



Education and Culture

# Leonardo da Vinci

ReBlending -project

HAMK University of Applied Sciences

**New Mobile Learning methods – The teachers guide to new methods**

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## **1. Introduction and What is mobile learning?**

The goal of this guide is to facilitate teachers to utilize mobile devices pedagogically meaningfully. In addition the guide provides a wide focus on different possibilities and methods to use mobile learning and tutoring. After reading and internalizing these teachers are able to design and carry out mobile tutoring and teaching occurring in the authentic environment.

Mobile learning is about learner's mobility, not about the device that is used. Mobile devices like mobile phones bring new dimensions to education by enabling pedagogically guidance and learning on-demand taking place in the authentic environment. mLearning integrates the learning environment a with real life environments, where learning can occur in an authentic situation and context.

Mobile learning makes learning possible just-in-time and on-demand situations. mLearning differs from traditional teacher centered learning –the learner defines mostly the content of learning depending on the present problem. This changes the traditional role of teacher. The theory of mobile learning differ from current theories of classroom, workplace and lifelong learning, because traditional classroom learning is based on a fixed location with common resources and an agreed curriculum, while mobility of learning allows transfer of knowledge and skills across context such as home and school, and across life transitions. The traditional teaching methods do not work in these new mobile learning settings - they cannot be replicated. New methods and tools supporting student's learning process are definitely needed.

In Multiplatform learning environment student's can access to learning environment and resources by various devices like by mobile phones, iPods, PDAs, smart phone, communicators as well as by computers. In addition pedagogical support and automatic tutoring can be provided to student's working and learning in the learning-on-the-job setting.

Table 1. *Typical Characteristics of Mobile Devices than can be used as a part of mobile learning environment in the project*

<b>Device</b>	<b>Interaction</b>	<b>Web browser (Communication)</b>	<b>Stand alone applications</b>	<b>Video- files/ Audio files</b>	<b>Data communication</b>
<b>Old mobile phones</b>	yes (SMS)	no	no	no	SMS
<b>Contemporary mobile phones</b>	yes	WAP / Browser	no (practically)	yes (limited memory)	SMS, MMS, GPRS
<b>Smart phones</b>	yes	Web/WAP + java + chat	yes	yes	SMS, MMS, GPRS, USB, Bluetooth (3G)
<b>PDA's</b>	yes	yes	yes	yes	SMS, MMS, GPRS, USB, Bluetooth
<b>Communicators</b>	yes	yes	yes	yes	SMS, MMS, GPRS, USB, Bluetooth (Wlan)
<b>Pocket PC:s (Pocket Windows)</b>	yes	yes	yes	yes	SMS, MMS, GPRS, USB, Bluetooth (3G) Wlan
<b>Tablets, lap tops</b>	yes	yes	yes	yes	Wlan, Lan, USB
<b>MP3 players</b>	no	no	no	audio	USB
<b>Ipods (New ones)</b>	no	no	no	yes	USB, Podcasting
<b>Portable Multimedia Players (PMMP)</b>	no	no	no	yes	USB
<b>Digital cameras</b>	no	no	no	yes	USB
<b>Data storages / smart cards</b>	n/a	n/a	n/a	n/a	n/a

## **reBlending's aim was to develop new mLearning methods**

The key contribution of the reBlending project was the transformation of the traditional classroom teaching into learning in authentic and natural environment. The pedagogical support needed for the learning process in a real environment is provided primarily by multiple platforms, such as Web and MSLE including mobile guided learning and automatic tutoring.

The challenge was to combine individual/separate and very versatile learning processes (e.g. language learning and the working skills required in a profession as well as problem-solving skills and sustainable development) with formal and informal learning in companies and in vocational education including learning-on-the-job. The mobile learning tools, methods and the concept of the Mobile Supported Learning Environment (MSLE) will be usable in a wider context in any subject domain of vocational education after the project.

1. The goals of this project will support open and flexible learning just-in-time in working environment (learning-on-the-job) and create a supportive learning culture, where learning can take place in authentic working situations. Exchange of expertise and experience between training organizations (e.g. vocational institutions and polytechnics) and companies facilitate creation of individually blended learning conditions for a student.
2. The project provides the target groups with new methods for blended learning, tutoring, assessment, and documentation. Moreover it provides new working methods based on the individual learners' learning process. The methods will be used in the mobile supported learning environment (MSLE). The environment includes learning tools, an automatic tutoring system, templates and pedagogical methods that are easy-to-use. The very elementary idea of MSLE is that the learning environment is not limited to virtual learning environment on a computer, but it extends to authentic working situations. The students' concrete work tasks are facilitated and guided by mobile learning tools. These methods motivate students to learn, because they solve authentic problems just –in-time. The project also provides learning materials in the form of Learning Objects (LOs), which are interactive unitary pieces of the learning material. These can be used in various devices such as computers, mobile phones, PDAs and communicators (multiple platforms). Learning Objects are also open source products. Both teachers and students can develop new objects.

The main idea is to combine formal and informal learning and to support learning processes in new innovative way by using learning objects and mobile learning tools. The German language has been chosen as the target content, especially due to lacking effective learning methods for languages.

The new and innovative methods are:

1. blended learning methods used side by side with
2. mobile guided learning in authentic situations and
3. mobile supported learning environment (MSLE) with

4. e-learning content organized into learning objects (LOs) will enhance the teaching and learning combining formal and informal learning situations in the authentic environment. e.g. in work places.

The project's originality was based on the fact that there are:

- methods for vocational education that are used for learning theoretical subjects (in this project the German language in working environment or in the learning-on-the-job period)
- methods for vocational education that are used for mobile supported learning environments (MSLE)
- concept of open mobile supported learning environment or tools for learning German language in working environment or in the learning-on-the-job period
- multiplatform learning environment for language learning that can be used with PCs as well with hand-held devices such as mobile phones and PDAs (Personal Digital Assistant)
- templates for mobile guided learning taking place in real environment
- automated tutoring systems used by mobile devices

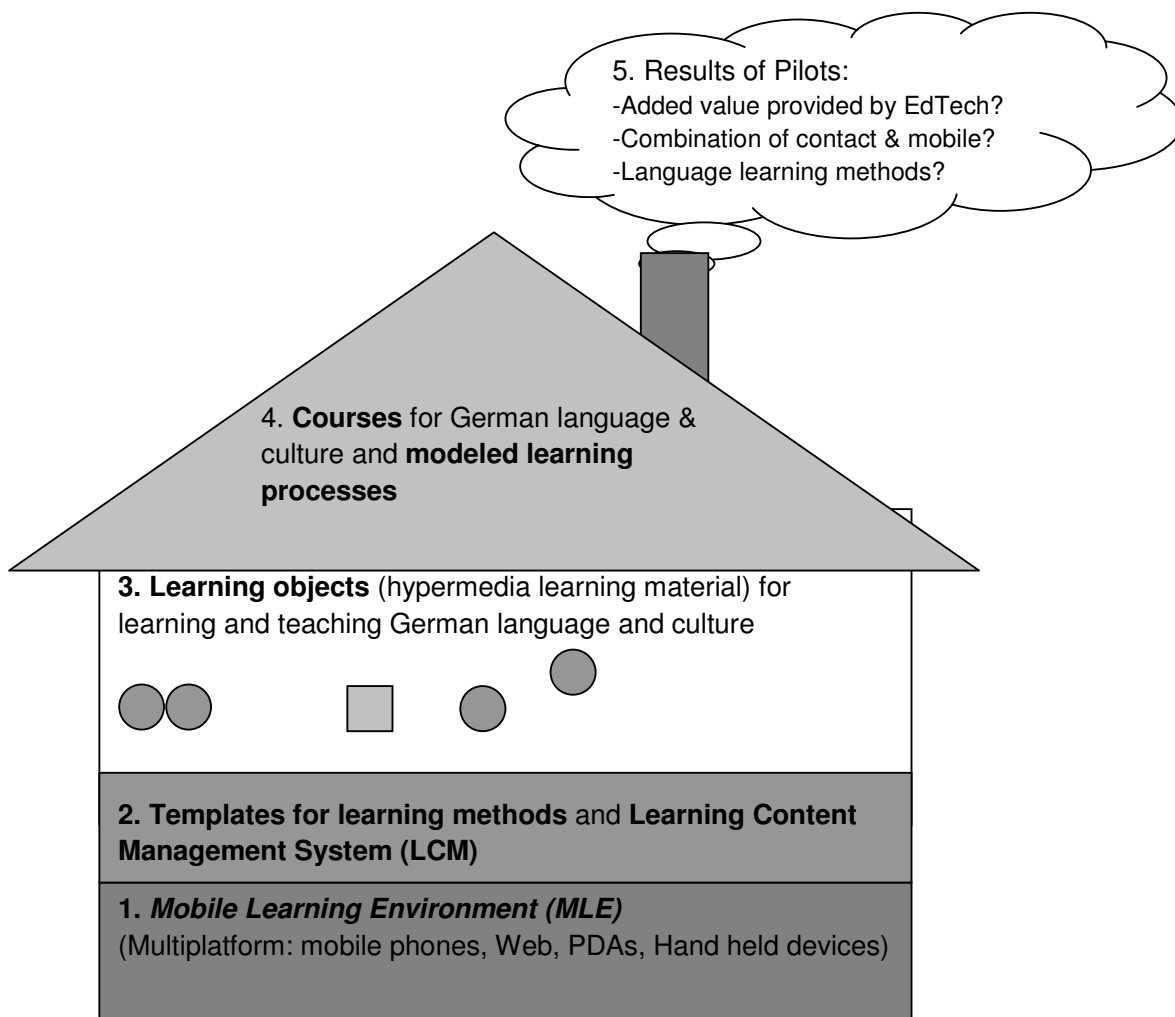


Figure 1. *Structure of ReBlending project*



## **2. Introduction to the mobile pedagogy and learning methods**

### **mPedagogy for mobile tutoring and individualised learning processes**

In order to design educational soft wares, the pedagogical foundation is worthy of consideration and has to be first defined at some level. The novel step we took in the development process of the new learning tools were designed and created new mPedagogy needed – innovative learning theory and pedagogy suitable for a framework for tutoring students learning in a authentic situation – outside the classrooms or lecture halls.

A pedagogical model for mobile learning should enable adaptation to the various situational contexts of individual's learning, even though on the deepest level, on the level of neuro-cognitive processes, learning can be seen as an universal phenomenon. In addition, tutoring of individual's learning process taking place in authentic environment should be based on the design of learners' individualised learning processes.

### **Why mPedagogy is needed in addition to methods used in web-based learning**

Mobile devices like cellular phones and PDAs bring many new dimensions in learning and education. Learning environment extends and integrates to the real environment, when learning can occur in authentic context like learning on the job or on the work places. Communication, collaborative knowledge building, observations and finding new innovations describe the students learning activity in the authentic learning environment based on mobile educational technologies. When using mobile devices, students are able to construct really useful knowledge in a real, authentic situation.

The past two decades have seen a number of convergences in the field of learning – a convergence that not only applies to the various educational technologies used; but also to the methodologies and the pedagogical principles applied. Educators do not have the same means to influence students in mobile learning as they have in a classroom or even in web based learning environments. Therefore, it is important to design learning situations from the point of view of the learners rather than from teachers' view.

Learning practices in real environment are influenced by the pedagogical, technical and contextual contexts. Educators have to use different means to foster learning than traditionally. The traditional teaching process does not apply to the mLearning process, because traditional teaching is based on the teaching process, whereas mobile teaching has to be based on the design of the learner's learning process. In mobile learning occurring in authentic environment situational factors have different influence on the student's learning process than in traditional Web based distance courses.

### **Common elements in the former pedagogical models that facilitates learning (Silander et al. 2003)<sup>i</sup>**

*Learners' Prior Knowledge.* Learners' prior knowledge and their attitudes toward any subject studied have an influence on learning. New understanding will be founded on prior knowledge. Therefore, it is tremendously importance that learners first become aware of their prior knowledge. In order to help them do so, different methods, like unstructured writing or concept maps, can be used.

*Problem Oriented Learning.* Problems arising from learners' own interest (or from a workplace) are regarded as a crucial factor in learning. Questions and problems set up by students, direct the knowledge building process.

*Authenticity.* The problems being solved during the learning process should be as authentic as possible. The same applies to learning assignments: they must not be tasks done just for a teacher. Authenticity requires that the culture of vocational expertise, i.e., a workplace with authentic tasks, methods, tools, and information sources, should be related to learning assignments.

*Knowledge Building.* Knowledge building and the construction of new knowledge, which is meaningful to a learner, have a core position in a learning process. Although learning does not equal knowledge building, it, along with the formulation of new knowledge, *can* be conceived as a metaphor for learning.

*Externalisation of One's Own Thoughts and the Process of Knowledge Building.* When learners externalise their own thoughts and simultaneously the process of knowledge building, they need to present these ideas in an abstract context. They can then learn from their own train of thought and deficiencies in their thinking may become apparent. This externalisation creates a need to produce more elaborate constructs.

*Collaboration.* The best learning is considered to take place in a social context based on collaborative knowledge building and shared expertise. The externalisation of one's own thoughts as well as feedback from peers plays a significant role here.

*Change in the Roles of Teachers and Learners.* Learners are seen as active processors of knowledge and as main actors in all these pedagogic models. Teachers are considered facilitators of the learning process, as well as experts on the substance of courses.

*Learning is a Qualitative and Conceptual Change in a Learners' Comprehensive Knowledge Structures.* The aim of processing information and problem solving (in a learning process) is to create conceptual change, i.e., genuine qualitative change in students' knowledge structures. Just adding new information to existing knowledge is not sufficient from the point of view of learning. A conceptual change is often a prerequisite for the capability to apply a learned substance in a different situation and in practice (transfer).

## **Mobile learning Environment**

Mobile learning environment (MLE) works as a basis for mobile learning and for tutoring dialogue between students and teachers. In addition, it enables the creation of the structure and framework for mobile learning process taking place in authentic environments. MLE with ITS can be described technically to be a PHP- and MySQL-based application with automatic and semi-automatic tutoring features. It forms an Open Learning Environment (OLE) for both PC and mobile devices. The learning environment is open in the sense that students are able to construct the individual content of learning, e.g. in the form of the portfolios and communicate with tutors by using the tutoring dialogue log. The ITS-component can contain semiautomatic and automatic guidance for learners' learning processes, enabling automatic individualisation of a learning process. The ITS is meant to be used with Learning Objects.

### **3. Learning in the authentic environment**

Authentic learning is a pedagogical approach that allows learners to explore, discuss, and meaningfully construct concepts and relationships in contexts that involve real-world problems and projects that are relevant to the learner (Donovan, Bransford, & Pellegrino, 1999). Authentic learning encourages interaction with a community of learners that includes other learners, teachers,

and outside experts. In such a place, technology becomes a tool for discovery, supporting the learning process as students seek new knowledge and insight and construct new knowledge.

According to modern research and theory concerning authenticity Herrington, Oliver and Reeves (2003, Reeves, Harrington, Oliver 2004) have defined ten attributes for phenomena of authentic assignments: 1) Authentic assignments are relevant from the real life's perspective. 2) Authentic assignments are not carefully planned beforehand – learners define themselves the assignments in the context. 3) Authentic assignments consist of complicated features that require concentration from the learners. It takes days, weeks and even months rather than minutes and hours to get those ready. Assignments require significant investment of time and intellectual resources. 4) Authentic assignments have to offer possibility for learners to reflect and construct own opinions and values. 5) Authentic assignments have to make possible for learners to research the assignment from different perspectives by using different learning materials and sources. 6) Authentic assignments have to offer possibility for co-operation. 7) Authentic assignments must be integrated and applied to different kind of contexts and lead to deeper learning, not only for strictly defined results. 8) Evaluation must be combined well to authentic assignments. 9) Authentic assignments must produce refined valuable productions. 10) Authentic assignments must able to produce optional solutions and diversity of results.

Authentic learning situation can be created for example including work life processes and models to learning materials, so that they reflect the problem based focus. Most effective are the assignments where learner is not able to use only one correct answer and at the same time it extends the learners reflection. Case and problem based assignments offer excellent possibilities to learner to apply their own knowledge and support authentic, transferable learning to new actual life situations. (For example: Jaakkola 2004: Leppisaari & Helenius 2005). Case based learning can be defined as learning from previously learned solutions when problem based learning creates new solutions. Complex authentic situations are part of case based learning, where the learner (often novice) has to start to think like expert. Through this learning can be seen as a process of developing to specialist (Bennet, Harper & Hedberg 2002.) Mobile devices offer versatile solutions to authentic learning situations, with mobiles you can easily save situations and review them over and over again. On the other hand one can ask help to the problematic situation just-in-time.

#### **4. Mobile mentoring and coaching**

Mentor sessions, tutoring and coaching programmes have traditionally been conducted in peaceful place face to face. Modern busy lifestyle makes hard to fit schedules and new technology has been taken to use to make meetings possible. New communication devices make mentoring and coaching relationships possible where mentor/coach and mentoree/coachee are working through long distances.

Bierema and Merriam (2002) see Internet mentoring as promising possibility. Mentoring that uses communication technology is called eMentoring, virtual mentoring, tele-mentoring, long distance mentoring or Internet mentoring. eMentoring and coaching is able to combine traditional mentoring and expand different interaction forms (Garrett-Harris, 2006). Experienced mentor in eMentoring and novice mentoree use primarily different kind of communication devices in their mentoring sessions. Communication devices make it possible to have communication at the same or at different time. E-Mentoring can be defined as cooperation between two or more people, who want share their knowledge and develop in area of common interests (Väljjarvi 2006). At the best eMentoring is organizational boundaries breaking action where is a lot of people involved.

Team/group mentoring process has different nature and quality than traditional face to face mentor meeting (Bierema & Merriam, 2002).

Through eMentoring it is possible that more than one specialist and novices work in the same environment. Flexible timing gives more time for reflecting and learning. Mentoring becomes the core of the action (Miller 2000; Megginson et al 2006; Bierema & Merriam 2002).

Key questions of eMentoring are: starting of the mentoring relationship, how to develop relationship, how to maintain the relationship and how to end it successfully. All these phases during eMentoring process should be well planned (Zachary 2000). Technology is just a utility; it can not take the focus away from the actual mentoring. The methods chosen to be used must be in accordance with the needs of the participants and the user tests must be conducted prior to the mentoring session.

Listening, making questions, collecting information, reflecting experiences and describing and developing own skills are typical for mentoring session. Communication devices must be chosen in a way that it will support the interaction. When using communication devices that require users to their computers, mentoring will happen through different non-scheduled messages or scheduled sessions. New mobile technologies, wireless computers and interaction supporting software are supporting tools of mentoring in “just-in-time” -situations. When using mobile devices in mentoring the participants are not bound to any place – time is something that must be founded to develop your own work.

## **5. AEFIRIP-model for mobile learning, teaching and tutoring**

We introduce theoretically constructed pedagogical model called AEFIRIP that has worked as a foundation for our development of the intelligent tutoring tool. AEFIRIP is based on the contemporary pedagogical models of elearning and learning theories, but it is focused on the characteristics of mobile learning. It's meant to be used with different kinds of mobile devices when learning is occurring in the authentic situations.

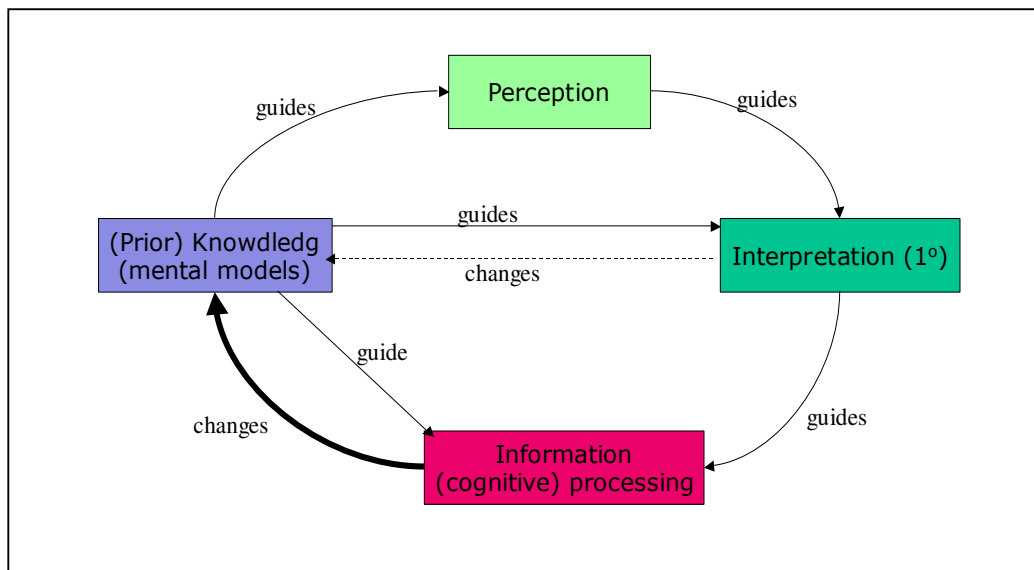
### **Theoretical background of AEFIRIP**

In this context learning is seen as a mobile-CSCL promoted by mobile learning tools. Similar individuals' knowledge building activity is describes for example in the process of Progressive inquiry model (Hakkarainen et al. 2001) that heavily relies on socio-cultural learning theories (Bruner 1985, Vygotsky 1978 and 1986). In addition to the knowledge construction, individual's perception and cognitive processes like heuristic and logical inference is heavily emphasizes in AEFIRIP.

Although mobile devices can be tools used during the whole knowledge building process, we mainly focuses on examining critical elements of tutoring the knowledge building process taking place in authentic environment. The early phases of knowledge building, like setting up own problems and questions, context creation and externalisation of prior knowledge are heavily emphasized in various pedagogical models and methods (e.g. in Progressive inquiry as well as in Activating instruction (Lonka & Ahola 1997), in DIANA-model (Aarnio & Engqvist 2001) and in

Problem Based Learning (PBL)). In AEFIRIP model mobile technology is seen not just as a mediator (of learning activity / collaboration) but also as a trigger and platform that includes guidance and support for learning methods and the learning process.

The main emphasis is on the information processing procedures, where learning can be seen as various ways of processing the information. According to cognitive theorists the revision of the material from different conceptual perspectives is essential for knowledge acquisition (Spiro et al., 1988). Learning is seen as an active process where people create their constructions from experience by interacting with the surrounding environment (see Figure 1). Learning should be meaningful and derive from an authentic context; students should pursue individual learning goals.



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Figure 2. Learning is seen as a cyclic process of student consisting of important elements like perception, interpretation of perception and cognitive processes. Student's prior mental models and cognitive strategies affect these elements.

The most of all AEFIRIP concentrate on how the human environment affects learning. Learning should take place in a context that is authentic and personally relevant to the students. Socio-cultural learning theories widen the perspective of the learning situation to include the whole cultural background and practices of communities. Teaching strategies include; problem-based learning and inquiry learning.

### Elements and stages of AEFIRIP pedagogical model for mobile tutoring and learning

AEFIRIP (Silander 2005) is an acronym for the phases of pedagogical model design for facilitating mobile tutoring of learning taking place in authentic environment. AEFIRIP stand for Activation, Externalization, Focusing, Interpretations, Reflection and Information Processing. Learning is seen as a constant cyclic process based on the learning cycle presented on Figure 1. Following steps of AEFIRIP model (described on the Table 1) have been created in order to structure learning process and tutoring activity needed.

Table 2. *AEFIRIP the pedagogical model for mobile learning and tutoring consists of following phases.*

<b><i>Phase</i></b>	<b><i>Description of activity</i></b>
<b>1. <u>A</u>ctivation</b>	Activating student's prior knowledge and cognitive strategies by context creation or e.g. presenting so called activating questions
<b>2, <u>E</u>xternalization</b>	Externalization of student's prior knowledge and thinking models. Students became aware of their prior knowledge by making it visible and exposed to reflection.
<b>3. <u>F</u>ocusing</b>	Focusing students perception and cognitive processing in a authentic learning environment according the objectives of the learning situation (e.g. by focusing questions or assignments)
<b>4. <u>I</u>nterpretations</b>	Explicit interpretations done by student based on perception and prior knowledge/cognitive strategies as well as situational factors.
<b>5. <u>R</u>eflection</b>	<b>Reflection</b> of own interpretations and situational factors.
<b>6. <u>I</u>nformation <u>P</u>rocessing</b>	Information Processing consist of sub learning processes (→cognitive processes) such as problem solving, classification, comparison, elaboration etc.

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The problems being solved during the mLearning process should be as authentic as possible. The same applies to mobile tutoring and learning assignments that must not be tasks done just for a teacher. Authenticity requires that the culture of professional expertise, i.e., a workplace with authentic tasks, methods, tools, and information sources, should be closely related to tutoring practices. Tutoring and structured learning process makes working in the real environment to be an intentional and scaffolded learning process needed in order to achieve goals of formal education.

### **Design tool for mobile learning setting**

By answering the questions, you will describe the students' and tutors' activity on the right column. →When finished, *the mobile learning process* is designed followed by AEFIRIP-pedagogical model. This form works also as an implementation plan.

Table 3. *Design tool for mobile learning setting.*

Phase	Description of the activity (How to utilize mobile devices?)
<p>1. <u>A</u>ctivation            How to activate student's prior knowledge and cognitive strategies by context creation or e.g. presenting so called activating questions? What is the role of the mobile devices, the role of tutor and the role of real environment where learning is taking a place?</p>	
<p>2. <u>E</u>xternalization            How students externalize/make visible their prior knowledge and thinking models? Students should become aware of their prior knowledge by making it visible and exposing it to reflection.</p>	
<p>3. <u>F</u>ocusing            How to focus students' perception and cognitive processing in authentic learning environment according to the objectives of the learning situation (e.g. by presenting focusing questions or assignments)?</p>	
<p>4. <u>I</u>nterpretations            How to make students do their own interpretations based on their perceptions of the real authentic environment they are acting?            How make situational factors visible? How do students share their interpretations about the situation or environment?</p>	
<p>5. <u>R</u>eflection            How do students reflect their own interpretations and situational factors? How do students reflect ideas and thoughts presented by other students?</p>	
<p>6. <u>I</u>nformation <u>P</u>rocessing            What kinds of processes are needed to happen in students' mind? How does student process the information? Does it involve reflection?            (Information Processing consists of sub learning processes (cognitive processes) such as problem solving, classification, comparison, elaboration etc.)</p>	

## 6. Taxonomy of mobile learning methods

### 6.1 Push-media / information delivery

Definition of push-media is information/media material is pushed to his/her mobile device. Marketers have been using this for a long time. Push-media can be applied to mobile devices as supporting actions of learning, in this case the informing and sharing information through mobile media is the core function. Simplex describes Push-media in teacher/tutor to learner relationships. Push-media is one to many communication where the same SMS-message, MMS-message or news feed is sent to more than one people.

Objectives of push-media can be taken into re-examination when automated systems are used, in these systems computer adapts to the learners learning situation and learning process. This makes it possible to guide the learner's process in authentic environment and structure learning according to pedagogical models. Core pedagogical restrictions often relate to a simplex and to the fact that the learners don't necessary doesn't have possibility to send reply message or ask more information.

Content sensitivity can be one of the targets where push-media can be used. In this case to the learner's mobile device is sent information or for example learning material according to location/environment where learner is moving. Through this example to the learner it is possible to offer exact information in right context. For example in language studies it would be possible to offer to learner models how to use language, phrase models vocabulary and not forgetting meaning of reflection what the authentic situation needs.

As a technology it is possible to use scheduled SMS-messages and MMS-messages. In this case guiding the learning happens mostly collectively. The most promising modern technology is Bluetooth communication. Bluetooth relay stations that can be positioned to different contexts/school premises where context sensitivity is reached easily. Rely stations are attached to computer, from here multimedia information can be pass on to the learner. This technology makes two way communications possible and on-demand material "ordering" to learners mobile devices.

Podcasting/vodcasting can also be described as push-media, although the learner has possibility to choose which materials (sound clips, video clips) are downloaded to his/her mobile phone.

Practically the tool of the teacher can be for example: Skype, web-based or system that can be used to send group SMS-messages (for example Moodle's Mobilog extensions makes this possible). Group SMS-messages can be very useful pedagogical tool when learners learning process is before hand planned or learner is studying for example in learning in work period.

Often push-media is suitable for the teacher who executes traditional communication based teaching. According to modern learning concept when learners activity is emphasized push-media is not by it self the solution to mobile learning or to mentoring. Wider learning environment thinking and pedagogical examination is necessary.

## 6.2 On-demand help / survival

Definition of On-demand is on-demand based information, ordering/downloading media or on-demand based learning and pedagogic. On-demand based learning the basis is the need of learner need for the information, question to the mentor or even the situations requirements for the using of tools or information. Earlier applications mentioned on-demand, probably video on-demand. What would be learning on-demand?

Table 4. *It is possible to use on-demand to different media in mobile devices.*

On-demand Target	Data Transfer methods
Text	SMS (text message), WAP, WEB, File transfer (cable/Bluetooth)
Audio	Calls, Call center applications, WAP, WEB, File transfer (cable/Bluetooth), podcasting.
Picture (charts, graphs, mnemonic)	Multimedia messages, WAP, WEB, File transfer (cable/Bluetooth), podcasting
Video	Video calls, multimedia messages, WAP, WEB, File transfer, vodcasting (cable/Bluetooth), podcasting
Animations	Video calls, multimedia messages, WAP, WEB, File transfer, vodcasting
Applications – Utilities (dictionaries, other applications, learning kits which operate on mobile devices.)	WAP, WEB, File transfer (cable/Bluetooth)

On-demand can be also used in mentoring framework. When learner is in situation where actual/acute need of mentoring is needed, learner is able to send mentoring request to teacher/mentor/tutor. Mentoring requests can be transferred to teacher for example through software or learning environment which is operating in server. Concrete application could be for example: request for mentoring where the learner identifies what kind of mentoring/help he/she needs (see attachment 1). Questions included in the mentoring form guide the learner's thinking and support learners own problem solving process.

Need of on-Demand mentoring is obvious and teachers should develop on-demand mentoring elements to their teaching where mobile devices, MMS- MMS- messages, mobile email, WEB and mobile blogging are being used. ([www.blogger.com](http://www.blogger.com)).

### **Learnign objects on-demand**

Different kind of learning objectives can be available in learning objective pool (example: www-pages or learning environment), where learner is able to order / fetch needed learning objective suitable for the learning situation. One of the most used HAMK's produced mobile learning objectives is tie knot (<http://elearningcentre.hamk.fi/mobile/>) in tie knot there is demonstrated how to do tie knot. This objective can be used for example when travelling and your wife is not with you and you have to knot your tie before dinner. These kind of small objectives would help in many communication or language based situations.

## **6.3 Mobile Collaboration and Team Work**

### *Working in mobile teams*

Mobile devices are one technical solution for virtual teams. A virtual team, or a decentralized organisation, is **a group of people who work for a common objective, are not physically located at the same place and use mainly electronic devices for mutual communication.** These teams are formed through work or past time activities. A virtual community is a local, national and global network that consists of different kinds of organisations. The virtual teams and communities operate on the principle of everybody sharing a goal which they strive to achieve by working together. These teams and communities can meet in person from time to time, but it is possible that their co-operation takes place only the through virtual working facilities. The group members do not need to work simultaneously.

It is often the lack of common objectives that hampers the operation of virtual teams. People start to walk their separate paths if their goals are not the same. When the target becomes unfocused, the team members start easily driving their own agendas – which unavoidably leads to conflicts. The team leaders are responsible for directing their teams back on track. If they are unable to do so, the team members should take action.

### **Prerequisites for successful virtual teams:**

1. Working in virtual teams is based on shared experiences, the team members wish to learn and do things together
2. The participants have uniform objectives and sub-targets that everyone is conscious of
3. The team members' actions are based on trust
4. Privacy and information security
5. Social interaction is the starting point of success
6. Beneficial value
7. Culture
8. Consciousness
9. Scalability
10. Authenticity
11. Flexibility

### **6.4 Mobile tutoring tool**

Part of the original work has first been published and reported on Silander P. & Rytönen A. (2005) Intelligent Mobile Tutoring Tool Enabling Individualisation. of Students' Learning Processes. In Van der Merwe & Brown the proceedings mLearn 2005: Mobile technology: The future of learning in your hands.

#### ***An Intelligent Mobile Tutoring Tool***

Mobile devices like mobile phones bring new and innovative dimensions to vocational education. They extend the learning environment and integrate it with real life environments, where learning can occur in an authentic situation and context. When design intentional learning process taking place in real environments new kind of pedagogy are needed especially when developing mobile tutoring practices – that is mPedagogy.

Mobilogi is a tutoring tool for teachers. It enables interaction and tutoring dialogue via mobile devices like mobile phones (SMSs) and PDA's. The tool contains semiautomatic and automatic guidance for learners' learning processes, enabling automatic individualization. In addition, Älykkö component of Mobilogi contains ready-made tutoring expressions and a documented tutoring dialogue for teachers' use, in order to reduce the teacher's cognitive load needed just for memorizing.

Table 5. *Charasteristics of the Mobilogi*

Agent	Function
1 Triggers	Trigger-agent sends automatic trigger messages to students in order to activate students and bring up new angles. In addition, automatic trigger messages are used to initiate interaction and maintaining dialogue when needed. Triggers are context sensitive.
2 Pre-structured Pedagogical Cycles and Scaffolds	Pre-structured pedagogical cycle scaffolds students learning process. Teachers may define in advance the pedagogical model and/or pedagogical cycle used in automatic tutoring. Agent follows students learning process by observing students dialogue messages and sends automatically tutoring messages according the stage of the pedagogical model. This is used in

	order to structure students' learning processes and promote students' progress. Tutoring messages are sensitive to individual learning processes. Teachers may use ready-made tutoring expression or define their own messages and pre-structured cycles that works scaffolds for student.
3. On-Demand Tutoring Help	Automatic answers are generated to Students' questions concerning the subject domain and e.g. practical issues of studies by utilizing the information on the FAQ-database and documents defined by the teacher as well as information available via internet search engines. Help, hints and links are provided to a learner on demand. On-demand tutoring agent response to the commands "help me on..." and "give me hint ..." Agent work iteratively in order to ensure appropriate answers for students and simultaneously update FAQ-database. Students rate the relevance of provided answers.
4. Automatic Iterative Tutoring Dialogue / Conversation as Scaffolds	The agent provides focusing and deepening questions to a student based on the student's progress and activity. These questions helps student to get deeper on his/her subject as well as to reflect and develop further his/her conceptual constructions and artifacts. In addition, so called <i>dialogical inquiry questions</i> are sent to students, e.g. "How did you end up to these results?"
5. Tutoring On-Demand Questionnaire	If a student needs more personal tutoring, the agent present questions to the student that the student is supposed to answer. The answers are documented into the database. By answering the questions, students have to consider problem from different angles and try to generate solutions to the problem she/he has. The questions help students to see a larger picture and organize pieces of information he/she has. If the student still needs further tutoring, student's answers are transmitted by an email to the teacher who can reply and advice the student. Student's answers provide to the teacher the necessary information needed in order to give effective tutoring.
6. Indicators of tutoring dialogue and relevance of students answers on learning tasks	The agent provides various indicators of tutoring dialogue related to a student's activity, conceptual density and conceptual centrality of content of dialogue. In addition indicators are used to describe relevance to students answer to learning task or assignments. Indicators are presented as visual symbols, numerical values and textual metaphors.

### 6.5 Mobile portfolios / Mobile blogs and life book

Portfolios are collection of authentic and diverse evidence, drawn from a large archive, representing the capital (competencies, knowledge, social networks) developed by a reflective person or organization, and designed to display their assets in a particular context. Portfolios can be as a record of working life, as a tool to promote employability, as a store of organizational knowledge or as a means of learning. In learning processes portfolio can be the tool, when the learner: reflect, plan, give and receive feedback, communicate, collaborate or publish something. Mobile devices are very helpful especially in working life as a method to collect portfolios.

## 6.6 Mobile concept mapping

Mobile technologies like mobile phones allow a learning community to combine classroom activities with simultaneous field explorations in an authentic environment. The collaboration between the two groups can be enhanced by a technique called Collaborative Concept Maps, based on SMSs (Short Message Service). This means that mobile technology is used not just as a mediator (of learning activity/collaboration) but as a trigger and platform that includes guidance and support for learning methods and the learning process.

A collaborative concept map works as a basis for learning and for further knowledge building. Concept mapping also creates a structure and framework for knowledge building activity. Mobile applications for constructing collaborative concept maps by using SMSs. It forms an Open Learning Environment (OLE) for mobile devices. The learning environment is open in the sense that students are able to construct the content of learning in the form of the concept map and also communicate by using chat.

Table 6. *The use of concept maps in a learning situation divided into the basic categories. Categories are not mutually exclusive (Silander et al. 2005)<sup>ii</sup>*

<b><i>Category of using concept maps in a learning situation</i></b>	<b><i>Description the role of the concept map in learning</i></b>
<b>Exploring/browsing of existing maps</b>	<i>Knowledge acquisition.</i> Ready-made concept maps are used to present conceptual information in the form of concepts and relations between them. Maps may be used in order to describe the overall picture of the subject/phenomenon.
<b>Construction of individual concept maps</b>	<i>Tool for physically distributed cognition.</i> Construction of individual concept maps with various concept mapping tools is used in order to present one's conceptual constructions or to organize, to develop and to learn new conceptual constructions.
<b>Construction of collaborative concept maps</b>	<i>Tool for socially shared cognition.</i> Collaborative concept maps are used in order to create collaborative conceptual constructions, to share individuals' constructions and to achieve joint conception.
<b>Assembling of concept maps on the basis of half done maps or primitives</b>	<i>Tool for physically distributed cognition and knowledge acquisition.</i> Construction of concept maps on the basis of the ready-made elements or primitives like given concepts or the structure of the map.

	Modification of the concepts and relations in an existing map.
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*Adopted from Silander et al. 2005*

## **6.7 Mobile Learning Objects**

Learning objects offer new opportunities for creating individual and mobile learning processes as well as for the massification of education. Mobile learning objects are emerging paradigm shifts in instructional systems that promise to bring to education to the working place and to the authentic environments. These benefits may be remarkable especially in the context of higher education and life-long-learning.

LOs have traditionally been used both, in web-courses and in classroom teaching - the significance of the learning objects is widely seen in the Europe. On the other hand, based on our experiences in the projects, it is just unworkable for average language teachers in higher education to produce pedagogically meaningful LOs by themselves without external support of experts of educational technology or experts of learning psychology. Teachers' key competences are focused on the lecture hall teaching, not on the field of designing and producing eLearning materials like LOs. Providing training as well as pedagogical guidelines how to design LOs for teachers has been our approach in order to facilitate teachers to produce LOs. Defining pedagogical quality criterion for learning objects has been a latest step in the process.

### **Definition of the Learning Object**

Currently, there are various definitions of LOs (see e.g. Polsani, 2003, Wiley, 2002, IEEE, 2001). The definition or classification of learning objects may be based on the description of the media used or on the description of the LO's "outlook" (e.g. presentations, drills, simulations). However, if the focus is on the pedagogical processes and educational practices, the broader context should be considered for the definition of the learning objects.

In this context, we define a Learning Object (LO) to be small piece of learning material that is a reusable, compact, as well as a unitary entity. The LOs can be described as the atoms that can be linked together with each other forming a learning process (Silander and Koli, 2003) (vs. molecule like hydrocarbon chains). The LO can be defined to be the smallest pedagogically meaningful entity of learning material.

Reusability in the educational context can be generally understood as instructional components which be reused a number of times in different learning contexts (Pitkänen and Silander, 2004). The LOs are reusable in the sense that a particular LO may be used in various learning processes and at various stages of a learning process as well as in various content domains. There are also many different pedagogical functions for a LO in a learning process. Ideally, this enables the personalization of learning processes (as well as massification of education) that consist of several learning objects stored in a database. Therefore, learning objects may be easily used in several contexts and for different learners on various levels.

Open Learning Objects (OLOs) are open in the sense of content, so that students as well as teachers may add new content in the learning object. OLO can be described to be a learning tool or a thinking tool that provides pedagogical framework and methodological guidance to learner's learning processes but does not include content. Open Learning Objects are even more highly reusable in various content domains and learning settings than traditional learning objects.

### 3. Pedagogical taxonomy of Learning Objects

In order to get deeper insight on learning objects, they should be explored in relation to a learning process (Pitkänen and Silander, 2004). LOs may be used in formal education in various pedagogical settings and therefore interaction between a learning object and a learning process varies to a great extent. Figure 1 illustrates the different types of learning objects described in relation to a learning process.

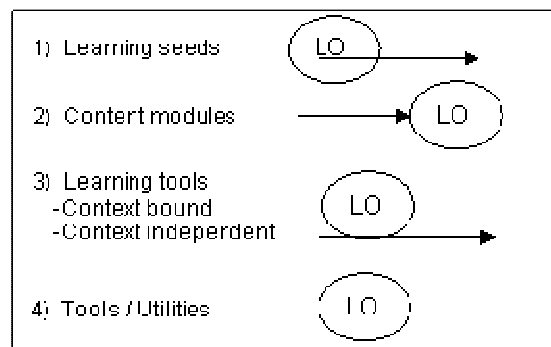


Figure 3. *The different types of learning objects described in relation to a learning process.* © Silander 2003

**The learning seeds** are LOs that initiate (sub-) learning processes in a learner's mind. In addition, they methodologically guide the learner's learning processes. Learning is not just limited into the use of the learning object, but extends to the whole web-based learning environments. For example, LOs may work as basis for students' own problem setting in discussion forums when using the Problem Based Learning (see e.g. Albanese and Mitchell, 1993) as a method.

Learning objects that can be described to be just **content modules** without pedagogically support for students learning processes are more like traditional learning materials. They provide the content and 'object' of learning for students. In addition, they can work as information resources when learner is doing assignments or learning tasks. Content modules do not work alone in education; they need in addition learning tasks given by teacher.

**Learning tools or Mind tools** (see e.g. Jonassen, 1996) are cognitive tools that intentionally guide the learners' learning process on the level on perception or cognition. Learning tools may be bound to the particular context and content, or they may be context free. Context free tools (e.g. concept mapping applications) may be used with various content domains. Open learning objects are usually learning tools that are context free.

Sometime LOs can be tools or **utilities** that do not guide pedagogically students' learning process or perception but may be used similarly in learning process as learning objects. These kinds of tools may be used for instance when students are creating content in a learning situation.

#### **4. Pedagogical function of LO – the Pedagogical Purpose of the Learning Object in Learning Process**

The past two decades have seen a number of convergences in the field of learning – a convergence that not only applies to the various educational technologies used; but also to the methodologies and the pedagogical principles and methods applied. Educators do not have the same means to influence students in web-based learning as they have in a classroom or even in distance education (Koli and Silander, 2003). Therefore, it is important to design learning situations from the point of view of the learners rather than from teachers' view. The focus in educational design when utilizing LOs should be on the pedagogical functions of the learning objects have in the learning process. The pedagogical functions of LOs (see Table 1) describe the role of LO in learning process as well as how to use LOs to facilitate student's learning. A learning object can have one or many pedagogical functions.

As LOs do not work alone in instruction they need an environment and a framework that defines how to use them in teaching and learning processes. In order to uses LOs in different situations they should have many pedagogical roles. LOs are more reusable if they are not heavily bound to particular learning theory or a pedagogical model. Still LO should guide sub learning processes and students' cognitive processing. The pedagogical function of LO and the framework is often provided by a teacher or by an environment.

LOs cannot be used or applied in the learning process in an arbitrary way, like Lego-blocks. The internal structure and the pedagogical interface of the LO identifies an external context and a structure of the learning situation with its pedagogical functions. The ultimate goal in the use of LOs is to lead to the extensions and modifications to learner's existing mental models based on the idea that learner herself/himself use e.g. reasoning (both procedural and heuristic), problem solving and own inference when using a LO.

Individual learning object may be used in various contexts and pedagogical settings, even when the LO originally has been contextually designed to work in a particular learning situation (Pitkänen and Silander, 2004). If the LO had been bound closely with a particular pedagogical model (instead of a learning process) it would not have had so many pedagogical functions and would not have allowed such high reusability in a learning process.

Table 7. *Pedagogical function of LO defines how LO can be pedagogically integrated in learning process (Silander 2003)*

***Pedagogical functions / purpose of LOs in a learning process***

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- 1. Activating** (cognitive)
- 2. Context creation, setting problems** (e.g. cases, simulations)
- 3. Hypothesis / working theory testing** (incl. students' own conclusions (e.g. interactive simulations, tools))
- 4. Information source** (e.g. describes procedural knowledge, visual learning)
- 5. Knowledge building** (~mind tool) (e.g. tool for presenting conceptual artifacts, support for distributed cognition)
- 6. Reflection**
- 7. Testing / Evaluation**

This taxonomy may be seen as a teacher's tool for implementing LOs in learning process, in their teaching. In addition, classification could help educators who are constructing LOs to focus more to modern learning theories and develop LOs further.

***Learning objects in ReBlending***

In this project was developed seven different kinds of types for learning objectives which are versatility in use different pedagogical contents. Teacher is able to tailor made or create new content to learning objectives. Part of the learning objectives functions as a tool of students learning, in this case learner creates own content for example: creates own associate (semantic) dictionary according to mind map model.

1. EDMOC –cartoons (Attachment 2)
2. Telephone-service (if you, please press 1, in order to ... please press 2) - Audio clips (interactive story, decisions tree, an aid in a tool kit for on demand-situations)
3. Learning Cards (picture, text, audio)
4. Concept mapping/mind mapping / some semantic network between words
5. Video clips / audio clips
6. Hypertext/Web-pages (static)
7. Templates for sentences

Following planning tool you can use when you are planning how the earlier described learning objectives are being used in learners learning process. Learning objectives must be planned and have goals to be able to support learning.

Table 8. *Designing Form for Using Objects and pedagogically integrating them into learning process.*

<b>Designing Form for Usining Objects and pedagogically integrating them into learning process</b>	
<b>Topic of LO:</b>	
<b>Phase in learning process:</b> <i>On what stages/phases of learning process the object will be used?</i>	
<b>Learning situation:</b> <i>What are <b>objectives</b> of whole learning situation?</i>  <b>What is the objective of Learning Object (what dose student learn?)</b> <i>Why LO is used?</i> <i>What are the goals of using LO?</i>  <i>What is the added value LO can pedagogically offer?</i>	
<b>Type of LO:</b>	<input type="checkbox"/> Learning Seed <input type="checkbox"/> Target of learning (matter/phenomenon to be learned) <input type="checkbox"/> Learning tool <input type="checkbox"/> Context bound learning tool <input type="checkbox"/> Context independent learning tool <input type="checkbox"/> Tool / Utility
<b>Pedagogical function(s) of LO:</b> <i>What fo LO is pedagogically used? Identify the primary and secondary (many) purpose(s) / pedagogical function(s) of LO in learning process.</i>	<input type="checkbox"/> Activation (cognitive, prior knowledge) <input type="checkbox"/> Context creation <input type="checkbox"/> Setting up problems (e.g. in PBL) <input type="checkbox"/> Hypothesis testing / working theory testing (e.g. in Progressive Inquiry) <input type="checkbox"/> Information Source (e.g. describes procedural information) <input type="checkbox"/> Tool for knowledge building (e.g. tool to present ones conceptual artifacts in various forms)

	<input type="checkbox"/> Reflection <input type="checkbox"/> Evaluation / assessment / testing
<p><b><i>In-going:</i></b></p> <p><i>What are the goals of orientation? How students will be activated (to focus perception, thinking etc.) to examine LO?</i></p> <p><i>What kind of processes are needed in order to create in-going, pedagogically focus and lenses for students?</i></p>	
<p><b><i>Media elements and pedagogy of MEs :</i></b></p> <p><i>What are the media elements in LO?</i></p> <p><i>What are the functions of each media elements (pedagogically) in LO?</i></p>	
<p><b><i>Students sub-learning processes when using LO:</i></b></p> <p><i><u>What kind of (sub)learning processes LO initiates in a students mind? (=cognitive processes) What is the pedagogical guidance for these elements provided by LO?</u></i></p> <p><i>How student process the information?</i></p>	<input type="checkbox"/> Combining different matters/concepts (“construction of small peaces of information”) <input type="checkbox"/> Comparison, Creating classification, Creating differentiation <input type="checkbox"/> Linking actively new pieces of information to one’s prior knowledge <input type="checkbox"/> Wholeness (“big picture” )→ smaller parts/pieces (Analysis) <input type="checkbox"/> Small particulars → wholeness (creating abreactions) <input type="checkbox"/> Elaboration of knowledge (linking to other contexts) <input type="checkbox"/> Problem learning process (divided to the stages, cyclic) <input type="checkbox"/> Creating ones own conclusion, own rules of reasoning <input type="checkbox"/> Heuristic reasoning (with scaffolds) <input type="checkbox"/> Creating/using analogies <input type="checkbox"/> Externalizing ones thoughts / ideas by writing, drawing etc. <input type="checkbox"/> Creating individual / shared meanings <input type="checkbox"/> Using of knowledge (applying knowledge) in various different situations <input type="checkbox"/> Etc

<p><b>Students activity:</b></p> <p><i>What do students do concretely?</i></p> <p><i>Is LO used by teacher/individual student/team of students etc.?</i></p>		
<p><b>The interface between LO and total learning process:</b></p> <p><i>How LO is linked to learning situation and other elements of it? How LO is glued (linked) to the total learning process.</i></p> <p><i>How LO guides / creates the interfaces?</i></p> <p><i>How learning process will continue after the use of LO?</i></p> <p><i>How phenomenon/matter will be processed after the use of LO?</i></p>	<p><b>Before LO:</b></p>	<p><b>After LO:</b></p>
<p><b>Other guidance / tutoring/ guidelines/helps:</b></p> <p><i>What kind of tutoring / guidance are needed for student when using LO? How? Who tutors?</i></p> <p><i>Who gives guidelines/assignment/learning task?</i></p>		

## 8. Learning tasks for teachers

You are able to study mobile learning methods by following the process described below. Process consists of seven learning objectives. These will function as a support of independent learning or community training.

### 1. Context & activation: What is mobile learning and is it possible?

Compare various definitions of the mobile learning or mLearning you'll find in the Internet. Try to find definitions via search engines (like Google, <http://www.google.com>) and consider, how to pedagogically define mobile learning?

Some references:

<http://en.wikipedia.org/wiki/M-learning>

<http://www.learningcircuits.org/glossary.html>

<http://www.mlearn.org.za/CD/papers/Laouris%20&%20Eteokleous.pdf>

## **2. Learning in the authentic environments with mobile tutoring (pedagogical analysis)**

What are the criteria for authentic learning activities? How they support learning?

## **3. What kind of needs I would have for mobile tutoring or learning with my own students?**

Consider various pedagogical aspects and possibilities of mobile learning. What is the added-value? How to get the environment involved in the student's learning processes? Try find out your own and your students pedagogical needs for mobile learning (at least 5 issues) and rate them from 1 to 10 (10 = very relevant, 1 = not so relevant).

## **4. Mobile learning environment and devices available / needed?**

What kind of mobile hand held devices are available? How they can be used as one component of the learning environments. Make yourself familiar with the classification of the different devices (see the document "[characteristics of mobile devices](#)") and a couple of cases listed below (copy address to your browser or go to [Reference material](#) for links):

-<http://activecampus.ucsd.edu/>

-<http://www.cs.ccu.edu.tw/~yschen/mypapers/JCAL-2003.pdf>

-<http://ctl.sri.com/publications/downloads/UnlockingWILDs.pdf>

-<http://www.mlearn.org.za/CD/papers/Mattila.pdf>

-<http://www.exploratorium.edu/guidebook/>

What kind of new ideas you got? What is the pedagogical added value of a mobile device in the cases? Write shortly your reaction

## **5. Pedagogical practices in mobile learning (link to 5 existing cases + teacher's own reaction/analysis)**

Search web and reference (<http://www.mlearn.org.za/papers-full.html>) for various pedagogical practices of mobile learning. Write a short description of 5 different pedagogical practices that have been implemented in a teaching and learning activity with students.

## **6. Analysis of the AEFIRIP pedagogical model**

Make yourself familiar with AEFIRIP -pedagogical model for mobile learning and tutoring. If you need more information on pedagogical models and principles, please use also other resources and references you find useful e.g. in the net.

### **7. How could I utilize mobile learning or mobile tutoring? Designing a mobile learning process with the AEFIRIP form.**

Design the learning process taking a place in authentic environment. Plan how do you tutor the students and how to utilize the pedagogical power of mobiles. Use the "Design tool for mobile learning setting" in order to facilitate your process.

## **9. Summary and Conclusions**

mLearning methods practices are influenced by the pedagogical, technical and content contexts. Educators have to use different means to foster learning in m environments (like web or mobile learning environments). Recent researches indicates that there is a shift looming to more active learning, problem solving, authentic learning, and virtual teaming or collaboration online. Virtual courses will move away from being text-centred and lecture-based and increasingly incorporate hands-on activities. New methods demands new competences.

Existing e-learning and m-learning products and solutions are mainly based on the content and they do not pay enough attention to learners' learning processes and to psychological mechanisms of human's learning. In addition, there is no educational technology designed to work especially as a teacher's intelligent tool. New pedagogically advanced software packages (e.g. cognitive learning tools, learning objects and mobile tutoring applications) are needed to support learners learning process and to facilitate individual learning based on the needs of contextualised learning.

There has to be also a paradigm change in teaching and learning culture, because it is not only technology which counts in making m-learning a success, but the pedagogical, technical and content delivery as well as the learning process and linked contextual elements. The further challenge is to build open learning objects (e.g. advance collaborative mobile learning tools) which could be even culturally adaptable and adaptive and serve as components, for example, in mobile learning games.

Formative research combining both, developing of hard infrastructures (new educational technology and softwares) and developing soft infrastructures (new pedagogical and learning methods) is most decidedly needed in order to create and implement successful educational technologies. The emphasis is on the educational technologies (like mobile learning with SMS-messages, use of Wikis, blogis, podcasting, vodcasting), that are easy to implement in various cultural settings and contextualised learning situations.

Formative research is used in order to develop applications that can be utilized in education (in learning and teaching). The focus is on the case studies with early phase prototypes. Laboratory studies may be needed in order to examine added value of educational technology concerning students' cognitive learning processes. During the development phase of new and innovative

educational technology research methods are based on the methods usable with case studies, but quantitative methods and experimental setting with larger sample will be used in order to validate the findings for generalization.

***We have very little experience on what the systematic organising of mobile teaching means for the teacher, degree programme and the entire organisation.***

What kind of changes and challenges do the constantly expanding web teaching and virtual qualifications bring into the way the teacher and the organisation work? What is a web teacher's job like and how is it to be organised in the education programme and institution?

Mobile makes different kind of learning possible, mobile learning methods have been described in many Internet sources and it seems that the future is in Asia, Southern-Africa. Using the methods depends on the teachers own motivation and the head of the organizations possibilities to support this new way to learn on-demand situations.

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Appendix 1

## TUTORING REQUEST FORM

The name of the course:

Your name:

Your e-mail:

What are the objectives / for what you need tutoring? What is the problem (please, describe very precisely)?:

How have you tried to solve the problem by yourself?:

Have you checked, if the answer could be found on the discussion forum or on the learning platform? Have you tried to find information from somewhere else? Where? Have you use other r references or books? Have you asked from other students?:

What would be your own idea on how the problem would be possible to solve? (Describe at least two options.)

On/for what you need tutoring / tutor's help? What kind of help form a tutor you would need?

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Send