

Reference: Tella, S. 2003. M-learning—Cybertextual Traveling or a Herald of Post-Modern Education? In Kynäslähti, H. & Seppälä, P. (eds.) *Mobile Learning*. Helsinki: IT Press, 7–21.

M-Learning—Cybertextual Travelling or a Herald of Post-Modern Education?

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Abstract: In this article, m-learning is presented as part of the teaching–studying–learning process. M-learning is defined as studying and communication that uses mobile technologies and other mobile applications, such as networked communicators and other appliances. Through a conceptual analysis, m is linked to mobile and to mediation. Three cognitive revolutions are used to explain individual, team-based and community-based knowledge formation processes. Mobile technologies support human beings' individual activity and enhance their cognitive flexibility. M-learning is further analysed within the framework of constructivism, constructionism and cybertextuality. When analysed in the light of modern and post-modern education, m-learning is seen to provide lifelong learning with novel technical options. M-learning summarises a number of school- and teaching-focused paradoxes, some of which are related to time and communication. At present, mobile technologies represent supertoys, but they are expected to gradually become tools and, at their best, empowering mediators. The article ends with some reflections of what will happen after m-learning and whether m-learning is again reduced to simple learning, without any prefixes.

Keywords: m-learning; mobile technologies; teaching–studying–learning process; modern; post-modern; information; knowledge; constructivism; constructionism; cybertextuality; cognitive revolution.

0 M-learning and Mobile Applications

"You cannot compel a human being to be immobile."

M-learning is a topical phenomenon, of which communication culture is likely to say the last word, but in which technology will always have the upper hand. In fact, can the notion of m-learning be analysed all in all from the perspective of media education, didactics (in the European, positive sense) or pedagogy? Or should we rather have a different framework based on digital culture, technological determinism or any of the paradigms grounded on fatalistic causalities? But bravely ahead, let me observe m-learning, this *belle de jour* of our times, from those starting points that I find relevant and closest to my professional self.

Generally speaking, m-learning refers to studying and communication, in which different tools of m-learning or mobile technologies are used. As mobile technologies I regard all different mobile, "portable" and "hand-size, pocket-size" multimedia communicators, smart telephones, PDA gadgets and many other that have not yet been launched on the markets.

1 The Dualistic Character of M-Learning

A natural approach to try to understand m-learning is to advance through a conceptual analysis: What does m-learning mean semantically?

I will structure my thinking in two directions: What does m mean? What does learning mean? By answering these questions I hope I will get some more understanding of what m-learning then is.

1.1 M

What kind of different things does m imply? Let's take a few examples, and though they might seem erratic, they all have a bearing on the topic of this article. Among ancient Phoenicians, m referred to 'mem', water. It was one of the most fundamental elements in controlling life and living. In certain cultures, such as in Islam, water is so important that not even enemies in war are denied access to it. Transposing the etymology a little, we can see in this word 'mem' the same source as in Latin *mare nostrum*, our sea, or in Trenet's sentimental chanson *La mer*. It is this element of water and sea that also combines certain metaphors of this article; it is almost customary to talk about the sea of knowledge and travels by this sea, voyage, and even more so in mobile nomadism. — In phonetics, m is a labial nasal, resonant and bilabial. Psychology taught us that m is associated with words that imply soft "round" values: mamma, or, in line with today's modernity, meme. Does m-learning then have something that goes with us smoothly, something that appeals to our minds, something impossibly and unconsciously pleasing, something subliminal and therefore many times stronger? As an abbreviation, m is used to stand for thousand, metre, mile. M has many a meaning, admittedly.

Many link m in a prosaic way to the word 'mobile', which means something that can move, be moved or transported. Mobile associates with movement and mobility and in the same way m-learning implies the opportunity of learning elsewhere, in movement, when not immobile or stationary. Mobile answers the question Where? On the other hand, as Sariola et al. (2002) have argued, m can also stand for 'mediated'. Then the question is of mediated learning, in which the mediation process is carried out by technology (cf. CMC = computer-mediated communication; VMC = video-mediated communication). Thus, m can be mobile but also mediated. Mediation answers the question how and mediated by which or by whom.

Is there anything that might link these two meanings of m—mobile and mediated? Yes, at least time and timeless, space and spaceless, delay and 'delaylessness', and, above all, the requirement of delaylessness (cf. e.g., Tella 2000 about *achronos*). Digital media, such as mobile technologies, are bound to change our conception of time and place, which usually determine where and when we can communicate, study and learn. At the same time, their opposites are in focus: the

independence of time, place and location in a Giddensian mantra. However, we are always tied to time and so is our communication and studying. As Urry (1985) put it, time and place are social concepts whose essence is dependent on the interactivity of presence and absence. The interactivity between technology-mediated m and mobility-focused m can just lie in the fact that even when being physically absent from a particular site, we can be 'present' thanks to technology, such as videoconference and even more, mobile technologies.

This phenomenon was depicted by Attali (1980) with the notion of nomad, who can get rid and out of his office and still continue to be logged on to the office's telecommunications network and to be a member of an information and communication society. Tella (1994) launched the idea of a digital nomad, arguing, in line with an ancient wisdom, that a human being cannot be forced to stay immobile. It is very much up to different mobile technologies that people can get mobile, but still keep in contact with others and, at the same time, communicate and study while being mobile. Now, it is time to speak of a mobile nomad, who while moving about still keeps on working, studying, communicating and learning.

1.2 Studying as Part of the Teaching–Studying–Learning Process

Modern media education (Tella 1998; Tella 2001; see also Kynäslahti 2000) and didactics (e.g., Uusikylä & Atjonen 1999) agree on the fact that talking only of learning is restrictive of reality. It is more appropriate to accept Uljens' idea (1997) of the teaching–studying–learning process, according to which teaching affects learning through the studying component, not directly. Besides, it is not possible to derive studying and study contents from learning. Without going into detailed justification of the above arguments, I will explicitly deal with and focus on studying in this article, not learning. In this sense, it would be more relevant to write “m-studying” (*m-opiskelu* in Finnish) than “m-learning” (*m-oppiminen* in Finnish), but for conventionality's sake, I have kept m-learning in English. What I mean is that purposive use of mobile technologies, m-studying, can lead to meaningful learning. In the following, I will look more closely into the studying component of the teaching–studying–learning process.

2 Studying and the Three Cognitive Revolutions

Studying combines information handling and self-directedness. They both have direct links to an individual's cognitive strategies: to ways and modes of choosing and elaborating on one's learning, memory and thinking.

Two cognitive revolutions are sometimes referred to (Tella 1997; based on Lin et al. 1995, 54). The first revolution embraces individual thinkers and learners, whose behaviour is not characterised by emotions, contexts, culture or history; rather, it typifies human beings' competition against each other, strongly growing self-directedness and certain indifference towards others to whom they pay hardly any

attention. A typical representation of the first cognitive revolution is a traditional academic research seminar, in which one student after another presents his or her work. Students scarcely help each other and it would be difficult to speak of shared co-construction of knowledge. At worst, one person's merits are looked down upon and underrated with harsh criticism.

The second cognitive revolution takes account of social studying and learning contexts, which include both cognitive and motivational features. It also supports collaboration and communalism as well as communal studying. The second revolution is based on the idea that society holds firm with a collective conscience or a joint feeling of sharing values, norms and patterns of thinking we have in common. These different elements can be summarised with the notion of consensus and integration. Knowledge, experience and cognition are shared, other people are helped, and this way each member of the group gets more than he or she would get if working alone and on his or her own. The question is of processes of action that are triggered on communally and in which both individuals and teams interact in many different ways. At the same time, they learn and develop, as do the processes themselves.

Typical tools or technological environments for the second cognitive revolution can be exemplified by groupware programs or IDLEs (integrated distributed learning environments), such as BSCW, WebCT and Blackboard, that support shared expertise and communal learning (e.g., Tella et al. 2001). In the second cognitive revolution are highlighted versatile relationships between teacher and students as well as between students. All this is conducive to creating a studying environment, in which cognition and motivation coexist side by side. Cognition then covers all the processes that help an individual grow cognisant of the outer world and gather information of some object in focus. Cognition implies knowing and intellectual and transferable human action, as distinguished from subconscious or emotional processes.

When speaking of knowing and contextuality of learning, Poikela (1999, 274) refers to "systems of action being holographic structures in which individuals and communities are effected on the one hand, while, on the other, they affect others via multidirectional and multidimensional processes of information and communication". This kind of interpretation clearly typifies the second cognitive revolution.

Lin et al. (1995) only talk of two cognitive revolutions. I would like to argue that mobile technologies and m-learning can be regarded as heralds of a third cognitive revolution.

Then mobile nomads can represent a studying situation, in which self-directedness becomes important again in a cyclic way, but essentially in a different fashion: cumulatively and constructively, but not in a competitive setting *vis-à-vis* the other students. The tools of m-learning can support, enhance and expand the cognition of their users. But how far does a human being's cognition reach when using

information and communication technologies, such as mobile applications? In psychology, this question used to read: How far does a blind person's cognition extend when he uses a white cane? Does it extend to the tip of the cane, half-way to the tip or simply to the fingers of the blind person, who sticks to the cane? It is only natural to assume that cognition extends not only to the tip of the cane but to the perceptions that a blind person can receive with the cane and thus directing his or her own behaviour. A mobile application in the hands of a seeing person is bound to be at least as efficient and empowering. Using tools is an integral part of all human action, including cognitive action.

In the light of the third cognitive revolution, it is also important to reflect on how an individual's cognitive structure may change once access to information sources can take place almost in real time. Is it to be assumed that this will increase people's impatience? Can it also decrease the durability and sustainability of people's behaviour, because looking for different things need not be stored in one's memory or first gathered together until one tries to find answers to these questions, as immediate replies are accessible all the time? Is there a threat that all this could add to the apparent importance of fragmented and disjointed bits of information, as so many TV quizzes try to convince us?

In all this, I see a clear connection to the delaylessness of time, in other words to the fact that we expect from ourselves and from others answers and reactions faster than we have time to process the questions properly, and for the most part, because technology makes it possible for us and, in a way, pushes us to faster and faster performances. Is speed perhaps the function of impatience, in which what seems to count is the gathering of meaningless fragments of information, instead of first processing the information we find relevant and only then forward our reflected answer to the others?

On the other hand, the third cognitive revolution, initiated partly by and represented with mobile applications can be seen in a more positive light, as it can also mean increased cognitive growth at individual level. Real life is always complex and context-specific and not all domains of knowledge have been structured into ready-made information packages like the ones in any encyclopaedia. Spiro et al. (1991, 24; see Enqvist 1999) argue in favour of such studying processes that presume an ability to present information from various conceptual and case-specific perspectives. Enqvist (1999, 35) contends that when information is used later, the ability of cognitive flexibility helps construct such a knowledge entity that corresponds to the requirements of understanding or being able to solve the situation in question. According to Spiro et al. (1991) cognitive flexibility is expressly required by computer applications and multimedia and hypertextual systems. It is only natural to presume that mobile technologies would also require their users to have similar kind of cognitive flexibility and adaptability to rapidly changing situations. Furthermore, it is good to bear in mind that an individual's inner motivation is usually enhanced by discoveries and study-related findings one has made oneself, as well as one's own opportunities to research, study and experiment. All this has a positive influence on the learning itself. In this respect

too, an individual's intellectual and cognitive tools and the technical tools at his or her disposal are deeply interrelated.

3 Constructivism, Constructionism and Cybertextuality

A general interpretation of constructivism refers to an individual that constructs knowledge of the information that he or she has got from the outer world through his or her senses. Constructionism (e.g., Papert 1993; Johannessen, Meyers & McKillop 1996) is more closely related to externalised products or outputs of the constructivist processes. When contrasted with the cognitive revolutions depicted above, constructionism can best be seen in the context of the second revolution, in which the members of a team construct examples of their own knowledge-building processes through a groupware program, for instance. The product can be a database, a web site, a game, a collection of best practices or a number of elements to be incorporated into a software package.

What is relevant to this article is to reflect on whether the third cognitive revolution embraces features of constructionism or whether the information gathered via mobile technologies is more likely to remain fragmented and disjointed. As mobile applications are still very much *terra incognita*, the question can only be answered tentatively. It would appear natural, though, to think that m-learning can produce elements that can then be used to solve a problem, shared between the different members of a communal learning community as part of the global problem-solving process. Then we could speak of communal knowledge-formation or communal co-construction of knowledge and, possibly, of the constructionist outputs and artefacts externalised from the more internal process itself.

Cybertextuality (Aarseth 1997) appears to be a promising interpretation, in which m-learning—and, equally important, network-based education and ICTs—can be seen from the user's perspective as a meaningful way to be and to act. Cybertext is not just text but also graphics, sounds and different combinations of graphical and textual presentation. Cybertext can consist of any hypertext, such as a home page, a web article, a net game, a computer program, a net service, a database, cell phone sound menu. Cybertext can further be a textual adventure game, a story generator, a simulation system or it can be made of social and textual game environments, such as MUDs (*Multi-User Domain*) or MUSEs (*Multi-User Simulations Environment*) (cf. e.g., Tella & Mononen-Aaltonen 1998, 109–110). What is interesting in Aarseth's thinking—and logical when bearing in mind the etymology of *kybernao*—is the way to see text as a machine and a mechanical instrument to be used in producing and consuming verbal characters.

Cybertextuality emphasises the user's power to experiment, navigate, choose and interpret the information he or she needs. The user's own choices are the ones that enable him or her to "write" to cybertext his or her own paths, his or her own narration. Aarseth argues that the user can add new paths or find new materialisations of the same text if seen through a textonic filter. Aarseth's (1997)

way of enlarging the concept of hypertext to cybertext makes the role of the user more dynamic while enabling him or her to act textonically and configuratively towards the text itself. What this might mean in practical terms is that the user (of a computer program, for instance) is able to interact with the program in a more versatile manner than before. Perfect examples might be web-based games, such as MUDs and MOOs but we feel that this principle could also be adapted for use in planning next-generation web-based teaching materials.

Aarseth (1997) describes the difference between using an ordinary text and a cybertext in a very vivid way:

“A reader, however strongly engaged in the unfolding of a narrative, is powerless. Like a spectator at a soccer game, he may speculate, conjecture, extrapolate, even shout abuse, but he is not a player. Like a passenger on a train ... he is not free to move the tracks in a different direction. He cannot have the player’s pleasure of influence. ... The reader’s pleasure is the pleasure of the *voyeur*. Safe, but impotent. ...

The cybertext reader *is* a player, a gambler; the cybertext *is* a game-world or world-game; it *is* possible to explore, get lost, and discover secret paths in these texts, not metaphorically, but through the topological structures of the textual machinery. This is not a difference between games and literature but rather between games and narratives.” (Aarseth 1997, 4–5)

Aarseth’s (1997) cybertext leads us to think of an active or proactive user of computer programs and computer software. If action is thought of as didactic action in this context, then it is justified to adopt the notion of *situated didactic experience*, in which action is situated in a didactically appropriate and apposite process of teaching, studying and learning. In this way, cybertextuality and didactics are linked together.

Action is often related to doing something concrete. When the principle of situated didactic experience is adapted for Finnish comprehensive schools, for instance, it is highly important to emphasise the concrete “actional” side of the teaching–studying–learning paradigm, as younger pupils are not necessarily ready for purely theoretical work. We see strong links between some of the ideas in our model when they are implemented in the real-life working contexts of the Finnish school system.

It must be borne in mind, however, that not all teenagers or youngsters are eager to have their texts and writings published via the net or via a groupware tool. There should be proper investigation into whether the increased potential generated by cybertextuality is likely to meet with “grassroots-level” action and expectations, or whether there are psychological and personal handicaps that are likely to reduce the empowering impact the web might otherwise have.

Writing is intimately associated with reflection. Therefore, at this level, we have a continuous cycle of action which is halted or slowed down by reflection which,

again, is due to change into action. When this cycle of action–reflection–action takes place in a virtual space, in “virtual togetherness”, and the action is focused on meaningful or purposive educational objectives, then we could call it mediated pedagogical meeting.

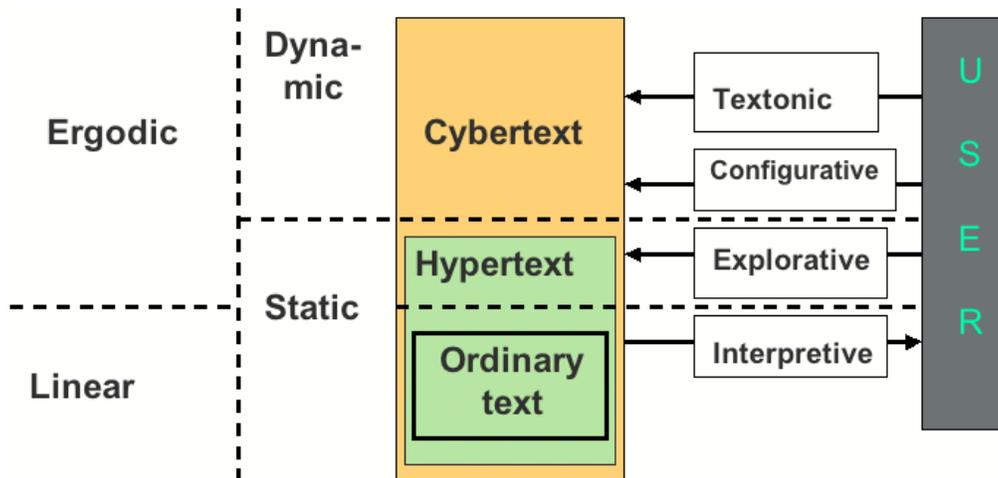


Figure 1. User Functions and Their Relation to Other Concepts (Aarseth 1997, 64).

How does an m-learner fit in Aarseth’s user descriptions? At least so that a cybertext user becomes the main star of a road movie or a voyage at sea or in space, a real mobile nomad, who can move at large in time and in space and still get support, help, inspiration and assistance for his own studying and communication. An m-learner is not a *voyeur* in the negative sense of the word, not any more than a football fan at a crowded stadium. But in his behaviour we can spot the etymology of the word *voyeur*, that is, viewing and seeing (French *voir* = see). An m-learner, however, “sees” his world more as a player and as a spectator, because he will have to be all the time a proactive constructor of his own knowledge base. M-learning that emphasises cybertextuality makes its user somewhat of a cyborg, whose human qualities are enriched by technical dimensions, for instance in the form of the potential embedded in the use of mobile technologies.

M-learning may well include constructivism, constructionism and cybertextuality or at least some of their salient features. Constructivism underscores the importance of constructing knowledge oneself, while constructionism underlines the importance of externalising and perhaps even making a product out of one’s internal representation of knowledge. Cybertextuality is likely to emphasise the actional space in which an m-learner moves with his mobile technologies: reforming and changing.

4 Interfaces of M-Learning

In the following, I will analyse certain interfaces that m-learning seems to have and which help us understand it better. I will discuss the role of the teaching component of the teaching–studying–learning process, as well as assessment, the three developmental stages of media or m-learning as toy, tool and art. Finally, I will look into m-learning as part of the growing digital culture. It is also important to reflect why we talk about m-learning and not for instance of uni-learning.

4.1 M-Learning and Teaching

Teaching is the first component in the didactic Teaching–Studying–Learning process. The relation between teaching and studying is likely to change, when information and communication technologies are introduced (e.g., Tella 2001). But is the situation the same when we talk about m-learning (Figure 2)? It is a current belief that m-learning tools and mobile technologies are intended to be used by the student, without the teacher's use of them. This is how it very often is: m-learning underlines self-directedness and self-access to and control of information, as stated above. It is therefore only natural to think that mobile technologies are precisely on the dimension studying–learning.

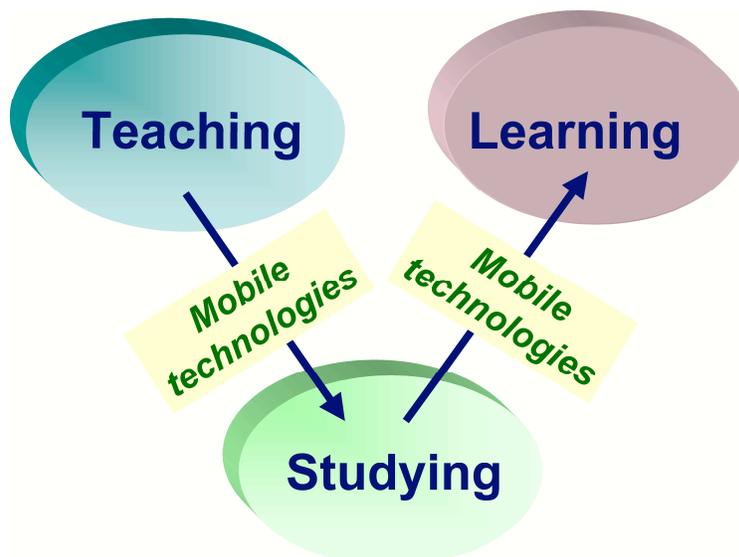


Figure 2. The Teaching–Studying–Learning Process and Mobile Technologies (based on Tella 2002).

But what sort of influence do mobile technologies have if they are part of the teaching–studying dimension? And what could be functional links between teaching and m-studying? They are in fact easy to find, because it is exactly the m-learning technologies—and especially the information gathered with these technologies—that can enhance the teaching–studying dimension. It is easy to think, for instance, that when the teacher launches a student-centred activity or individual learning task, students look for necessary information explicitly with the

aid of mobile technologies. In this case, these technologies are tools and media relevant to multidimensional studying that the students choose according to the learning task. Information received via a mobile application can thus complement the information gathered from books or newspapers. In the same way, the teacher can use mobile technologies to support her work, guidance and communication.

On the other hand, it is possible and even desirable to think about what sort of teaching could best take into account those features that characterise m-learning. Let me refer to post-modern education such as Parker (1997), for instance, has described it. In the following, I'm using Tuominen's (1999, 39–40) analysis and summary of Parker's original ideas. The major feature in post-modern education is that it does not enumerate facts, it does not define some facts correct and others wrong and it does not set strict aims to learning situations. Rather, post-modern education is different narratives or *genres* to support the pupils' growth. What counts is the attempt to analyse and deconstruct, together with the students, the differences so that they could then start constructing a new identity of their own. Post-modern education makes use of other narratives too, such as narratives and stories mediated by media, that complement one's own life or that of people living near us. Instead of speaking of curricula, we can speak of experiences together with a newspaper and getting involved through it in different discussions and part-realities. Knowledge is understood as activity tied to situations. Different ways and skills to learn are then important: knowledge relevant to oneself is extracted from information. A post-modern teacher supports and encourages the construction of students' own narratives. (Tuominen 1999, 39–40)

Parker's views reflect quite a few ideas that are central in m-learning too and which I have already introduced in this article. For instance, building one's own paths is parallel to writing one's own cybertextual narratives. The stories embedded in narratives are not far from the themes discussed by young people in their text messages and other kinds of youth culture writings. Parker's comparison is linked to a voyage, which in this article is a fundamental metaphor, starting with the Phoenician character of M referring to water, and advancing to Attali's nomadism and to the voyages of information oceans. Creating one's own identity relates to the basic principle of constructivism, that is, constructing one's own knowledge base from that information whose control an individual trains throughout one's life. Perhaps one could argue that m-learning is post-modern education at its best. At least the principles of post-modern education are relevant when describing m-learning.

Aside post-modern education, we can discuss the modernist tendencies and reflect on how these relate to m-learning in the way it is seen in this article. Poikela (1999, based on Bagnall 1994, 24–36) has analysed modern and post-modern education by starting to relate modern education to competence-based education, while post-modern education approaches the ideals of continuing education. Bagnall (1994) contrasts, among other things, the approaches that focus on one discipline vs. many disciplines, rationality vs. expressivity, simplicity vs. complexity, concentration vs. reflective contextuality. Modern education is further typified in

Bagnal's (1994) thinking by technical knowledge, practicality and learner dependence, while post-modern education underlines the importance of needing mansided knowledge, critical understanding and learner independence.

According to Poikela's interpretation (1999, 23–25), modern education is an ideology, while post-modern education is not a system itself, though it poses itself systemically as the opposite of modern, while drawing critical elements from humanistic, constructivist and contextual approaches. I feel an irresistible temptation to relate media education to post-modern education, whereas traditional didactics seems to be closer to modern education. Without analysing every cell of the table, I still tie some of its ideas to m-learning in the spirit of this article. The general principle of m-learning is clearly apart from the institutionalised school system: with mobile technologies one can study and communicate almost anywhere and at any time, depending on one's own desires and wishes. In this sense, an m-learner is more autonomous than in the traditional school system, in which the systemic use of time limits everybody's degrees of freedom.

Post-modern complexity refers to complex real life situations as experienced by all of us, and to which there is very seldom one correct or appropriate answer. Information is not always that clear and easy to understand as one could imagine, and once an individual creates meaningful knowledge of it, then the information interpretation process is influenced by his own internal meaning systems and, at the organisational level, the flexibility and inflexibility of its communications system. Therefore, when weighing different options, an m-learner should be critical when facing the multifaceted and contradictory nature of information. At the same time, he should be open to new things and solutions and yet participatory. The integrated way that studying and communication often have in mobile technologies sheds more light on the phenomenalist and expressive character of post-modern. We could also speak of experientiality if we use a different term. It is clear, however, that m-learning opens up new technical potentials to continuing education and to lifelong learning.

In Finland, Sahlberg (1996) has compared modern and post-modern through paradoxes originally based on Hargreaves' (1995) ideas of school and teaching (Table 1).

Table 1. Paradoxes Related to School and Teaching (Sahlberg 1996, 22).

| | |
|---|---|
| 1 | The more you centralise, the more important centralised guidance becomes. |
| 2 | The more you teach, the less you learn. |
| 3 | Increasing cooperation requires increasing individualism. |
| 4 | Self-organisation of the system means increasing chaos. |
| 5 | The further science advances, the more insecure knowledge becomes. |

Poikela (1999) argues that in fact the question is of old paradoxes related to systemic thinking, such as the contrasts between entity vs. parts or hierarchy vs. non-hierarchy. Why not interpret these paradoxes in the framework of m-learning

as well! M-learning means exactly decentralisation of information handling (paradox 1), because an m-learner can work with his or her mobile technologies anywhere and any time. Then centralised guidance becomes more important and it means the new emphasis of the first dimension (teaching) of the teaching–studying–learning process. The same observation has been made in relation to network-based education (Tella et al. 2001): the teacher’s role and the need for guidance do not decrease; rather on the contrary. Consequently, from the perspective of m-learning, paradox 1 could be reformulated like this: the more the studying and learning environment is decentralised, the more important will be the guidance and support given to the learner by the teacher or a knowing peer, because the environment itself does not any longer support the use of familiar and safe learning processes.

Paradox 2 speaks of the relation between teaching and learning, but I find it could as well be formulated as follows: the more you teach, the less time you will have for studying and learning. If and when teaching is coupled with m-learning, it has to serve such global aims that inspire and encourage studying and thus indirectly enhance learning as well.

Paradox 3 is directly linked to the 2nd and 3rd cognitive revolutions. The 2nd revolution underlines collaboration, social knowledge construction, shared responsibilities, communalism, while the 3rd revolution is based on new kind of individualism. As a tentative thesis I could argue that through m-learning the 2nd and 3rd cognitive revolutions can be linked together to a process that is bound to empower the student, resulting in overall benefits as far as the teaching–studying–learning process is concerned.

Paradoxes 4 and 5 are reflected clearly in network-based environments and in materials accessible through mobile technologies. The possibly very fragmentary and piecemeal information of various materials does not change in the student’s head into knowledge until he or she is capable of modifying it to an integral part of the knowledge system, adding to it new meanings and values and, in a way, internalising it. This is in my understanding one of the greatest challenges in m-learning.

The first five paradoxes could have been rewritten in Aarseth’s cybertextual spirit from the point of view of m-learning. Yet I contented myself to comment on the classical paradoxes in terms of m-learning. However, I would like to point out a few new paradoxes (Table 2) and discuss them in the context of m-learning.

Table 2. New Paradoxes Related to M-Learning.

| | |
|---|---|
| 6 | The better an ideal public space is achieved, the closer we are to an ideal individual space. |
| 7 | The faster we can communicate, the more time we will need for our communication. |
| 8 | The more we communicate, the less order we have in our lives. |
| 9 | The more information we access, the less of it will change into knowledge. |

Paradox 6 is associated with Habermas (1974) in his search for ideal public space. In different centuries, this kind of space has been interpreted to be different public houses, such as cafés or *salons de thé*. Ideal public spaces in our times are, among other things, Internet cafés, in which the physical and the virtual merge. In the same way, integrated distributed learning environments (IDLEs; groupware programs) can act as shared virtual spaces, whose discussion fora represent at their best active exchanges of ideas and views. They correspond to the targets of the 2nd cognitive revolution in that they increase communalism. According to this paradox, common good can be very close to one's own ideal space in the spirit of the 3rd cognitive revolution.

Paradox 7 deals with mediation in m-learning. Modern communication technologies, such as e-mail, chat, short message service (SMS) or MMS (multimedia message service) enable real-time communication that is almost without any delays. However, as the amount of communication increases and communication itself becomes real-time, we will need more and more time to respond and to reply. Tella (2000) has described this paradox with the notion of *achronos*, timeless time, which can lead to personal-level stress and at the organisational level to communication saturation or to a situation in which communication occupies too much time from creative working. This dilemma brought about by increased communication is sometimes referred to as a half-joking expression *ex post hasto* (*ex post facto* + *post-haste*). In other words, if we receive a message today, the answer to I was expected yesterday.

From the viewpoint of m-learning it is important to bear in mind that communication is part of studying and in mobile technologies often quite an essential feature. The key concept in Paradox 7 is time, which links in a wider perspective to contextualism, which is, as Pettigrew (1985) contends, one of the world hypotheses that aim at creating order to chaos. What is paradoxical is exactly the fact that increasing communication is likely to lead to increased chaos (paradox 8). This is something that very many of us personally experience after a few days' absence from office. Surprisingly though, according to Breton's classical definition (1992, 93), communication is a constant and explicit struggle against entropy: «*La communication n'est au fond rien d'autre que la lutte contre l'entropie*». Information is material to communication, but in itself it consumes energy and the negentropy generated by it lead to entropy (e.g., Lyotard 1985, 88). In communication, entropy can be reduced by redundancy and control (e.g., Ollivier 1992, 19), but it goes without saying that communication is energy-consuming activity.

Paradox 9 argues that the more information is accessible and on display, the less of it can be changed into knowledge. This paradox is explained by the fact that the time used to look for information decreases the time that one can dedicate to studying and adopting the relevant information. When facing enormous amounts of information, an individual may not have enough time nor cognitive dispositions to modify it to meaningful and relevant knowledge structures. This is one of the reasons that compel us to develop new kinds of pedagogical principles to support

m-learning, in the same way as has already been done concerning network-based education (cf. e.g., Tella et al. 2001).

4.2 Assessment

The teaching–studying–learning process is closely linked to assessment. As m-learning gains ground, the gap between information handling and assessing what has been learnt is likely to increase, because—as it has been recognised in certain educational circles—those tools that are normally used in information search, handling and control are not accepted in testing and assessment situations especially within the institutionalised school system.

Mobile technologies are clearly an area which could give cognitive scaffolding to students in test situations. The problem lies in the conflict between the emphasis by the schools and other learning institutions to use ICTs in teaching and studying and the denial of the same tools when the question is of assessment. It is true, however, that product assessment that was almost exclusively used earlier, has partly been replaced by other forms of assessment, such as process evaluation, self- and peer-assessment and portfolio assessment, in which the use of different tools is not only allowed but even encouraged.

A bigger problem lies in the fact that assessment in schools very often is focused on testing an individual's performance, while in working life there are lots of tasks whose solving calls for close collaboration and communication from the team or the whole community. Perhaps assessment should be developed in the direction of making information handling and problem solving more central. Then accepting the use of mobile technologies would be considerably more justified.

4.3 The Three Developmental Stages of Media

Media and new technical innovations seem to have three developmental stages. First they are used and regarded as interesting toys, then tools and—as with Levinson—“mirrors”, until they grow into art (e.g., Levinson 1999; Pantzar 1999). At the same time, the names of the users change. They might be called jesters, sages and artists (Levinson 1999), which are very close to Panzar's (1999, 225) idea of the future consumer as player, worker and artist.

At present, m-learning tools are clearly objects of intellectual interest, they are some kind of toys of the information and communication society, “supertoys”, if we quote Spielberg's expression from the film *Artificial Intelligence*. M-learning tools are also linked to the notions of *edutainment* and *infotainment*, in which entertainment, information and education coexist peacefully, albeit that the main emphasis lies on other things than education. Teachers' beliefs and concerns about mobile technologies should not be underestimated. Yet it is to be expected that mobile technologies change—and have already done so to some extent—to

useful media, inspiring intellectual partners, novel studying, working and communication contexts and, at best, to those empowering mediators that Tella (e.g., 2001; see also Tella et al. 2001) has spoken of as an ultimate example of the development of information and communication technologies.

5 To Finish—or to Start Again

Is m-learning an example of digital culture as defined by Järvinen & Mäyrä (1999; based on Fornäs 1999) as a bunch of customs and habits to communicate?

”Johan Fornäs speaks ... of the culturalisation of society. He thinks that culture is no longer the top of society nor a thing to be taken for granted; rather, culture can be seen in our everyday lives more and more clearly as cultural products and, on the whole, as aestheticity. Digital culture is therefore not the same thing as the so-called information or knowledge society, and it is not directly subjected to them. Digital culture consists of a bunch of customs and habits to communicate, to be in contact as well as to interpret and construct meanings with the help of computers and networks. ... These kinds of practices are not marginal from the point of view of society, because culture with its practices is ‘a central and multifaceted component of human life’”. (Järvinen & Mäyrä 1999, 17; Tella’s translation)

One can admit that these customs and habits are not shared or adopted by everybody. On the contrary, they are changeable and modifiable, as customs and habits should be, unless they have already grown into routines or, at the organisational level, into collective habitualisation. Questioning all these calls for an active attitude from all actors and changing them usually implies a conceptual turn in their minds. At the individual level, a conceptual turn usually means annoyance or anger, as one feels compelled to change something in one’s own behaviour or position taking. In general, this “cognitive” anger is easily alleviated when the individual realises the necessity of the change. Unless this kind of change takes place from time to time, the individual might become a slave to custom and finally remain stuck to the magnetism of the past by being against all innovations. In the final analysis, the question is of the ability to conceptualise things and to give them new meanings, that is, the ability to rename things and phenomena and to reflect on their interrelationships by means of a conceptual analysis.

An environment that is conducive to conceptual turns is sometimes characterised as the knowledge–use perspective (e.g., Huberman 1985). This kind of perspective presupposes that the persons involved construct new knowledge and relate it to their normal environment of action. It is then important to be cognisant of the fact that personal needs are often context-bound and lead to various situational solutions. And because they are context-bound, we will have to be able to tie theoretical knowledge to those practical contexts that help us develop our working and studying environments and this way, perhaps, to sort out in advance problems that might arise.

The title of this article questions whether m-learning is cybertextual travelling or a herald of post-modern education. M-learning is both, beyond any reasonable doubt. It is travelling in cybertextual space but at the same time it manifests many features of post-modern education. But these answers to the question asked in the title do not suffice: we must ask one more question.

Is there any technology that would have been used for that specific purpose for which it was created? "A fine invention, but for what?", one often asks. This is true in m-learning as well. We are just in the beginning, but the length of the path is difficult to estimate and we do not know whether the path we have chosen leads to anywhere.

Why m-learning? Why is it now so fashionable and in vogue? How else could we call this present-day phenomenon? To me, e-learning is already *passé*, though it still seems to be the herald of very many commercial enterprises and businesses. In the same way, is the eEurope programme of the European Commission up to date or simply *la neige d'antan*? Without being cynical, one should ask what added value that prefix e or m gives to learning. In 2001, when visiting a London bookshop, I came across a book about e-learning and its potential, but the book was published in the early 1970s and it dealt with tape recorders and overhead projectors! E is clearly ambiguous and out of fashion. How about other letters of the alphabet? Perhaps the next stage is *g-learning*, some kind of global learning, in which glocalism, that combination of globalisation and localisation, plays a major role. Then we should perhaps retort that even now only 4% of the world's population access the Internet. How about *u-learning*, *universal learning*? Could that be close enough to that ideal of *ubiquitous computing* that Joseph Weizenbaum spoke of in the 1970s by claiming that we will be in the information society as soon as information technology becomes as invisible as any Bic pen on our desks. *UniWear* or computer-supported clothing could be and already is a materialisation of this idea. In smart clothes, technology is invisible and yet it protects and helps us in danger. And imagine how *uni-learning* might appeal to Finnish speakers at least! Universal and, playing with words, even learning when asleep!

Once and for all: different letter prefixes promote selling, they appeal to people and help catch their attention, but strictly speaking they are futile and unnecessary, because, as philosophers have put it, in the end, all unessential features are washed away. So why m-learning, why not simply learning? Why e-learning, when learning would tell it all? We are approaching the heart of the matter when we can afford to wash away unnecessary prefixes and when the construct itself, once again, can be seen: learning and education. In distance education this change has already happened, at least in many thinking people's minds. Why underline that education can happen at a distance or face-to-face or in flexi-mode? This should be evident to all without any descriptive prefixes in front of the basic idea of education.

And once we are mature enough to speak of teaching, studying and learning as such, then, ironically, we are bound to come across one more novel “revolutionary” technology or tool that makes its best to catch our eye and mind. It is then if ever that we should remember what Picasso said about computers: “Computers are no use; they can only give us answers.” What about mobile technologies? Are they also there just giving us answers? Well, if they are, then is it not up to us to start asking those questions that must also be asked in education, irrespective of tools, applications or technologies?

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NB. The article is based on Tella (2002) but is slightly updated and modified.