Inventory of Mobile Learning Technology D1.6.1 Report

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Table of contents

Introduction - Executive summary

The first objective of the WP1.6 consists in doing:

- a large inventory of mobile technologies for learning: analysis of identified trends, both for technological choices and pedagogical usages;
- a selection of mobile technologies with big potential for informal-formal usages in Higher Education.

The current report D1.6.1 presents the results of the work developed during the first part of the WP1.6 project with these aims. In order to do the inventory of mobile technologies for learning, all the partners first brainstormed about the best way to build up an inventory approach, having in mind the competences about mobile learning and mobile technologies, that each partner could bring into the project. In the report, “mobile technologies” mean both hardware devices (such as tablets and smartphones) and mobile applications (such as blogs, ebooks, etc.).

The result of this brainstorming was the definition of four sources of information which could be used to build up the inventory:

1. a study of the international scientific literature (leader: FHNW);
2. a list of the existing mobile learning projects in the Switzerland HE landscape (leader: UniGE);
3. a list of mobile learning use cases (leader: UniFR);
4. a study of the learning activity e-reading with e-books (leader: FFHS).

By taking this decision, we adopted an approach combining different ideas:

- To do an inventory allying both theoretical and concrete points of view.
- To have both an horizontal and a vertical point of view. The three first information sources concern mostly the horizontal point of view. And the use of the fourth source is mainly representing the vertical one.

Then the first main section of the report D1.6.1 is presenting the inventory done this way. And It is structured in four parts, one for each of the information sources.

There is also a second main section in the present report. This section summarizes the work performed by the group of partners about the process to be applied for making a selection of mobile learning technologies having a big potential in Higher Education. The question had three aspects. First aspect: What criteria are defining the big, or low, potential of mobile learning technologies? Second aspect: What survey tool to be used during this process? Third aspect: What publics to be asked about what are the big potential mobile learning technologies and usages (from their point of view)?

Inventory of mobile technologies for learning

The project team chose to adopt both an horizontal and vertical investigation modes to build up the inventory. Because this project focuses on learning, a vertical approach means a deep analysis of a learning activity: we chose e-reading. Similarly, an horizontal approach means a large variety of notions, examples, projects, etc. dealing with mobile learning technology usages.

A systematic review of the literature about m.learning in HE

Goal & research question

- Research Question 1: ***How*** is mobile learning being used in the context of higher education, and ***what*** are associated effects in terms of educational outcomes (big potentials)?
- Addressing and differentiating the practices and underlying pedagogical and theoretical strategies of mobile learning in higher education; paying attention to the specifics of "mobile learning" compared to other forms of technology-enhanced learning using the conversational framework of Laurillard (see below).
- Supporting the decision-making of lecturers when it comes to the concrete use of mobile phones in Higher Education; Avoiding simplifying answers such as " Research outcomes in mobile learning studies are significantly positive" (Wu et al., 2012)

In the current D1.6.1 report, we aim at defining the adequate criteria grid of information to be extracted from the reading of the literature. We aim also at defining the list of publications which will be read in this perspective. In the future D1.6.2 report, we will then present the results obtained with the grid after reading of the selected publications.

Review papers & meta-studies identified

- (Wu et al., 2012) m-learning review
- (Hwang & Tsai, 2011) m-learning review
- (Frohberg et al., 2009) m-learning project review incl. theoretical underpinning
- (Hew, 2009) review of podcasts
- (Cobcroft, 2006) m-learning review in universities: not systematic
- (Alexander, 2004) Educause review: not systematic
- (Trifonova, 2003): not systematic

Introduction and summary of reviews

- The research purpose of most mobile learning studies focuses on effectiveness (Wu et al., 2012).

- Research outcomes in mobile learning studies are significantly positive (Wu et al., 2012);
- "It is found that, from 2001 to 2010, research samples in higher education were selected most (59)"(Hwang & Tsai, 2011)
- Mobile learning is most prevalent at higher education institutions, followed by elementary schools: "Mobile learning is most frequently used by higher education students (51.98%), followed by elementary school students (17.51%), adult learners (12.43%), secondary (post-secondary) school students (8.47%) and disabled students (0.56%)" (Wu et al., 2012)
- Subjects: It can be seen that most studies did not involve any learning domain, instead, they mainly focused on the investigation of motivations, perceptions and attitudes of students toward mobile and ubiquitous learning in the two time periods (13 and 36) followed by 'engineering (including computers)' (2 and 20), 'language and art' (3 and 21) and 'science' (5 and 25)
- Although a significant number of projects have ventured to incorporate the physical context into the learning experience, few projects include a socializing context. Tool support ranges from pure content delivery to content construction by the learners. Although few projects explicitly discuss the Mobile Learning control issues, one can find all approaches from pure teacher control to learner control. Despite the fact that mobile phones initially started as a communication device, communication and collaboration play a surprisingly small role in Mobile Learning projects (Frohberg et al., 2009).
- Podcast, as a specific form of mobile (and non-mobile learning): Students generally enjoy using podcast, and tend to listen to the podcasts at home using desktop computers, rather than on the move, commuting to school with a mobile device. A majority of the previous studies were descriptive, and were conducted in higher education and traditional course settings (Hew, 2009). Interpretation: In our reading this provides evidence that podcasting cannot be the core value of mobile learning in higher education.
- Definition: Changed over time, but does not include laptops, focus on context as an organising feature; however, context has not been incorporated in many of the projects (Frohberg et al., 2009).

In summary, on a meta-level, one can see the way forward to developing Mobile Learning in order to push it towards its greatest potential that is presently hidden. Mobile Learning can best provide support for learning in context. There, learners are asked to apply knowledge and not just consume it. Novices are often not ready to do so, thus Mobile Learning should better address more advanced learners first. Content delivery can often be provided by other means; therefore, Mobile Learning should provide instruments to provoke deep reflection, communication and cooperation (Frohberg et al., 2009).

First insights, gaps and own conclusions

- The number of mobile learners in many contexts increased sharply after 2009. (Wu et al., 2012) => after the study of Frohberg
- Most of the reviews do not investigate the role of underlying or explicit theoretical accounts (with the exception of Frohberg)

- There is no such thing like mobile learning. M-learning has many different nuances which of course have to be considered in reviews. For example, (Wu et al., 2012) report positive effects of many studies, without detailing what exactly has led to these results. As Frohberg rightly noted: "The huge variety of Mobile Learning is confusing and challenging to deal with. For instance, it is hard to point out the added value and benefit of Mobile Learning as a whole." (2009)
- Prior reviews have adopted a mechanistic view, not capturing the core of learning; and they underline that many studies are not associated with a domain but either describe the development of a system (Wu et al., 2012), or the perceptions of students towards whatever they understand by mobile learning (without having been confronted with it (Hwang & Tsai, 2011).

Methods, inclusion- exclusion criteria of publications

In order to define the publications to be analysed, we used:

- Source: Web of Knowledge
- Type 'articles' and SSCI
- language: English

Furthermore, the following inclusion- exclusion criteria were used:

- **Target group/learners**: students from higher education including classroom, excursions, museums, field visits linked to curricular goals: not primary, nursery school, high school or exclusive workplace learning
- **Use of technology for learning**: pads (e.g. ipad), tablets, phones, smartphones, PDAs, (lower levels of portability) and mp3 players and no cameras (different aspects of ownership). As reported in the publications, mobile apps and programs will be also presented.
- **Primary focus** on learning; NOT administration
- **Time**: 2000-2013
- **Activity-based**: reporting empirical data on what was done; students (including small pilot groups have used mobiles) NOT: exclusively theoretical papers or perceptions towards "m-learning" without having tested it; and not "designing a mobile system for learning (32%)" (Wu et al., 2012)
- **Suggested search**: Topic=("mobile learning" OR "m-learning") AND Topic=("higher education" OR university) Refined by: Document Types=(BOOK OR ARTICLE)
- Timespan=All years. Search language=Auto

As a result, we obtained about 160 publications which will be further analysed. One can find their references in the Annex 1.

The reading analysis grid

The work to come is the reading-analysis of these publications by using a grid based on the following components:

- **Technology**: phones, smartphones, pads, PDAs / minor focus on programs/apps
- **Activity/practices**: using the framework of Laurillard (2009): "Technology does not change what it takes to learn" as an organizing feature; or: Naismith et al. (2005a) suggest a classification with the underlying pedagogy of a Mobile Learning setting with six categories: (1) behaviourist, (2) constructivist, (3) situated, (4) collaborative, (5) informal and lifelong learning, and (6) support for learning and teaching.
- **Explicit theory:** referred to in the papers (ex: cognitive, multimedia psychology, etc.)
- **Outcomes**: knowledge effects (students know more, can do something better); motivation; increased level of activity, convenience; better control, orchestrate students; satisfaction/acceptance; measure of practicability/gains in efficiency; NOT studies exclusively focused on usability
- **Outcome measures**: self-perceived vs. "measured"
- **Geographical distribution**: States: Areas, South, North America, Europe, Asia Pacific
- **State of development**: High, middle and low income countries
- **Research methods**: surveys, experiments, observation, interview, focus group
- **Subjects:** (e.g. mathematics, physics) => find taxonomy

Overview of Swiss mobile learning Projects

(main redactor: UniGE)

In this chapter, we provide a list (non-exhaustive) of the projects initiated by the Swiss HEIs in the field of mLearning. The creation of this list is based on SIG-mLearning wiki as well as the AAA eLearning project overview provided by Switch.

We did not list here below m.learning projects that are more focused on information than learning (for example: m.unifr.ch).

Name	**Podcasting systems**
Institution	**UNIL, UNIGE, EPFL, Switch, ETH**
Website	http://podcast.unil.ch/, http://mediaserver.unige.ch/, ...
Target audience	**Teachers, students, external public**
Description	Lectures, conferences, interviews, etc.

Name	**Mobile learning for interpreter training**
Institution	**UNIGE**
Website	http://virtualinstitute.fti.unige.ch/home/index.php?module=clip&type=use&func=display&tid=4&pid=13&title=mobile-learning-for-interpreter-training
Target audience	**Teachers, students**
Description	Learning portal (LMS like) that works complementary with differen mobile devices (smartphones, tablets). This portal offers different courses geared to the needs of different learning communities. Each course includes different modules. Each module, in turn, is made up of different activities, each with a specific learning objective and specific resources. These resources can be text, images, audio, film, etc. It is important that different file types can be seen on any screen size to improve the accessibility of learning material anywhere, anytime.

Name	**eOSCE System, experimented by Faculty of Medicine**

Institution	**UNIBE**
Website	http://www.e-osce.ch/
Target audience	**Teachers, students**
Description	eOSCE is a simple and efficient system to enable practical medical examinations (especially OSCEs) to be carried out without resorting to paper checklists. Assessments using our system are quicker to evaluate and have less erroneous or missing data. Our research also shows that examiners prefer using our examination client over paper checklists and that students aren't graded differently than when using traditional assessment methods.

Name	**Bibup**
Institution	**UNIFR**
Website	http://nte.unifr.ch/BibUp
Target audience	**Students and scientists**
Description	BibUp allows you to easily create bibliographic references by scanning books barcodes and extracts of text. The references, including the OCRed text, can be viewed on a web page and collected using the Zotero plugin for Firefox.

Name	**Clickers**
Institution	**EPFL**
Website	http://craft.epfl.ch/page-44099-fr.html
Target audience	**Teachers, students**
Description	Tool (software + hardware) that allows lecturers to create questions to ask live during the lecture.

Name	**Mobile Learning / Research - The Mobler Cards App – Flash Card Learning for Any Topic**

Institution	**ETHZ**
Website	http://www.isn.ethz.ch/e-Education/M-Learning-Research
Target audience	**Students**
Description	Flash cards have long been used by students all over the world to practice for tests and exams. What the ISN Mobler Cards App does is adapt this worthy tool for a mobile world – i.e., it turns smartphones into personal training devices that are readily at hand, even for the shortes practice and learning sessions.

Name	**Votamatic**
Institution	**UNIGE**
Website	**http://votamatic.unige.ch**
Target audience	**Teachers, students**
Description	Webtool that allows lecturers to create questions to ask live during the lecture.

Name	**academe**
Institution	**UZH, ETH, UniL**
Website	**http://www.switch.ch/aaa/projects/project_ideas.html**
Target audience	**Students**
Description	**academe** web is a tool for the creation and administration of flashcards. A simple text editor not only permits the use of different character sets but also allows the integration of mathematical formula. The reproduction of images, audio and film is guaranteed. In addition to mobile learning, students can learn and test themselves online.

Name	**Movo**
Institution	**UNIBS**

Website	http://movo.ch
Target audience	**Teachers, students**
Description	**movo.ch** is a web application allowing live voting during an event. Participants need only a web enabled mobile device. Teachers prepare the voting by grouping questions to a set. Voting results are immediately displayed.

Name	**EduApp**
Institution	**ETH**
Website	http://www.eduapp.ethz.ch
Target audience	**Teachers, students**
Description	The ETH EduApp is the application for studying and teaching at the ETH **Students** ● display your personal timetable; ● find lecture halls; ● give feedback on courses; ● answer lecturers' clicker questions. **Teachers** ● create and activate clicker questions; ● present the results of clicker questions; ● collect feedback on your course via a backchannel.

Name	**Kulturwege**
Institution	**UZH**
Website	http://www.hist.uzh.ch/lehre/altegeschichte/naef/forschung/projektkulturwege.html

Target audience	**Historians**
Description	The goal of the project **Kulturwege** is to provide an audience interested in historical topics with information. So far, three iPhone apps have been produced, Frühchristliches Köln being the newest one. All apps use location based services to guide the user and show context dependent information. The knowledge aquired by Kulturwege leads to the CARD-A-CH project which uses a central database that can be used to dynamically generate apps on the fly.

Name	**Mobile Uni-App**
Institution	**UNISG**
Website	**http://ccmb.iwi.unisg.ch/projects/project-mobile-uni-app/**
Target audience	**University members**
Description	**Mobile Uni-App** is a Web-App that allows users to access a variety of useful information whilst on the move such as: ● Transportation (time schedule) ● Library access (based on EDS / EbscoHost and ALEPH) ● People directory (HTML parser) ● News/RSS feeds ● Event Calendar (HTML parser and .Net web service access) ● Campus Maps ● Emergency

Name	**MobiLER**
Institution	**FFHS**
Website	**ifel.ch**
Target audience	**Teachers, students**

Description	The internal research project “Mobile Learning Environment“ (MobiLER) c the Institute of Research in Distance-, Open- and eLearning (IFeL) aims a introducing multimedia-content enriched e-books in teaching at the Swiss Distance University of Applied Sciences (FFHS).

Name	**Konzeptstudie eBook und Tablet**
Institution	**ZFH**
Website	**http://www.switch.ch/de/aaa/projects/detail/ZFH.7**
Target audience	**Teachers**
Description	The aim of this project is to find software for e-book production that is easy to use for all lecturers, without any need of specific HTML or CSS knowledge. The lecturers involved in this project want to produce enhanced textbooks that are enriched with multimedia and interactive elements. Students should be able to annotate the e-books and inser handwritten mathematical and chemical formulas. The project evaluates different production software as well as the software to read enhanced e-books on tablets and notebooks.

Name	**invote**
Institution	**UNIDRESDEN, PH FHNW**
Website	**http://invote.de**
Target audience	**Teachers, students**
Description	Webtool that allows teachers to create questions to ask live during the lecture.

Name	**Course: "Tablets / iPads in teaching and learning scenarios"**
Institution	**PH FHNW**
Website	**http://www.digitallernen.ch/veranstaltungen/ipad-weiterbildungen/**

Target audience	**Teachers**
Description	For the third time, the Fachstelle Digitales Lehren und Lernen in de Hochschule will offer the blender learning tablet course about the use of tablets in higher education. During four face-to-face lectures and three online phases, the course “Tablets / iPads in teaching and learning scenarios” will allow course participants to make themselves familiar with the equipment and get to know the right apps. The course will take participants from the level of a novice user up to an experienced and successful user of tablets in higher education.

Name	**Smartpoll**
Institution	**ZHAW**
Website	**http://smartpoll.sml.zhaw.ch/**
Target audience	**Students**
Description	Exam preparation with Web-App and Android App, also offline.

Name	**Mobile Response**
Institution	**ZHAW**
Website	**http://response.sml.zhaw.ch/**
Target audience	Lecturers and students
Description	Mobile voting system; WebApp for all devices with Webkit-Browser.

Name	**GADEMAVO**
Institution	**HES-SO**
Website	**http://www.switch.ch/cms/uni/projects/aaa/projects/detail/HES-SO .4**
Target audience	**Teachers, students**
Description	**GADEMAVO** implements an online serious game template dedicated to problem solving and decision-making, adaptable to various learning

	contexts. It enables people without programming skills to generate a serious game related to their own professional and teaching context.

Name	**Moodle SMS Gateway**
Institution	**USI**
Website	**http://www.elearninglab.org/servizi/strumenti?lang=en**
Target audience	**Teachers and students**
Description	In this project an add-on module for the Moodle learning managemer system has been designed, implemented and tested. It makes it possible for teachers to send SMS to the mobile phones of their students.

Name	**the Botanical Garden application**
Institution	**UniFR**
Website	**http://elearning.unifr.ch/botanique/**
Target audience	Teachers and students and even “grand public”
Description	In this project, people who visits the botanical garden can use their smartphone and an iPhone application to guide and inform them about thematic paths about plants. There are paths about toxic plants, paths for biology students preparing exams, paths for children, etc. In the garden, plants, that are used in a thematic path, are identified with colored labels and a QR code. The different colours correspond to different paths. The iPhone application allows the visitor to access web pages of information about the thematic and its path in the garden. The QR code and the App allows also to access an online database of plants.

Collection of use cases and best practices

(Main redactor: UniFR team)

This collection[1] is assembled in the current report with the aims of:

- providing concrete ideas of learning activities done with technologies in mobile situations;
- identifying mobile technologies (devices and applications) which are used for mobile learning activities.

In order to organize the collection items, we were inspired by the ideas expressed by Sharples and his colleagues (2005): “A study by Vavoula (Vavoula, 2005) of everyday adult learning found that 51% of the reported learning episodes took place at home or in the learner’s own office at the workplace, i.e. at the learner’s usual environment. The rest occurred in the workplace outside the office (21%), outdoors (5%), in a friend’s house (2%), or at places of leisure (6%). Other locations reported (14%) included places of worship, the doctor’s surgery, cafes, hobby stores, and cars. Interestingly, only 1% of the self-reported learning occurred on transport, which suggests both that mobile learning is not necessarily associated with physical movement, and conversely that there may be opportunities to design new technology that supports learning during the growing amounts of time that people spend travelling.”

We then made the four following categories of uses cases in order to differentiate mobile learning experiences occurring when learners :

- are outside their usual learning environment for a long term;
- are outside their usual learning environment for a short term;
- experience mobile learning during transportation time;
- use a mobile device and/or application in their usual learning environment.

The reader could be surprised by the fourth category. Why to consider, in this m.learning inventory, moments where students are in their usual learning environment? Then not being mobile... But we thought about the fact that much learning is made in this condition, 51% according to Sharples and his colleagues. We thought about how mobile technologies can be brought into an usual learning environment and improve thus the learning conditions? We thought also about the “Bring your own device” idea (BYOD[2]) which was enhanced by Ballagas and his colleagues (2004). A simple example with an old technology: a personal printed pocket dictionary can be transported into a classroom and improves the learning conditions for a reading activity.

Students outside their usual learning environment for a long time

[1] We do not want, nor pretend, to be exhaustive.

[2] en français : AVEC = Apportez Votre Equipement personnel de Communication

UC01: Students exchange their mobile learning experience with a blog

- description: Tom decided to enrol for an Erasmus experience of 2 semesters. He moved from Scotland to Barcelona, to continue his BA in mathematics. When he thought about this mobile period of studies, he learned about the existence of the blog "mobi-blog.eu" and browsed through. He learned a lot about everyday life in Barcelona, but also a few tricks for his learning tasks. For example,
- technologies hardware: in this use case, HD device to write-read the blog is not important
- technology software: blog
- activity: discussion / exchange
- source:
    - http://mobi-blog.eu/ This source gave us the idea of a blog for mobile long term exchanges of experiences. However, we didn't find any experience around mobility or ubiquity resources for learning activities.

Students outside their usual learning environment for a short time

UC02: Students explore the collections of a museum according to a thematic

- description: In order to introduce a pedagogical control of learning activities performed by students during a visit in a museum (mobile situation), a teacher makes a thematic request into an application linked to the collections of the museum. On the basis of the request, the application makes a calculation of semantic proximity, and then suggest physical paths into the museum environment so that the students will see specific works (or objects, documents, etc.) displayed into the museum rooms and deeply linked with the thematics that the teacher wants. This thematic can be directly focused on learning objectives of the school or university cursus program. Another solution is the use of microblogging (e.g. tweeter) to create/explore paths in a museum.
- technologies hardware: tablet or smartphone,
- technologies software: semantic analysis system, microblogging (tweeter)
- activity: follow a thematic
- source:
    - use case described during the presentation of P.-Y. Gicquel "interactions dans environnement d'apprentissage ubiquitaire" (EIAH2013)
    - Charitonos, K., Blake, C., Scanlon, E., & Jones, A. (2012) analyze the use of a microblogging tool (Tweeter) to create and explore trails in a museum. They analyse an experience of 14-15 year old students of a history class during a museum visit. The students became a question and a path, and they had to *"carry out some activities and collect some evidence with the use of iPhones and Twitter (notes, pictures and posts) in order to address an inquiry (in total, four different inquiries) and eventually, post-visit, create a presentation"* (p. 807), they were supported by the teaching staff.

UC03: Students take and share multimedia notes on mobile devices during a scientific

geology excursion

- description: Tom and Julia are in the Jura mountains, looking at rocks. Two of their colleagues also look for the same thing at some distance, perhaps 200 meters far. They can not see the rest of the group members, about 20 students who came with a bus the day before in this section of Jura where a lot of fossils can be found. Indeed this is their task: to find traces of ammonites, belemnites and trilobites and to make photographs of them. They use their smartphones and the Multimedia note taker application which is sharing a blog article for a group and assembling the different photographs sent by the different students. This is done to make easier the assembling of such traces and the discussion, about the assembled collection, which is done after the afternoon spent on the ground. At 5 pm, they receive a message from the teacher to join him. They can see on a map exactly where he is and they meet him at this point. He wanted to show to the group a good example of a ground fold.
- technologies, hardware: smartphone or tablet
- technologies, software: blog, evernote
- activities: take multimedia notes. share mm notes, reuse notes
- source:
    - pre-developed with Jean-Pierre Berger (UniFR, Geology) for his students
    - similar: Kingston, Eastwood, Jones, Johnson, Marshall, & Hannah (2012)

UC04: Students stay aware of the learning activities of their class when they can't attend it (ill, at work, etc.)

- description: listening to audio files of a course (through a podcast) that the student couldn't attend. Even if not the same, it allows to stay aware of what was in the lecture, and allows to catch up. For students on campus, this can be seen as more time consuming and less effective, so the motivation in normal circumstances is sometimes low. But in exceptional situations (illness, accident, agenda collisions with job, etc.) this seems a good way to catch up or not fall behind. This activity is usually coupled with others (eg.: readings, exchanging with peers, review prior concepts, etc.).
- technologies hardware: smartphone, tablet, pc, mp3 player
- technologies software: podcast
- activity: awareness
- sources:
    - Finlay, Sheridan-Ross & Gorra (2008).
    - Self experience of some of the authors

UC05: Students following a learning path through a botanic garden with smartphone and qr-codes

- description: A trail is proposed in a botanic garden, qr-codes point to informations prepared and distributed via the web and can be seen on the smartphone/tablet while standing in front of the real plant.
- technologies hardware: smartphone or tablet,

- technologies software: qr-codes, online database
- activity: follow a thematic
- source:
    - Unifr NTE project Jardin Botanique
    - Battle, Kyd, Groom, Allen, Day, & Upson (2012) describe a similar case at the Cambridge University Botanic Garden, where trails focus on plant chemistry. They present virtual trails on the web corresponding to real trails in the garden.

UC15: Students use a mobile game to learn historical facts about a city

- Students are involved in a one day game. In teams, they explore parts of the city, receive informations about it and have to solve questions about the locations (e.g. historical facts) by documenting the response with multimedia productions. They are supported by a team at the institutions.
- Technology hardware: Smartphone, Tablet
- Technology software: video, images, audio; chat or SMS
- Activity: solve problems
- Source:
    - Akkerman, Admiraal and Huizenga (2009) analyze the use of a game that storyfies historical facts in the city of Amsterdam. In this game, students (second grade) are introduced to the game, have to split in teams. Each team is composed of two parts. In turns, one part goes in the city, the other gives backup with informations. Arriving in the selected area, they receive informations (video, images, texts) about how it was at the time the historical events took place, so to allow an immersion in history. They are given hints and have to document an aspect of the history of the city. Communicating with the other part helps getting informations and external point of view. The experience seems to be very positive and allows to switch from real actual life to imagining how it was in a determined point in history.

Students use mobile technologies in an usual learning environment

UC06: Students write-record multimedia notes and traces somewhere (outside the usual study place) with a smartphone and reuse them at their usual desk

- description: Students learn to use Evernote and take notes on mobile and non-mobile devices. Evernote has the advantage of being cross-platform, and can be used on PC and on handheld devices. As not all students can or want to use mobile device in their learning activity, the advantage of this tool is to allow the mobile use to be optional, and in a degree that can be decided by each student. It can so be a nice bridge to get a taste of mobile learning, without being forced to commit till the beginning. Note taking is also an independent study behaviour (the student is in charge of it), and applicable cross-disciplinary.

- technologies hardware: tablet or smartphone, desktop or portable PC
- technologies software: evernote,
- activity: take multimedia notes, reuse mm notes
- source:
    - Schepman, Rodway, Beattie and Lambert (2012) found that with appropriate training (5-15 students per 70-90 minutes session of tool presentation, demo of how to do different actions, usage ideas and small group follow-up session after first usages) and ongoing support, students use a note taking tool (Evernote) on computers and, if available, on mobile devices. They found that those who used mobile devices created 27% of their notes with these tools. Also, the students use more of the traditional location than the “mobile” location (where there is no PC). In conclusion, for note taking, students seem to prefer traditional computer usage, but use mobile devices as a complement. The major benefit reported from students is in the self-organisation activities.
    - Reading/writing and annotating texts on a tablet: MindMap around activity with iPad

UC07: Podcast support students in Chemistry Laboratory

- description: In chemistry didactics, the inquiry based laboratory gives the students more and more responsibility in the planning of laboratory experiments. To assure that the students have the informations and develop laboratory competences, video and podcasts can be used, in form of pre-laboratory lesson or assignment. Mobile technology allows to go further, and to allow students to access podcasts during the laboratory session, when it is most needed (right on time). The podcasts can contain procedures and concepts needed in a laboratory course.
- technologies hardware: PC, smartphone, tablet, mp3 or audio player
- technologies software: vidéo/audio podcast,
- activity: tutorials
- sources:
    - Powel and Mason (2013) analyzed the effectiveness of on demand chemistry podcasts for first semester laboratory course students using an inquiry-based curriculum, comparing it with a classical lecture before the laboratory activities. They find that podcasts are regularly used by students, and clarification interactions with tutors about the experiment is significatively lower when podcasts are available (more autonomy), the students have the same scores in tests and find the podcasts useful. In difficult lab experiment conditions, students having access to podcasts are evaluated as calmer by the teaching staff.
    - However, use of podcasts don’t suite all students (Kazlauskas and Robinson, 2012), it is so suggested that this m-learning activity remains optional. The right use of podcasts seems also to influence their efficiency, for example by taking notes while consulting them (McKinney, Dyck and Luber, 2009).

UC12: Students use microblogging (tweeter) to bring real live examples of concepts

seen in class

- Case: Students use their smartphones or tablets to collect and tweet examples (images, texts, web pages) of the main concepts seen in class. Other students can so see, share and comment/discuss their findings.
- Technology hardware: smartphone, tablet
- Technology software: tweeter
- Activity: Find examples to illustrate concepts
- Source:
    - Hsu and Ching (2012) explore the possibilities of using tweeter via mobile devices to let the students find real life examples in a fully online course on instructional message design held on moodle. Students had to tweet each week an example (of graphic design) with relevant content in their real live environment, and had to comment on findings of peer students. They find that the activity did not cost much time to the students, but had a positive influence on connecting learning with everyday life.

UC13: Students explore real life objects through augmented reality to connect reality with the learned concepts

- Students use their smartphone or tablets to look at objects, through the camera, connected to the concepts seen in class. An augmented reality layer associate the theoretical concepts to the real object observed. As an example, in mathematics, a real cylindric form can be augmented with the formulas to calculate its volume, surface, etc., or a statue (using GPS) can be augmented with historical or social facts.
- Technology hardware: smartphone or tablet (with camera)
- Technology software: augmented reality software (content editable)
- Activity: Illustrate concepts
- Source:
    - Cadavieco, Goulão & Costales (2012) describe a tool in development to create augmented reality layers over real images, using open source apps.

UC16 : Utilisation de smartphone en classe (Applications pratiques en classe)

- "L'usage principal des smartphones dans le quotidien scolaire reste très banal: calculer, traduire un mot anglais, inscrire des rendez-vous, répondre à une question à l'aide de Wikipedia, consulter une vidéo contenant la démonstration de la résolution d'un devoir de géométrie ou la manière de présenter à un groupe une expérience de chimie, photographier une solution du cahier de calcul et la transmettre grâce à "bump" à un autre smartphone.... Les projets d'utilisation des mobiles permettent au mobile d'acquérir une nouvelle fonction dans l'école. En effet, d'agent perturbateur, il passe au rôle d'instrument du savoir et d'apprentissage. Il est alors également très important de fixer des règles claires et de convenir de certains principes."
- Technology : smartphone
- Activity : Use as a computer
- Source : L'enfant et les écrans, L'académie des sciences

http://www.academie-sciences.fr/activite/rapport/avis0113.pdf

Students make learning activities during transportation/away times

UC8: Students receive SMS with main contents of classes/lessons

- description: Students receive SMS with structured contents seen in a lesson. This reinforces the storage of this information in memory (by recalling it some times after first exposure during the lesson), and allows to store the information on a cellphone (always available to quickly review or check the correctness of a memorized content). The diffusion of this sort of SMS is made twice a day thanks to a time planification tool. The reception of such SMS with this agenda allows a good repetition of the main concepts seen during class. The SMS can also contain questions to allow activation of the acquired knowledge or to prepare for the next class.
- technologies hardware: smartphone, cellphone
- technologies software: asynchrone SMS or MMS
- activity: review / memorize content
- sources:
    - Chuand and Tsao (2013) analyzed the efficiency of sending SMS about medications to nurse students after that these were seen in class and found that the SMS had a benefic impact on learning.
    - Alipour, Moini, Jafari-Adli, Gharaie, N and Mansouri, K. (2012) analyze a similar setting, where informations about breast cancer are sent via SMS to students in residency hospital. Compared to students receiving a booklet, the student receiving SMS have better score and are more interested.

UC09: Students peer-support each other with mobile chat and messaging

- description: Students use mobile messaging tools (text or multimedia), among other communication tools, to help and collaborate among each other, especially through chat.
- technologies hardware: smartphone, tablet, laptop
- technologies software: synchrone messaging tools
- activity: peer support
- source: see Timmis (2012)

UC10: Students self-evaluate their learning via quiz provided by teachers

- description: students access a series of questions or quizzes, edited by the teaching staff, about the themes seen in class, via a website with a mobile layout/template (e.g. moodle 2) or a ad-hoc system (with a web app).
- technologies hardware: smartphone, tablet, laptop
- technologies software: quizz, (m)website
- activity: self-evaluation
- source:
    - De Marcos, Barchino, Jiménez, Martiez, Gutièrrez and Otón (2010) analyzed

such a scenario, where students (college and HE) were asked to use such a system of self-evaluation questions during a course, and found an improvement in achievements.
    - Munoz-Organero, Munoz-Merino, & Delgado Kloos (2012) observed a similar case, where students in a Computer Engineering class received learning pills composed of questions about the just seen contents in class or laboratory sessions.

UC11: Students use e-textbook in their course

- Textbooks (or syllabus) are a largely used in teaching. Recently, the possibility of transforming these in electronic e-books (e-pub) allow students that want it, to access the textbooks from a portable device.
- Technology hardware: tablet, laptop
- Technology software: e-book reader
- Activity: reading/annotating and review/memorize content
- Source:
    - Rockinson- Szapkiw., Courduff,, Carter, and Bennett (2013) analyzed the scores, perceived learning and learning habits of students using either a traditional textbook or a reflowable e-book (content adapts to size of screen and device) for the same course. They found that the students that choose e-texts hat a higher perceived affective and psychomotor learning. and no difference was found on cognitive learning and grades. The use of the text is also quite similar. This better attitude towards reading textbooks is a good argument to try to provide the students that want it, to obtain the course texts in reflowable e-book format. An interesting finding is also that both groups tended in majority to take notes about their readings on paper.
    - Evaluation of ebook device for education; http://www.ifets.info/journals/6_4/3.pdf
    - see also: Part “E-reading and e-books” in this report.

UC11B : Usage pédagogique du format ePub

- Le format ePUB peut être exploité pour les activités suivantes : lire la presse en ligne, lire des livres audio et interactifs, lire des ouvrages numériques.
- Technology : ePub, eBook
- Activity : reading
- **source : http://www.cndp.fr/crdp-dijon/Creer-vos-eBooks-ou-livres.html#outil_sommaire_5**

UC11C : Social learning scenario: providing instant, informal access to ebooks

- “As with formal learning, ebooks can be used within an informal learning context. The role that ebooks can fulfil is one of immediacy, in providing near-instant access to texts within an informal environment. This may allow for more spontaneous informal learning, for example, within ad hoc discussions after formal lectures.”JISC (2012, p.27)

- Technology : eBook
- Activity : informal learning
- source :
    - “As with formal learning, ebooks can be used within an informal learning context. The role that ebooks can fulfil is one of immediacy, in providing near-instant access to texts within an informal environment. This may allow for more spontaneous informal learning, for example, within ad hoc discussions after formal lectures.”JISC (2012, p.27) http://blog.observatory.jisc.ac.uk/techwatch-reports/ebooks-in-education/

UC14: Student access data of the LMS via mobile devices

- Students can access the Learning Management System pages of their courses via a mobile device, allowing them an access when they are outside the institution and home.
- Technology hardware: smartphone, tablet
- Technology software: LMS with mobile compatibility
- Activity: review/memorize content, awareness
- Source:
    - Kinash, Brand, and Mathew (2012) looked at the use of a mobile access to the LMS Blackboard (Blackboard Mobile Learn) by students. They found that students have no preference about mobile or standard access to the course, no perceived difference in learning and a little more motivation. Some students were very motivated in using the mobile version of the LMS, other not. So it is a good alternative, but should not be mandatory.

Other ideas of use cases

UC18: Learning with eBook (in the classroom and outside the classroom)

- description: Peter is studying industrial engineering at the Swiss Distance University of Applied Sciences (FFHS). There, in the course Technology Management, all students received their course material in form of an eBook. Students can work on this eBook either using the newly developed FFHS app running on mobile devices or in a browser-based application on their computers. For their next offline class lecture, students have to study thoroughly the first part of the eBook. Peter reads the text using his tablet. Using one of the functions of the FFHS app, he highlights important information. Moreover, in some passages, Peter makes a written or records a spoken annotation. In the text of the eBook, there is a quite complicated process model causing Peter a headache. So, he adds there a question in his eBook that is linked to a forum on the FFHS Moodle learning platform. Other students can see Peter’s question and post a reply to him. When ever having an internet connection, the FFHS app automatically updates the forum conversation, so Peter gets the answers to his question right in his eBook.
  Since this process model was very challenging for many students, in the upcoming offline lecture, Professor Karl-Heinz Hagenbruch gives the class some more

explanations. For this purpose, he shows the process model on the whiteboard. While listening to his professor, Peter makes some annotations at the right place in his eBook using a tablet stylus. For some of the most difficult parts he records Professor Hagenbruch's spoken explanations with help of the FFHS app. Finally, the app also helps Peter to take a picture of the graphical model elaborated on the whiteboard. Both the resulting audio note and the picture can be embedded in the eBook text where they belong to. Compared to his colleague Kaspar who always works with a laptop, Peter deals much more intuitive with the eBook using a tablet with touchscreen and stylus, and can use the practical functions of the tablet device like taking pictures or audio recording.

- technologies hardware: tablet (smartphone, laptop, computers)
- technologies software: eBook app (browser-based application)
- activity: reading, writing, highlighting, annotating, recording, taking picture, posting questions (forum)
- source: Swiss Distance University of Applied Sciences (FFHS)

Other ideas

- reading book on ebook (UC11)
    - Students access to different resources like ePubs and PDFs
    - Great evaluation of ebook device for education (http://www.ifets.info/journals/6_4/3.pdf)
- reading/writing and annotating texts on a tablet (UC06)
    - MindMap around activity with iPad
- writing a short text
    - Students use their mobile device to take note about everything, it usually to keep note and information they don't want to forget.
- discussing on a blog article
- looking for information over the Internet
    - Students use Internet through mobile device to get complementary information about some reflexion they made or questions they have.
- looking at videos
- revising with a card system
- other frequent tasks when mobile (more organization than learning):
    - to find a place
    - to find somebody
- sometimes it is good also to make a break and to profit from a small journey to empty our mind and to take a breath
    - tools: none, game, music, smalltalks with friends, etc.

List of technologies and learning activities in the use cases

- Applications
    - agenda, asynchrone messaging tools (SMS or MMS, email, etc.), blog, ebook,

evernote, online database, podcast, qr-codes, semantic analysis system, synchrone messaging tools (chat).

- Hardware devices
    - audio player, desktop PC, portable PC, smartphone, tablet, video player
- Learning activities
    - analysis (multi criteria), annotating, awareness, discuss / exchange, Find examples, highlighting, illustrate concepts, follow a thematic, peer support, reading, reuse multimedia notes, review / memorize contents, self evaluate, share multimedia notes, solve problems, take multimedia notes, tutorials

E-reading and e-books

(Main redactor: FFHS team)

Literature about e-reading and e-books

Since some years there is a growing awareness within research, education and publishing houses that E-Books are used more and more for reading, especially in the context of higher education. This goes more or less together with the development of devices such as E-Book-Readers or Tablet computers equipped with high resolution displays. In the background of this development is the idea that E-Books offer greater flexibility and also a better accessibility than print-based texts (Huang, Liang, Su, & Chen, 2012). Moreover, sometimes these E-Books have a bigger appeal as they are multimedia enriched and support a high potential for personalised learning. At the same time it must be stated that it is still necessary to deeper investigate how one can use E-Books as learning tools before adopting them fully as substitute for printed textbooks (Woody, Daniel, & Baker, 2010).

Nevertheless, there are already relevant studies on the integration of E-Books in an academic learning. Berg, Hoffmann and Dawson (2010) investigated how undergraduate students used E-Books compared to printed books. The results showed that students did not intuitively know how to navigate and use E-Books in an effective way. Similar results came up in another study done by Siegenthalter, Bochud, Wurtz, Schmid and Bergamin (2012). Results showed that better navigation ratings of students correlate with touch screen technology comparing E-Reading-Devices provided with and without such touch screen technology. Overall results suggest that touch screens allow an easier and more intuitive interaction with the device and with the content. Woody et al. (2010) showed in their investigation that despite the possibility to access easily supplemental learning contents by navigating links in the E-Books, students were more likely to do so with printed books. Similar findings were found also in a study of Berg et al. (2010). Therefore, we suggest within such evaluations to identify the effectivity of the different usage scenarios and to consider students experiences and attitudes with printed materials. In other studies it is established that most of the current E-Books have been designed to resemble printed books (Berg et al., 2010; Huang et al., 2012). This somehow slightly limited perspective is probably not optimal to prove and evaluate all vantage points and the potential of establishing E-Books within education. In this context other researchers (eg. Woody et al., 2010) suggest that the design of an E-Book needs to differ from that of a printed book, in order to offer a more constructive user experience and learning process. The issues of functionality and usability seems to be a crucial element for the adoption of E-Books in academic learning. However, in the relevant work it is also stressed that both teachers and students believe that current E-Books are not as readily used as printed books (Bierman, Ortega, & Rupp-Serrano, 2010, Huang et al., 2012). In other investigations, portability and appropriate functions are named as key components for the acceptance and the use of E-Books (Dewan, 2011; Lam, Lam, Lam, & Mc Naught, 2009; Pattuelli, & Rabin, 2010). This last crucial finding drives us to advocate for analysing E-Books in the context of mobile learning.

An valuable analytic framework for mobile learning is the FRAME Model (Koole, 2009). In the following section we bring out and review to most important points of this framework. The purpose of the FRAME Model **(F**ramework for **R**ational **A**nalysis of **M**obile **E**ducation; see figure x) serves a heuristic allowing to analyze given phenomena of mobile learning in a broader didactical context of HCI.

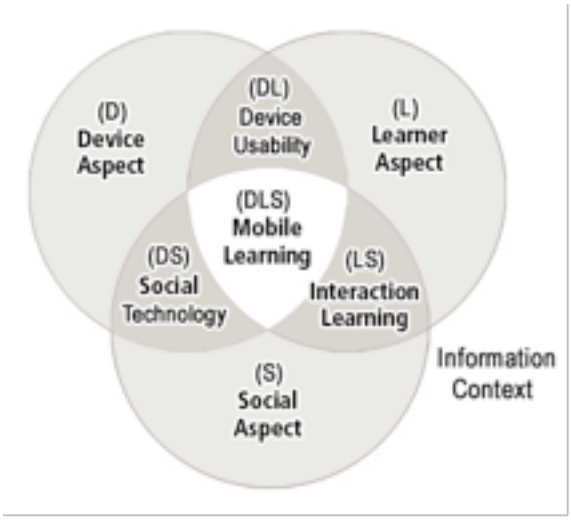

Figure x: Components of the FRAME-Model (Koole, 2009, p. 27)

The three circles represent the interplay of characteristics of the device(s), the learner and social aspects of learning. The Device-Aspect takes into consideration the physical and technological properties of the device(s) e.g. input/output components, processor capacity, storage or screen properties, etc. If other technologies are used, other characteristics come into play. The Learner-Aspects takes individual learning characteristics into consideration like pre-knowledge, knowledge in different contexts, learning experiences, learning strategies, transfer skills, memory, emotions, beliefs, etc. The Social-Aspect focuses on activities like interaction, communication, cooperation, social, cultural beliefs and values in the learning process of the involved participants (learner, teacher, peers) and technology. In our view, it is important to take into account all the involved stakeholders in the learning process, in the sense of a community that learns in a flexible way together. From this we follow that, even if there are individual reading and learning phases, in the collaborative mobile learning aspects (e.g. reading and public annotating of a text) the learning responsibility shifts from individual to collective cognitive responsibility (Laouris & Eteokleaous, 2005). This means that the learner accepts and fosters collaborative learning attitudes.

At the intersection of the main aspects resp. at their overlap emerge interesting behavioural and functional variables. The interface between Device and Learner is called Device Usability Intersection. Hereby usability elements come into the focus. This mean

elements like portability, information availability, comfort/ergonomics and satisfaction. In the Social Technology Intersection (interface between Device and Social aspects) one looks at the interaction of people acting as a group or community via technology respectively Devices. Therefore networking, connectivity and collaborative functions and tools are hereby in the foreground. The third interface is named as Interaction Learning intersection. Here collective influences to individuals and oppositions come into the viewpoint. Therefore interaction types, situated cognition and learning communities are regarded. Considering that the different elements will deliver a reasonable picture of mobile learning processes (centre of the model) last but not least relevant elements as information access and selection, mediation and knowledge navigation, construction should also be considered. Once again, we would like to mention that the model is not a theory for mobile learning but can be used as a heuristic tool to understand mobile learning processes and as it already gives a good base also for analysing e-Reading and E-Books in the learning context supported by mobile technologies. Another very important point is that the model takes into account informal and formal processes.

Taking in account the complex heuristic structure of the E-Reading process with E-Books we propose, without claiming total completeness three functional areas of interactive E-Books to exploit the learning potential within E-Reading processes:

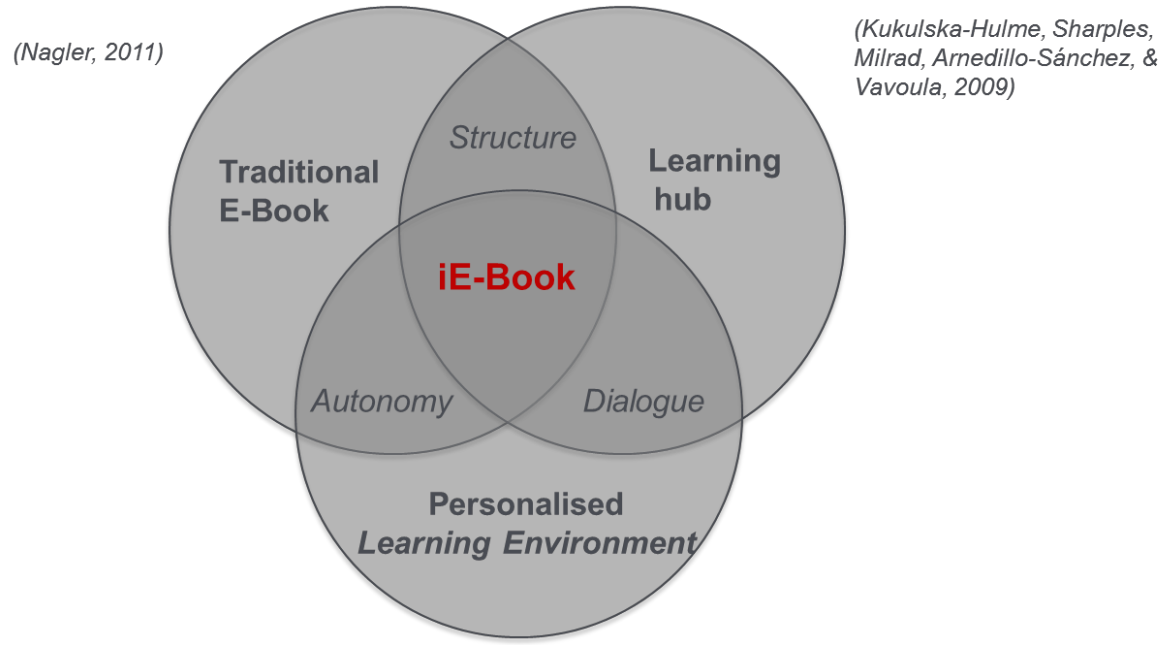

Figure x: Functional areas of interactive E-Books

Traditional E-Book

The generally accepted definition for e-books is the one corresponding to the digitisation of printed books of libraries. This includes not only digitised releases of real books but also the online book stock of a library; e-journals cover the range of online newspapers and magazines. So this definition includes all readable or downloadable documents (books, other publications …) offered by a library portal or similar institutions. These documents are of PDF format by default. Possibilities for interaction are not usual for such e-books. E-Books in that sense are well-known by students of today. One big advantage is its easy and quick availability. Additionally libraries offer very often a good search system in that context. (Nagler, 2011)

Learning Hub

Fixed technology environments like desktop PCs play already an important role in the boundary crossing between different learning contexts. Actually tele-enhanced learning mostly takes place in a multiple device environment. Thus the role of mobile devices and technologies in fact are very important for situated learning in authentic context. Learning activities overall are not and should not be limited to a mobile device but should take place on multiple devices that provide an adequate implementation of the learning experience (Kukulska-Hulme, Sharples, Milrad, Arnedillo-Sánchez, & Vavoula, 2009). If within a learning scenario the learner uses for example a PC with a Windows operating system, his tablet that operates on iOS and his smartphone that has a Android system he has to adapt to the programs and applications every time he changes the device. He has to make sure that he can transfer the documents and the notes he made with the specific programs and applications onto the other devices. In order to not burden the user with multiple usability and usage problems it is suggested that a learning hub should be implemented. This means the learning hub consists in big parts of a stable main learning management system of the institution. It should use for each device the same design and functions (recognition value) in order to guarantee effective learning processes. The learning hub supports the learning activities of the students in the context of the affordances the learning organisation (e.g. solving learning tasks while and after reading relevant literature).

Personal Learning Environment

Finally, the Personal Learning Environment (Chen, Millard, & Wills, 2008), which describes software systems that users choose and tailor to fit their own learning needs and preferences e.g. by managing their time, helping to organise learning goals and activities as well as gathering and archiving reference material.

On the basis of Bloom's taxonomy of learning objectives (Bloom, 1956) and it's revision by Anderson and Krathwohl (Anderson & Krathwohl, 2001), we defined twelve didactic functions, which must be supported in order to optimally support the student's E-Reading activities while learning.

Taxonomy Knowledge dimensions	Components Trans. Distance	Functions in E-Book
Metacognitive K.	Autonomy	1) Learning goals before each chapter/ section 2) Chronological learning strategy
Factual & Conceptual K.	Structure	3) Chapters as structure in Moodle 4) Information about the text: mandatory, relevant for exam, supplementary 5) Annotation 6) Highlighting
Procedural K	Structure	7) Multimedia enrichments
Conceptual & metacognitive K.	Dialogue & Autonomy	8) Notes for chapter synopsis Procedural 9) Tests with feedback 10) Assignments 11) Transfer assignments
Conceptual & Procedural K.	Dialogue	12) Communication

Figure x: didactical functions of an iE-Book within the Anderson & Krathwohl Taxonomy

The technical solution of the iE-Book has to support the most widely used devices like PCs, tablet computers, smartphones, and systems like Windows, Android, MAC, iOS, Linux which will most likely be deployed by the students to access the desired learning materials and activities.

Internal Research Project: Mobile Learning Environment (MobiLER)

The internal research project “Mobile Learning Environment“ (MobiLER) of the Institute of Research in Distance-, Open- and eLearning (IFeL) aims at introducing multimedia-content enriched e-books in teaching at the Swiss Distance University of Applied Sciences (FFHS).

The access to the learning materials and the didactical functions as described in the figure before were provided with an Application for tablet computers, the learning-management system Moodle and a PDF based solution for desktop PC’s. The enriched e-books and the didactical framework were tested and will be evaluated at the end of the spring semester 2013. The follow-up project will use a Moodle Application developed by the eLab in Ticino and will be deployed on tablet computers and smartphones. The application will distribute all the materials from the Moodle courses to the mobile devices and will store them offline, and the enriched E-Books will be provided as SCORM packages. Using a SCORM package as a format for distributing the materials we offer the same user experience on the PCs as well as on the mobile

devices. It also opens us the gate to further develop the solution by adding other important features of a SCORM package.

Potential of e-books for mobile learning

As already mentioned the different research and projects show the potential of E-Books in the context mobile learning. This can be summarised in 4 points:

- portability,
- access,
- enrichment,
- flexibility.

It has been shown that in order to exploit this in a learning context a new learning culture and relevant evaluation methods are necessary. The usage, especially the efficiency and effectivity, in learning process depends on the interplay of a lot of different elements, as shown with the FRAME Model. To establish relevant environments still application oriented research is needed e.g. the efficiency of the three functional areas of interactive E-Books (see figure x). Questions as the following stand in the foreground: will the developed solutions find a broad acceptance in the student learning habits?; as generations pass, will there be a different reading and thus learning culture that allows learners to fully rely on digital materials?; as the penetration of mobile devices grows in the Swiss market, will there be a need of new scenarios and skills to manage the usage of multiple devices, technologies and learning environments?

Without a doubt there is a great need in developing new strategies in the teacher/learner scenarios in order to fully accept the new technologies into the higher education landscape.

Encompassing context variables that come into play should also be systematically evaluated. One of the crucial points hereby are the topic of copyrights and the availability of the e-Books. While research literature is widely available, publishers are just beginning to give access to digital forms of classic books. Just the concept of making them available and allowing them to be enriched needs new business and licensing model by publishing houses as well as universities. The above mentioned project at the Swiss Distance University of Applied Sciences showed that about 25% of the books used in the curriculums are available as E-Books with a relevant licensing model.

The University is considering a new literature distribution model that works on the basis of so called campus licenses, similar to those used with software products.

If such a solution can be implemented one comes quickly to the idea of a virtual library. This could be achieved analogous to the already existing virtual libraries with research papers and materials.

It remains to be determined who will offer this interface, the publishing houses or rather the

universities as they have an interest to maybe distribute them through their learning management platforms.

Who will determine the extent of the enrichments? It is of course desirable that the authors and the publishing houses start the enrichment process as they develop the E-Books, but still offer the universities the possibility of adding and customizing the product.

Mobile technologies with big potential in HE

(main redactor: UniFR)

To select the “big potential” mobile learning technologies from our inventory of technologies, we had to define the “big potential” criteria.

First reflexion about selection criteria and process

We first thought to differences such as: frequency of use, number of usages, number of users, added value in learning, multiple places, etc. We then considered a model: “Bates and Poole (2003) have proposed a model for the effective use of technology for teaching in higher education that suggests eight criteria to be used in determining choice of technology.“ (Traxler & Kukulska-Hulme, 2005):

- “the appropriateness of the technology for students
- ease of use and reliability
- costs
- teaching and learning approaches
- interactivity
- organizational issues
- novelty, as a choice not to use existing technology
- speed, i.e. how quickly materials can be developed “

Then people (partners, students, teachers, etc.) could evaluate the different technologies assembled in our inventory by:

- placing their favorite technology usages in the second column of the table below;
- and by writing the reasons of the choice in the third column (by using the list of criteria from Bates and Pole.

Technologies	**Usage (examples)**	**Evaluation by the authors**
Smartphone	reading	frequency of use,
Tablet	annotating	number of users
Laptop		
e-book / e-pub		
etc.		

Table N - Technologies, Usage and Evaluation

But this process would be very subjective and difficult to analyse.

Criteria to select high potential mobile learning technologies

Then we found a more objective list of criteria for our inventory, in a work done by Kukulska-Hulme & Traxler (2005) who reveal, from an analysis of 12 international case studies, three main reasons for using mobile technologies in teaching and learning : to improvement of access, exploration of changes in teaching and learning, and alignment with institutional aims. We adopted and adapted this global structure, and the underlying more precise items, to constitute a part of our selection tool :

1. Access, Edit and Share :
    a. Improving access to assessment, learning materials and learning resources
    b. Improving sharing of assessment, learning materials and learning resources
    c. Improving editing of assessment, learning materials and learning resources
    d. Increasing flexibility of learning for students
    e. Compliance with special educational needs and disability legislation
2. Changes in teaching and learning (examples):
    a. Collaborative learning (exploring the potential for)
    b. Students' appreciation of their own learning process
    c. Consolidation of learning
    d. Guiding students to see a subject differently
    e. Identifying learners' needs for just-in-time knowledge
    f. Time and task management
    g. Reducing cultural and communication barriers between staff and students
    h. Altering attitudes, patterns of study, and communication activity among students
3. Alignment with institutional or business aims (examples):
    a. Making wireless, mobile, interactive learning available to all students without incurring the expense of costly hardware
    b. Delivering communications, information and training to large numbers of people regardless of their location
    c. Blending mobile technologies into e-learning infrastructures to improve interactivity and connectivity for the learner
    d. Exploiting the existing proliferation of mobile phone services and their many users.

On this basis, we think about a questionnaire with three parts, one for each reason of the Kukulska-Hulme & Traxler study:

1. Please evaluate how access, editing and/or sharing is favoured, increased, improved in each of the mobile learning technology-usages. Please use figures (0 = no increase, …, 5 = very much increase) for your evaluation.
2. Please evaluate how changes in teaching and learning are favoured, increased, improved in each of the mobile learning technology-usages. Please use figures (0 = no increase, …, 5 = very much increase) for your evaluation.
3. Please evaluate how alignment with institutional aims is favoured, increased, improved in each of the mobile learning technology-usages. Please use figures (0 = no increase, …,

5 = very much increase) for your evaluation.

In each of the three parts a series of mobile learning technology-usages will be proposed and the people who will answer the questionnaire will evaluate each of the item of these series. We have built these series with the following reasoning.

First, this has no meaning to evaluate a technology while not taking into account the learning activity performed with that technology. Similarly, it is not possible to evaluate a learning activity while not taking into account the technology used to perform this learning activity. Second, we could use directly the collected use cases and the Swiss projects (presented before in the report). The advantage would be that these examples of mobile learning technology-usages explain about a learning context. The context is indeed very important for somebody to proceed with the selection we want to make. On the contrary, the use cases and projects are perhaps too much specific. It means that somebody who will evaluate a geological scientific excursion activity performed with a smartphone used as a multimedia note taker will perhaps be largely influenced by the scientific domain.

Then, we decided to consider all the couples (mobile learning activity, mobile technologies[3]), which we could extract from our collected use cases and Swiss projects, and to ask people to evaluate all these couples with respect to the three reasons of the Kukulska-Hulme & Traxler study. This work of extraction gives, when applied to the uses cases, the following list:

1. Take, share and reuse multimedia notes with Blog/ microblog (tweeter) (UC 3, UC 18)
2. Take, share and reuse multimedia notes with multimedia production tools (e.g. Evernote, etc.) (UC 3 + 6, UC 18)
3. Reading / annotating with e-books and e-text (UC 11 + 17, UC 18 + part e-reading of this report)
4. Self evaluate with mobile websites and mobile LMSs (UC 10)
5. Peer support with asynchrone (SMS, MMS,…) and synchrone (chat) messaging tools (UC 9, UC 18)
6. Review/memorize content with asynchrone messaging tools (SMS, MMS,…) (UC 8)
7. Keep aware (of what happens in courses/curriculum/...) with podcast readers (UC 4)
8. Keep aware (of what happens in courses/curriculum/...) with asynchrone messaging tools (SMS, MMS,…) (UC 14)
9. Access/consult tutorials with podcast readers (UC07)
10. Follow a thematic, a thematic path, a suite of informations with Blog/ microblog (tweeter) (UC02)
11. Follow a thematic, a thematic path, a suite of informations with qr-codes and online-databases (UC05)
12. Discuss / exchange with Blog/ microblog (tweeter) (UC 1, UC 18)
13. Find examples / illustrate concepts with Blog/ microblog (tweeter) (UC 12)

[3] All activities are meant in a mobile learning setting (on smartphone, tablet or other hardware). This implies that here “technology” means technology software (mobile application).

14. Find examples / illustrate concepts with Augmented reality tools (UC 13)
15. Solve problems with multimedia production tools (e.g. Evernote, etc.) (UC 15 + 16)
16. Solve problems with asynchrone (SMS, MMS,…) and synchrone (chat) messaging tools (UC 15)

Our questionnaire is then a double entry table where:

- each raw is for a question 1a to 3d (from the adapted study of Kukulska-Hulme & Traxler)
- each column is for a couple (mobile learning activity, mobile technologies)
- each cell contains a figure (0 to 5) which is the evaluation from a person

During the Autumn, we will submit our questionnaire to:

- all the partners of the WP1.6 project,
- all the member of the SIG mobility,
- students and teachers from diverse HEIs.

The results compilation will indicate us high potential mobile learning technology usages.

Conclusions and perspectives

With the work done yet (Phase 1), the WP1.6 partners obtained:

- an inventory
    - of possibilities of mobile learning technologies-usages (use cases)
    - and of mobile learning actions performed in Switzerland in HE (projects)
- two tools
    - a questionnaire to make a selection of high potential mobile technologies-usages
    - a reading-analysis grid and a reading list of scientific publications about mobile technologies-usages

These results of the inventory Phase will allow the partners to determine high potential mobile technologies-usages and to analyze them further. For example, the collected use cases and Swiss projects allowed the creation of the questionnaire and give concrete ideas that people answering the questionnaire can use in order to precise their understanding of mobile learning while answering.

The next future previewed actions to be performed are Phases 2 and 3.

Phase 2 (=> until D1.6.2)

- diffusion of-answer to the questionnaire (=> data for definition of high potential mobile technologies-usages)
    - WP1.6 partners answer the questionnaire (=> data1 for definition)
    - mobile SIG members answer the questionnaire (=> data2 for definition)
    - students answer the questionnaire (=> data3 for definition)
    - teachers answer the questionnaire (=> data4 for definition)
- analysis of data from questionnaire answers => definition of high potential mobile technologies-usages
- analysis of literature (=> documentary elements)
    - general elements about mobile learning technologies-usages
    - specific elements about high potential mobile learning technologies-usages

Phase 3 (=> until end of project)

- tests of high potential mobile learning technologies-usages
- definition of the main conclusions of the study

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Annexes

Annex 1. List of publications identified for the literature study

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Annex 2. Learning activities x technologies x applications x Usecases

Software / Activity	Blog/ microblog (tweeter)	Multimedia production (e.g. Evernote, etc.)	podcast	asynchrone messaging tools (SMS or MMS, email, etc.)	synchrone messaging tools (chat)
take multimedia notes	UC03	UC03 UC06			
share mm notes	UC03	UC03			
reuse notes	UC03	UC03 UC06			
reading / annotating					
self evaluate					
peer support				UC09	UC09
review/memorize content				UC08	
awareness			UC04		
tutorials			UC07		
follow a thematic	UC02				
discuss / exchange	UC01				
Find examples / illustrate concepts	UC12				
solve problems		UC15 UC16		UC15	UC15

Table: learning activities x technologies

Software / Activity	e-book / e-text	m.website and mLMS	online database	qr-codes	Semantic analysis system	Augmented reality
take multimedia notes	UC18					
share mm notes						
reuse notes	UC18					
reading / annotating	UC11 (cf. also chapter e-reading in this report) UC17, UC18					
self evaluate		UC10				
peer support	UC18					
review/memorize content	UC11	UC14				

awareness		UC14				
tutorials						
follow a thematic			UC05	UC05	UC02	
discuss / exchange						
Find examples / illustrate concepts						UC13
solve problems						

Table : learning activities x technologies (suite)

Hardware/ Activity	Smartphone	Tablet	Laptop	Audio/mp3 player	Cellphone
take multimedia notes	UC03 UC06 UC16	UC03 UC06 UC18	UC06		
share mm notes	UC03	UC03			
reuse notes	UC03 UC06	UC03 UC06 UC18	UC06		
reading / annotating	UC17	UC17 UC11 UC18	UC17 UC11		
self evaluate	UC10	UC10	UC10		
peer support	UC09	UC09 UC18	UC09		
review/memorize content	UC08 UC14	UC14			UC08
awareness	UC04	UC04	UC04	UC04	
tutorials	UC07	UC07	UC07	UC07	
follow a thematic	UC02 UC05	UC02 UC05			
discuss / exchange	UC01	UC01	UC01		
Find examples / illustrate concepts	UC12 UC13	UC12 UC13			
solve problems	UC15	UC15	UC15		

Table : Hardware x Activities