related to the idea of ‘transition’: mobile learning as a didactic means of managing and supporting transitions, physical and intellectual. In fact, it is very interesting to note the parallel between the analysis of Boltanski et al., (1999) of the ‘great man in the projective city’ and the role of the teachers in a mobile learning experience:

[These great men] are not (hierarchical) bosses, but integrators, facilitators, an inspiration, unifiers of energies, enhancers of life, meaning and autonomy. (Boltanski et al., 1999, p. 114)

So, the contingency of this experience, the situated nature of this learning, has as a consequence the necessity to manage the agency of the people involved, transferring the control to the learner, until eventually educators might completely disappear:

In a connexionist world, people are called upon to move around, to forge the links they use in their work themselves—links that cannot, by definition, be pre-established in advance—and to distrust any structure and post designed in advance, which risk confining them to an overfamiliar universe. Their flexibility, their ability to adapt and learn continuously, become major advantages, which takes precedence over their technical expertise (knowledge changes so quickly) and their experience (Boltanski & Chiapello, 1999, p. 135)

In fact, all analysed projects in MOTILL showed the necessity to manage a complex environment:

With knowledge doubling every year or so, expertise now has a shelf life measured in days; everyone must be both learner and teacher; and the sheer challenge of learning can be managed only through a globegirdling network that links all minds and all knowledge. (From Perelman, 1993, in Dreyfus, 1999, p. 22)

In conclusion, mLLL appears as a natural effect of a more general change that the management literature has tried to describe. The management of mobile learning projects is, for this reason, often deemed a problem of harmonization of intuition and expertise (Hadjithoma-Garstka, 2011). In contrast, for some aspects, elearning appears to be still related to more traditional management and instructional design approaches, structured around the principles of performance and efficiency (Boltanski & Thévenot, 1991).

From the analysis of the mLLL projects carried out during the MOTILL project this vision is corroborated. In fact, the results show a scarce interest in the traditional management issues: the quality assurance process was rarely designed, and the risk assessment was often undervalued. Only the instructional design issues appear as central, and many efforts seem focused on creating or adapting content for mobile devices; setting up new pedagogies and educational practices supported by mobile technologies; and designing tools and infrastructures to make content available on new channels and devices.

The role of the teacher as facilitator and integrator was generally recognized, and the interviewed practitioners pointed out the lack in technological skills of the staff and the high cost needed to train them. It is important to note that the role of other professionals and, in general, of organizations and institutions did not appear well-defined and their relevance to the didactic experience was not stressed.

If the agency was ascribed to learners, who are in charge of managing and organizing their learning process, this occurs within a general vision of the lifelong learner as a person concerned with practical knowledge, a sort of informal and intentional learning (Gu et al., 2011) engaged with to establish new links, to construct a network of contents, persons, and activities.

The analysis also shows that mobile technologies play a crucial role in promoting transition. This happens, for example, by moving informal competences to a formal scenario, moving to a higher level of study, supporting moves between learning institutions, and changing from individual and uncreative work to collaborative creative interactions.

In conclusion, we have highlighted the paradigm shift associated with the diffusion of mobile and lifelong learning, and illustrated that this shift is also related to a more global movement, started during the 1990s, directed to overcoming some constraints that

characterize western industrial society. Management issues are not a secondary aspect, but an important touchstone to understand the difference with respect to traditional learning, and elearning too.

Pedagogy

MOTILL's pedagogical inquiry explored pedagogical approaches, learning behaviours, development of competences, achievement of educational goals and support for learning across contexts. These aspects reflected the main pedagogical concerns found in the mobile learning literature and were oriented to identifying opportunities for new forms of learning. Laurillard (2007, p. 153) had observed that mobile technologies '(...) change the nature of the physical relations between teachers, learners, and the objects of learning'.

The MOTILL consortium felt it was important to understand these changing relations and what might be the implications for mLLL. We found that a range of familiar pedagogical approaches was evident across the MOTILL case studies; but the projects have also led to the development of new models of instruction to fulfil specific educational aims. The new models attempt to describe the agency of the learners, the various settings where learning takes place, and how it is necessary to re-think the educational process, content and objectives. The case studies in the BPC demonstrate how, in many cases, the use of mobile technologies has effectively increased learner engagement and has had positive impacts on learners' self-perception. Furthermore, it could be said that the mobile technologies were having a transformative effect upon the subject matter involved and the traditional boundaries between subjects.

In relation to learners, mobile learning facilitated access and social inclusion; responded to learners' needs (such as collaboration) and their technology use habits; and enabled learners to manage and direct their own learning. It was possible to take learning out of the classroom and into the real world; to enable construction of learning in context; and to provide learning content based on contextual information about the user. Finally, there was evidence of use of ontologies to create multidimensional curricula that work at scale and cater to individual needs, enabling mass-customized learning content delivery, helping teachers and instructors to provide personalized content for students.

The foregoing considerations are deliberately concise and generic. For further details, it is possible to refer to the project website (www.motill.eu), where all the pedagogical issues are explored and discussed in relation to every single experience described. However, in the following some factors will be highlighted related to the development of mLLL experiences not so well represented in the literature.

The need for those in post-compulsory education to manage and direct their own learning is widely recognized as essential to their success as lifelong learners. For example, mobile technologies have enabled young people to have more control over learning about their emotional states (Mobile Mood Diary case study). In another case study (BathSMS), the integration of SMS messaging and a Virtual Learning Environment encourages students to take greater control of the style and the content of lesson delivery. In a third case study (WoLF), mobile devices helped learners in development of a number of important skills, including analytical skills (gathering and reflecting on evidence), technical and communicative. PDA devices helped them organize their work and provided continuity between formal and informal learning contexts. They also provided important opportunities for course leaders to give formative feedback through email and instant messaging services, both of which were accessible through the mobile device.

Other case studies in the BPC collection consider how temporal and spatial factors can influence the collaborative process. For example, the learning activities of the MoULe

project have taken place in different physical contexts (the classroom, outdoors) and across different cultural environments; consequently, a model for a mobile Knowledge Building Process was defined. On the basis of this model, the researchers studied the evolution of a mobile collaborative learning experience through interactions in social, information and geographic spaces. One of the aims of the system was to introduce the constructivist paradigm in everyday life situations: students learnt that the objects around them can be transformed into learning objects. The appeal of real-life learning is also exploited in another case study (the FO'N project), which extends the context for increasing fluency in a spoken language out of the classroom and into real conversations supported by mobile technologies. In the Bletchley Park case study, learners are supported in the transition between the semi-formal environment of a museum and more informal learning scenarios at home through the continuity provided by intelligent navigation of the museum's digital archives.

Finally, a number of case studies (e.g. LOGOS and Contsens) explore the use of ontologies in order to give a structural description of pilot courses. Mobilization of learning has also been a key issue in both these projects. The mobile device can act as a sensor, collecting contextual information about the user's behaviour. Later, content based on this information is provided to the learner automatically. In another project (ENSEMBLE), MMS and podcast formats aim at producing stimuli for the learner by adopting these communication solutions. The latter project also confirms that mobile devices are suited to supporting learning in contexts which are less formal, or where the learner is substantially or entirely self-managed or self-directing.

Thus our findings support the idea of changing physical relations between teachers, learners and the objects of learning, as learners orientate themselves more towards a variety of different real-world settings, where they manage and direct their own learning, pointing to a future where mobile learning is likely to become a shared enterprise between learners, teachers, learning objects, and more sophisticated technologies that increasingly understand, and provide for, a variety of learner needs and behaviours in context.

Policy

When the management issue was analysed the main difference highlighted was between approaches in mobile learning and elearning. The former appears better to translate the shift summarized in Castells' (1996) definition of the network society. Furthermore, mobility, contingency, everyday life immersion, situatedness and context awareness of the learning experience make mobile learning the natural pedagogy for the citizens of the projective city for whom the concept of flexible networks is paramount.

When one comes to study the policy issues, the main difference is between mobile and lifelong learning visions. In this respect, mLLL can originate a significant change in the way we think about LLL. In some respects, it is not a real novelty but a return to its origins. In fact, the principal pressure to introduce the Lifelong Education concept was, originally, to help countries in the third world overcome the gap between them and western countries, putting right the mistakes of colonization (Gelpi, 1973). This original vision was slowly modified and Lifelong Learning is becoming the main political driver in the educational policies of the European Union, but LLL appears also in the documents of OECD (Organization for Economic Co-operation and Development), World Bank, and other global organizations. The main differences with respect to the original vision are that LLL is more focused on the developed world, LLL is now conceived more as an ensemble of policies aimed to boost competition, and these policies are increasingly addressed to individual learners more than educational organizations and public institutions (see Billett, 2010, for a critique of policy).

As Brine (2006) has put on evidence in a textual analysis of European Commission documents from 1993 to 2006, the consequence is that the concept of LLL was addressed only to high knowledge-skilled graduate and postgraduate learners. This learner was identified in terms of educational status, in contrast with the low knowledge-skilled learner who was referred to mainly in terms of gender, ethnic origin, economic class or particular learning needs.

In this framework the introduction of mobile technologies has put on evidence new needs, new subjects, and a new perspective, mainly for three reasons. First, the widespread adoption of handhelds permits the design of educational projects that are able to overcome the gaps related to the digital divide, and so these projects are well-suited also for economically depressed countries, or for people who inhabit the grey areas of exclusion, such as immigrants, low-skilled workers, ethnic and linguistic minorities, and unemployed people. Second, mLLL projects often require the involvement of political institutions, as well as educational agencies and organizations. The consequence is a new responsibility of decision-makers and of communities in relation to the meaning of learning, duties and rights of the learner, and the social impact of educational programmes. Finally, the strong orientation of mobile devices toward communication produces the setting up of learning experiences in which cooperation prevails over competition. In mobile learning, more than other technomediated situations, teachers, students and others have not to convey information per se, but 'to establish a context in order to convey a particular interpretation of information' (Levy, 2010). Therefore, these devices fully deploy their potential in sharing contexts, creating a community of peers, or setting up networks oriented to specific projects.

So, mLLL can recover some aspects of the original pressure: the interest toward the social inclusion issue, a vision shaped by political demands, the focus on cooperation and development. This emerged also from the analysis of the good practices in the MOTILL project.

We frequently observed in mLLL projects an interest in social challenges addressed towards minorities, migrants in the Ensemble project, adults interested in having access to university study in the Federica project; to preserve heritage, as in the Bletchley Park project, and linguistic specificity, as in the FO'N project. Often these projects were organized with the explicit participation of political entities, ranging from regional authorities to global organizations like UNICEF.

mLLL appears oriented to involve in the learning process not only teachers and students, but a larger part of society, situating learning in everyday life situations. Unstructured activities and ephemeral encounters, such as an interview on the road with a passer-by, can be transformed into knowledge, when they are inserted in a suitable context. The necessity to plan non-traditional learning experiences requires a definition of new policies for the accreditation of these courses, the definition of new curricula and a different management of the intellectual property rights of the learning contents. Similar issues call for the interest of policy-makers at national and supranational level.

Finally, mLLL raises also a financial challenge. In fact, it is important to note that some examined projects were funded with a contribution of EU funds, or directly by means of specific programs, such as the Leonardo da Vinci Program, or the Lifelong Learning Program; or indirectly by means of the European Social Fund. Other projects obtain financial support from local organizations, often a university or college wanting to try these innovative technologies in an educational setting. Thus, to sustain mLLL new forms of funding are necessary, also considering the costs of the mobile technologies, in terms of devices and connections, which at the moment are not so cheap.

Ethical considerations

Ethical issues in the mLLL context present some peculiarities, especially compared with the contexts of mL and LLL. In fact, mLLL is a learning activity requiring the interplay between pedagogy, technology, organization/institution, people, and artefacts. The careful consideration of this interplay brings to the fore particular ethical issues, or rather it modifies the way we need to assess typical ethical issues related to technology enhanced learning (Lewthwaite, 2011). Analysis of the replies in the questionnaire used to define the MOTILL BPC puts on evidence a broad range of ethical issues which fell into three broad categories: accessibility; privacy and security; copyright. However, these three big issues in the mLLL context acquire new dimensions.

Recent approaches in the field of accessibility have highlighted that accessibility implies two aspects: access through technology, and access in any environment and location (Lewthwaite, 2011; Seale, 2006). In mL, the use of handheld devices puts evidence on some specific difficulties in relation to the physical attributes of devices, content and software applications in use, technical characteristics of networks, and also the physical environment and location (Kukulka-Hulme, 2007). In the case of LLL, the focus is on access to knowledge and information. The lifelong learner has to be a skilled learner in a position to manage his/her educational and training programmes. This framework defines a more complex learning space that calls for new accessibility conditions if the priorities are increasing opportunities, reducing inequalities, and improving employability. In this space the principal concerns are enhancing flexibility, widening participation, improving access to learning opportunities, and supporting diverse learners' needs (HEFCE, 2009).

Thus, in the mLLL context, pedagogical, technological, and organizational issues have to be managed simultaneously to avoid troubles which would lead to an inability to engage with a learning experience at all. For example, to overcome the technological gap, providing mobile devices to the learners cannot be sufficient. In fact, the provision of a mobile device in order to facilitate engagement with the learning experience could be perceived to be detrimental to the learners' perceptions of the experience. They may prefer to use their own devices.

From the analysed projects, an ethical issue involving educational institutions is the content of planning policies and business models for keeping the cost of using mobile technologies to a minimum. Moreover, as the proliferation of mobile technologies was not considered universal, in some of the projects the learning activities performed a supplementary role and other means of access to the learning experience were provided. An alternate means of access to the experience was an ethical consideration arising from concerns about the literacy of users in relation to using mobile technologies. At times, care had to be taken not to undermine the ethos of the learning institution's approach to mobile technologies; for example, policies relative to the use of mobile phones in the classroom, or rules for the dissemination of photos and videos depicting minors, or compliance with the rights for reproduction of artworks. This was particularly evident in projects in schools and museums. Modifications to the learning experience in order to support access by learners with physical and cognitive disabilities were also undertaken to foster inclusion. Privacy and security concerns assume a special relevance in the mLLL context. The necessity to improve personal communications has to be reconciled with the opportunity to monitor all activities of the learner, especially in consideration of the long-lasting nature of LLL. In fact, an mLLL experience does not resolve itself in a single course; competences and qualifications, attained in this experience, will contribute to broaden the learner's curriculum. Naturally, educational institutions have to define specific policies to manage personal data and to guarantee the rights of learners, teachers, and other parties involved. Many initiatives were undertaken to protect all partners engaged in the learning experiences. The limitation of the functions of the devices used, the anonymity of users, adequate mentoring, and

monitoring of the use of the technologies were all employed to alleviate these concerns. The use of mobile technologies to communicate with learners can be perceived as an invasion of privacy and this concern was usually addressed through consultation with the learners. The ethical use of images, video and sound recordings obtained via learners' mobile devices was another area that needed to be addressed.

Finally, the need to adhere to the relevant copyright and media ownership issues while incorporating mobile technologies for learning raised ethical issues. Often, mLLL activities require an active role on the part of the learner in the creation of contents and artefacts. These objects do not have a well-defined authorship, they were created during a collaborative activity, working on materials from different sources. Any object can be an occasion to construct new learning content, and the 'on the fly' nature of many mobile learning processes does not permit proper recognition of intellectual property rights. These issues were resolved by obtaining permission, if possible, to use the material from the owner, the development of unique material and the use of material available under creative commons licensing.

Conclusion

This paper aimed at considering the relatively new topic of the use of the mobile technologies in relation to the imperatives of lifelong learning. The intent was to set out some observations on the complexity involved in forging a definition of mobile lifelong learning (mLLL).

Often, when a new concept is considered, two distinct approaches are possible. The researcher can adopt a low profile, deciding to analyse everyday practices and the actors involved. On the other hand, she/he can decide to opt for a theory-driven vision, with the aim to define the new concept thanks to commonly accepted theoretical references. Both these approaches have points of strength and weakness.

An approach aiming to describe practices can catch the more fine-grained features and some processes that are not yet completely deployed. The problem is that it is often addressed to very restricted communities, and it is not able to describe the consequences of such practices in other communities.

The strength of the second approach is to indicate the way toward a deduction-based definition. Such a definition should be easily generalizable, thanks to its anchorage to a clear theoretical framework. The risk is in the weakness of the predictive power of this definition. In the effort to attain a more general vision, it can lose some detailed features of the situation, perhaps features that can suggest future directions.

This paper suggests a path toward the definition of mLLL that puts together some theoretical assumptions with a constant attention to actual mLLL experiences, as they have been carried out in some European countries and analysed during the MOTILL project.

In relation to the theoretical framework, the relation between mobile technologies and education was analysed using Gibson's concept of niche. The ecological perspective suggested by this concept seems to better highlight some features evidenced from the analysis of the cases in the MOTILL project. For example, the ecological vision helps to illustrate the contribution of technology to the definition of a particular niche, but also that this niche is part of a more complex environment and the proposal of Boltanski and Chiappello (1999) of the projective city is very useful in this respect. In this perspective, mLLL can be seen in a new light, in a wide world dynamic able to mobilize human resources and to promote new educational policies, in a quick process of creation/disruption through new actor-networks (Latour, 2005).

Passing from theory to everyday practice, mLLL reveals itself as a node of a net that relates educative practices, strategies for economic development (the European Lisbon

strategy is an example), laws and individual rights (intellectual property, privacy, etc.), social policies (such as policies for inclusion and integration of migrants), identity claims (high- vs. low-status learners/workers), technology fascination (swift spread of handhelds around the world), and more. The future of mLLL can be understood only as a 360 vision that is able to take into account a range of pedagogical, managerial, political and ethical issues in addition to the perspective of rapidly evolving technology.

Any proposal for a definition of mLLL is necessarily biased and before long it is superseded. This will also be the destiny of the vision presented in this paper. The mLLL described here is the result of a 10-year process of research and practice in mobile learning, a very short period of time. Moreover, further developments in mLLL can be conceived as a new actor that is playing a role in the formation of a new decade, completely different from the one before.

The paper suggests we should think about mLLL as seamless work carried out by the lifelong learner, but this process does not happen in a void. First, the learner is not an isolated individual; second, the current organization of social life has a deep impact on his or her values, interests, and priorities. So mLLL is also work that is carried out by the lifelong learner in connection with other people and particular artefacts, such as mobile technologies. The learner is engaged in an activity aimed at acquiring not only new knowledge, but also new skills—for example, to manage intricate connections and various identities, in an adaptable and flexible manner. The idea is that mLLL stands as the principal candidate to shape the educational environment for the next city, beyond the projective city.

Acknowledgements

The results presented in this paper are part of the MOTILL project. The MOTILL project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

References

- Arrigo, M., Gentile, M., Taibi, D., Fulantelli, G., Di Giuseppe, O., Seta, L. & Novara, G. (2007). Experiencing mobile learning: the MouLe project. In Minh Hung Le, Metin Demiralp, Valeri Mladenov, & Zoran Bojkovic (Eds). *Proceedings of the 7th Conference on 7th WSEAS International Conference on Applied Informatics and Communications - Volume 7 (AIC'07)* (pp. 40–45). Wisconsin, USA: World Scientific and Engineering Academy and Society.
- Arrigo, M., Di Giuseppe, O., Fulantelli, G., Gentile, M., Merlo, G., Seta, L., & Taibi, D. (2010). MOTILL – Mobile Technologies in Lifelong Learning. Best practices (Italian National Research Council - Institute for Educational Technology). Available online at: http://www.motill.eu/images/stories/motillbooklet_en.pdf
- Arrigo, M., Kukulska-Hulme, A., Arnedillo-Sánchez, I., & Kismihok, G. (2013). Meta-analyses from a collaborative project in mobile lifelong learning. *British Educational Research Journal*, 39, 222–247. doi: 10.1080/01411926.2011.65206
- Associazione TreeLLLe (2010). *Il lifelong learning e l'educazione degli adulti in Italia e in Europa* (Quaderno No. 9, Dicembre 2010). Retrieved March 27, 2011, from http://www.treeulle.org/files/III/quaderno_9.pdf
- Attewell, J., and Savill-Smith, C. (2003). M-learning and social inclusion: focusing on learners and learning. In J. Attewell & C. Savill-Smith (Eds.), *Proceedings of MLEARN*

- 2003: Learning with Mobile Devices (pp. 3-12). London, UK: Learning and Skills Development Agency.
- Attwell, G. (2007). Personal Learning Environments – the future of eLearning? *eLearning Papers* ISSN, 2, 1887–1542.
- Barab, S. (2002). Human-field interaction as mediated by mobile computers. In T Koschmann, R. Hall, & N. Miyake (Eds.), *CSCL2. Carrying forward the conversation* (pp. 533–537). Mahwah, NJ: Erlbaum.
- Barron, B. (2006). Interest and Self-Sustained Learning as Catalysts of Development: A Learning Ecology Perspective. *Human Development*, 49, 193–224.
- Biesta, G. (2006). What’s the point of lifelong learning if lifelong learning has no point? On the democratic deficit of Policies for lifelong learning *European Educational Research Journal*, 5, 169–80.
- Billett, S. (2010). The perils of confusing lifelong learning with lifelong education. *International Journal of Lifelong Education*, 29, 401–413.
- Boyle, T., & Cook, J. (2004). Understanding and using technological affordances: a commentary to Conole and Dyke. *ALT-J, Research in Learning Technology*, 12, 295–299.
- Boltanski, L., & Thévenot, L. (1991). *On Justification. Economies of Worth*. Translated in English by C. Porter. Princeton: Princeton University Press.
- Boltanski, L., & Chiapello, E. (1999). *The New Spirit of Capitalism*. Translated in English by G. Elliott. Princeton: Princeton University Press.
- Bradford, D. J. (2010). *Emerging and disruptive technologies for education: An analysis of planning, implementation, and diffusion in Florida’s eleven State University System institutions*. Unpublished doctoral dissertation, University of Central Florida. Retrieved October 29, 2012, from <http://tinyurl.com/62jaw8f>
- Brine, J. (2006). Lifelong learning and the knowledge economy: those that know and those that do not - the discourse of the European Union. *British Educational Research Journal*, 32, 649–665.
- Buchem, I., Attwell, G. & Torres, R. (2011). Understanding Personal Learning Environments: Literature review and synthesis through the Activity Theory lens. In: *Proceedings of The PLE Conference 2011, 10th – 12th July 2011, Southampton, UK*, p. 1-33. Retrieved October 29, 2012, from <http://journal.webscience.org/658/>
- Callon, M. (1986). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, action and belief: a new sociology of knowledge?* (pp. 196–223). London, UK: Routledge.
- Castells, M. (1996). *The Rise of the Network Society*. Oxford, UK: Blackwell.
- Castells, M., Fernández-Ardevol, M., Linchuan Qiu, L., & Sey, A. (2007). *Mobile Communication and Society: A Global Perspective*. Cambridge, MA: MIT Press.
- Chigona, W., Beukes, D., Vally, J., & Tanner, M. (2009). Can mobile internet help alleviate social exclusion in developing countries? *Electronic Journal of Information Systems in Developing Countries*, 36, 1–16.
- Cobcroft, R. (2006). *Literature Review into Mobile Learning in the University Context* Unpublished doctoral dissertation, Queensland University of Technology.
- Coffield, F. (1999). Breaking the Consensus: Lifelong Learning as Social Control. *British Educational Research Journal*, 25, 479–499.
- Coffield, F., Edward, S., Finlay, I., Hodgson, A., Steer, R., & Spours, K. (2008). *Improving learning, skill and inclusion: the impact of policy*. London: Routledge/Falmer.
- Conole, G., & Dyke, M. (2004a). What are the affordances of information and communication technologies? *ALT-J, Research in Learning Technology*, 12, 113–124.

- Conole, G., & Dyke, M. (2004b). Understanding and using technological affordances: a commentary to Boyle and Cook ALT-J. *Research in Learning Technology*, 12, 301–308.
- Deleuze, G., & Guattari, F. (2006). *A Thousand Plateaus: Capitalism and Schizophrenia*. Translated in English by B. Massumi. London, UK: Athlone Press.
- Dimakopoulos, D. N., & Magoulas, G. D. (2009). An Architecture for a Personalized Mobile Environment to Facilitate Contextual Lifelong Learning. In H. Ryu & D. Parsons (Eds.), *Innovative Mobile Learning: Techniques and Technologies* (pp. 232–254). Hershey, PA: Information Science Reference.
- Donner, J. (2008). Research Approaches to Mobile Use in the Developing World: A Review of the Literature. *The Information Society*, 24, 140–159.
- Dreyfus, H. L. (1999). Anonymity versus commitment: The dangers of education on the Internet. *Ethics and Information Technology*, 1, 15–21.
- Dreyfus, H. L. (2001). *On the Internet*. London: Routledge.
- Edwards, R. (2005). Your employees are increasingly mobile, is your learning? Paper presented at mLearn2005: 4th World Conference on mLearning, Cape Town, South Africa. Retrieved March 10, 2010, from <http://www.mlearn.org.za/CD/papers/Edwards.pdf>
- European Parliament and Council (2006). Decision no 1720/2006/EC. *Official Journal of the European Union* of 24.11.06, L 327, 45.
- Fortunati, L., & Manganelli, A. M. (2008). The social representation of telecommunications. *Personal and Ubiquitous Computing*, 12, 421–431.
- Gelpi, E. (1973). Some Thoughts on Lifelong Education. UIE, Unesco Document, n. 5033. Retrieved May 24, 2011, from <http://unesdoc.unesco.org/images/0000/000050/005033eb.pdf>
- Gentile, M., Taibi, D., Seta, L., Arrigo, M., Fulantelli, G., Di Giuseppe, O., & Novara, G. (2007). Social Knowledge Building in a Mobile Learning Environment. In R. Meersman, Z. Tari, & P. Herrero (Eds.), *On the Move to Meaningful Internet Systems 2007 OTM 2007 Workshops, Part I* (pp. 337–346). Berlin: Springer-Verlag.
- Gibson, J. J. (1986). *The Ecological Approach to Visual Perception*. New York: Taylor & Francis Group.
- Green, N. (2002). On the move: technology, mobility, and the mediation of social time and space. *The Information Society*, 18, 281–292.
- Gu, X., Gu, F., & Laffey, J. M. (2011). Designing a mobile system for lifelong learning on the move. *Journal of Computer Assisted Learning*, 27, 204–215.
- Hadjithoma-Garstka, C. (2011). The role of the principal's leadership style in the implementation of ICT policy. *British Journal of Educational Technology*, 42, 311–326.
- HEFCE (2009). Enhancing learning and teaching through the use of technology. A revised approach to HFCCE's strategy for e-learning. HFCCE Document. Retrieved October 29, 2012, from http://www.hefce.ac.uk/pubs/hefce/2009/09_12/09_12.pdf
- Hodgson, A. & Spours, K. (2009). Collaborative Local Learning Ecologies: Reflections on the Governance of Lifelong Learning in England (IFLL Sector Paper No 6). Leicester, UK: National Institute of Adult Continuing Education. Retrieved October 29, 2012, from <http://www.niace.org.uk/life-longlearninginquiry/docs/IFLL-Sector-Paper6.pdf>
- Hoppe, H. U., Joiner, R., Milrad, M., & Sharples, M. (2003). Guest editorial: Wireless and Mobile Technologies in Education. *Journal of Computer Assisted Learning*, 19, 255–259.
- IBSTPI (2000). Instructional design competencies. International Board of Standards for Training, Performance and Instruction. Retrieved October 29, 2012, from <http://www.ibstpi.org/competencies.htm>
- Klopper, E., & Squire, K. (2008). Environmental Detectives - the development of an augmented reality platform for environmental simulations. *Educational Technology Research and Development*, 56, 203–228.

- Klopfer, E., Squire, K. & Jenkins, H. (2002). Environmental Detectives PDAs as a Window into a Virtual Simulated World. Paper presented at International Workshop on Wireless and Mobile Technologies in Education. Vaxjo, Sweden.
- Kreijns, K. & Kirschner, P. A. (2001). The social affordances of computer-supported collaborative learning environments. Paper presented at Frontiers in Education Conference, 2001. 31st Annual (Vol. 1, pp. T1F–12). IEEE.
- Kukulska-Hulme, A. (2007). Mobile Usability in Educational Contexts: What have we learnt? *The International Review of Research in Open and Distance Learning*, 8, Article 8. Retrieved October 29, 2012, from <http://www.irrodl.org/index.php/irrodl/article/viewArticle/356>
- Kukulska-Hulme, A., & Traxler, J. (2007). Design for Mobile and Wireless Technologies. In H. Beetham & R. Sharpe (Eds.), *Rethinking Pedagogy for the Digital Age*. London, UK: Routledge.
- Latour, B. (2005). *Reassembling the Social. An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- Laurillard, D. (2007). Pedagogical forms for mobile learning: framing research questions. In N. Pachler (Ed.), *Mobile learning: towards a research agenda* (pp. 153–174), WLE Centre Institute of Education, University of London.
- Laurillard, D., Stratfold, M., Luckin, R., Plowman, L., & Taylor, J. (2000). Affordances for learning in a non-linear narrative medium. *Journal of Interactive Media in Education*, 2000(2). Retrieved October 29, 2012, from <http://www-jime.open.ac.uk/00/2>
- Levy, F. (2010). How Technology Changes Demands for Human Skills. OECD Working Papers, n. 45. Retrieved October 29, 2012, from <http://www.oecd.org/edu/highereducationandadultlearning/45052661.pdf>
- Lewis, S., Pea, R., & Rosen, J. (2010). Collaboration with Mobile Media: Shifting from 'participation' to 'co-creation'. In U. Hoppe, R. Pea, & C.-C. Liu (Eds.), *The 6th IEEE International Conference on Wireless, Mobile, and Ubiquitous Technology in Education (WMUTE 2010)* (pp. 112–116). Los Alamitos, CA: IEEE Computer Society Press.
- Lewthwaite, S. (2011). Critical approaches to accessibility for technology-enhanced learning. *Learning, Media and Technology*, 36, 85–89.
- Li, D., & Shearer, R. (2005). Project management for online course development. *Distance Learning*, 2, 19–23.
- Liaw, S.-S., Hatala, M., & Huang, H.-M. (2010). Investigating acceptance toward mobile learning to assist individual knowledge management: Based on activity theory approach. *Computers & Education*, 54, 446–454.
- Looi, C.-K., Seow, P., Zhang, B., So, H.-J., Chen, W., & Wong, L.-H. (2010). Leveraging mobile technology for sustainable seamless learning: a research agenda. *British Journal of Educational Technology*, 41, 154–169.
- Lundin, J., & Magnusson, M. (2003). Collaborative learning in mobile work. *Journal of Computer Assisted Learning*, 19, 273–283.
- Luo, P., Fortunati, L., & Yang, S. (2006). *New Technologies in Global Societies*. Singapore: World Scientific Publishing Company.
- Mauger, S. (2009). *Technological Change (IFLL Thematic Paper No 2)*. Leicester, UK: National Institute of Adult Continuing Education. Retrieved October 29, 2012, from <http://tinyurl.com/mauger09>
- McDaniel, K., & Liu, M. (1996). A study of project management techniques for developing interactive multimedia programs: A practitioner's perspective in Education. *Journal of Research on Computing in Education*, 29, 29–48(Fall'96).
- McFarlane, A., Roche, N. and Triggs, P. (2007). *Mobile learning: research findings (Report to Becta, July 2007)*. Bristol, UK: University of Bristol British, Educational Communications

and Technology Agency (BECTA). Retrieved October 29, 2012, from <http://dera.ioe.ac.uk/1470/>

McGrenere, J. and Ho, W. (2000). Affordances: Clarifying and Evolution a Concept. Paper presented at the Graphics Interface 2000, Montreal, Canada.

Nyi'ri, K. (2002). Towards a philosophy of mLearning. Paper presented at the IEEE International Workshop on Wireless and Mobile Technologies in Education, Va`xjo`, Sweden. Retrieved October 29, 2012, from <http://tinyurl.com/pwoa>

Nordin, N., Embi, M. A., & Yunus, M. M. (2010). Mobile Learning Framework for Lifelong Learning. *Procedia Social and Behavioral Sciences*, 7, 130–138.

Oliver, M. (2005). The Problem with Affordance. *E-Learning*, 2, 402–413.

Pachler, N., Cook, J., Bachmair, B., Pachler, N., Bachmair, B., & Cook, J. (2010). Whither a Socio-Cultural Ecology of Learning with Mobile Devices. In N. Pachler, et al. (Eds.), *Mobile Learning Structures, Agency, Practices* (pp. 155–171). New York: Springer.

Perelman, L. J. (1993). *School's Out*. New York: Avon Books.

Pettit, J., & Kukulska-Hulme, A. (2011). Mobile 20 Crossing the Border into Formal Learning. In J. W. Mark Lee & C. McLoughlin (Eds.), *Web 20-Based E-Learning Applying Social Informatics for Tertiary Teaching* (pp. 192–208). Hershey, PA: Information Science Reference.

Pettit, J., & Kukulska-Hulme, A. (2007). Going with the grain: Mobile devices in practice. *Australasian Journal of Educational Technology*, 23, 17–33.

Quinn, C. (2000). mLearning: Mobile, Wireless, In-Your-Pocket Learning. *Linezine*. Fall 2000. Online article. <http://www.linezine.com/2.1/features/cqmmwiyp.htm>

Richey, R., Fields, D., & Foxon, M. (2001). *Instructional Design Competencies: The Standards* (3rd Ed). Eric Clearinghouse on Information and Technology, Syracuse: NY. Retrieved March 31, 2011, from <http://www.eric.ed.gov/>

Ryu, H. (2007). Is mobile learning a necessary evil?: The goodness-of-fit of mobile learning situations. In H. Ryu, M. Milrad, & H. Ogata (Eds.), *Pervasive Learning 2007, Proceedings of the Workshop on Pervasive Learning 2007* (pp. 27–33). Massey, New Zealand: Massey University, Centre for Mobile Computing.

Ryu, H., & Parsons, D. (2008). Designing Learning Activities with Mobile Technologies. In H. Ryu & D. Parsons (Eds.), *Innovative Mobile Learning: Techniques and Technologies* (pp. 1–20). Hershey, PA: Information Science Reference.

Seale, J. K. (2006). *E-Learning and Disability in Higher Education: Accessibility Research and Practice*. Oxford, UK: Routledge.

Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. *Computers & Education*, 34, 177–193.

Sharples, M., Taylor J. & Vavoula, G. (2005). Towards a theory of mobile learning. Paper presented at the mLearn 2005 4th World conference on mLearning, Cape Town, South Africa. Retrieved October 29, 2012, from <http://tinyurl.com/sharples05>

Shih, Y. E. & Mills, D. (2007). Setting the new standard with mobile computing in online learning. *International Review of Research in Open and Distant Learning*, 8, Art. 8.2.8. Retrieved October 29, 2012, from <http://www.irrodl.org/index.php/irrodl/issue/view/29>

Shih, J.-L., Chu, H.-C., Hwang, G.-J., & Kinshuk (2011). An investigation of attitudes of students and teachers about participating in a context-aware ubiquitous learning activity. *British Journal of Educational Technology*, 42, 373–394.

Smith, K. E., & Cap, O. (2008). Impact on Social Change: Benefits and Barriers to School Culture and Integration of M-Technologies. *International Journal of Interactive Mobile Technologies*, 2, 31–35.

Traxler, J. (2009). Learning in a Mobile Age. *International Journal of Mobile and Blended Learning*, 1, 1–12.

- Turkle, S. (2008). Always-on/always-on-you: The tethered self. In J. E. Katz (Ed.), *Handbook of Mobile Communication Studies* (pp. 121–138). Cambridge, MA: The MIT Press.
- Uexkull von, J. (1934). A Stroll Through the Worlds of Animals and Men. In C. H. Schiller (Ed.), *Instinctive Behavior: The Development of a Modern Concept* (pp. 5–80). New York: International Universities Press, Inc.
- Waycott, J., Scanlon, E., & Jones, A. (2002). Using PDAs as learning and workplace tools: An activity theory perspective. In *M-Learn 2002: European Workshop on Mobile and Contextual Learning* (pp. 34–35). England: Birmingham.
- Warren, W. H. Jr (1995). Constructing an econiche. In J. Flach, P. Hancock, J. Caird, & K. Vicente (Eds.), *Global Perspectives on the Ecology of Human-Machine Systems* (pp. 210–237). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Weaver-Hightower, M. (2008). An Ecology Metaphor for Educational Policy Analysis: A Call to Complexity. *Educational Researcher*, 37, 153–167.
- Williams van Rooij, S. (2010). Project management in instructional design: ADDIE is not enough. *British Journal of Educational Technology*, 41, 852–864.
- Williams van Rooij, S. (2011). Instructional design and project management: complementary or divergent? *Educational Technology Research and Development*, 59, 139–158.
- Wong, L.-H., & Looi, C.-K. (2011). What seams do we remove in mobile-assisted seamless learning? A critical review of the literature *Computers and Education*, 57, 2364–2381.
- Wright, S. (1932). The roles of mutation, inbreeding, crossbreeding and selection in evolution. In D. F. Jones (ed.), *Proceedings of the sixth international congress of genetics*, Ithaca, NY, vol. I, 356-366, Menasha, WI: Brooklyn Institute of Arts and Sciences Botanic Garden. Retrieved April 30, 2013, from <http://www.blackwellpublishing.com/ridley/classictexts/wright.pdf>
- Yang, C., Moore, D., & Burton, J. (1995). Managing courseware production: An instructional design model with a software engineering approach. *Educational Technology Research and Development*, 43, 60–70.
- Zagardo, G. (2010). La punta di diamante scenari di scolarizzazione e formazione in Europa. Roma: ISFOL. Retrieved October 29, 2012, from http://www.aeeitalia.it/documenti/La_punta_di_diamantel.pdf 50
- Zemsky, R. & Massy, W. (2004). Thwarted innovation: What happened to e-learning and why. (A Final Report for The Weatherstation Project). West Chester, PA: University of Pennsylvania in cooperation with the Thomson Corporation, The Learning Alliance. Retrieved October 29, 2012, from <http://www.educause.edu/library/resources/thwarted-innovation-what-happened-e-learn-ing-and-why>