

Constructive m-Learning Environments

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Abstract

In this paper we deal with *constructive mobile learning*, i.e., a positive approach to combining learning with moving, field education with ICT, personalized and learner-enhanced learning material. Technically it is based on *location dependency of educational content and method* and de-segregates moving and information processing for a learner community. A comprehensive example for a 10th grade class studying history coupled with several interdisciplinary educational goals is given. Analysis and organization of information leads to the specification of *m-learning objects dynamically created based on learner's location, movement, learners' profile and curriculum*.

1. Introduction

“Mobile learning” (m-learning, i.e., learning while on the move) is not new for learning in the becoming-wiser sense: acquiring new skills, and modifying one's posture, has always taken place everywhere and during the whole duration of one's life. We believe that the net result of m-learning, in the medium term, will be to bring institutionalized learning closer to learning in the fullest sense. To achieve this, it is our position that, we should take advantage of the research results and technological revolution in the mobile ICT, and go beyond just building lecturing tools for outside-the-classroom use.

In recent years, m-learning enjoys attention from the academic community (educators and engineers), the industry, and social (more than educational) authorities. Interesting work has been done in suitable educational methodologies and related mobile technology [8], tools, languages and interfaces for special categories of learners [6], architectures and specifications for m-learning platforms [9] [4], services for learning [2] [9] and adaptation of e-learning to m-learning [1] [10]. Despite all these efforts, m-learning environments are often traditional lecturing environments transferred outside the classroom, giving assistance, with very low input from the learner, who is, at best, asked to fill in multiple choice assignments.

In this paper, we deal with *constructive m-learning* for k-12 education, i.e., the *location* and the *movement*

of the learners make a positive difference in both content and method of learning. Furthermore, learner's *profile* and *interests*, as well as school's *curriculum* are taken into account.

The research presented here comes from experience in four strands: projects in k-12 using ICT developing educational software [13], mobile ICT technologies [7] [12], m-learning and network projects [11] and e-learning in higher education.

The contribution of this work is, firstly to specify constructive m-learning and illustrate it with an exemplary educational activity (Section 2). Secondly, we set out the differentiating factor of m-learning, i.e., learner's location, which leads to dynamically created m-learning objects (Section 3). We conclude with a set of research issues (Section 4).

2. Constructive m-learning environments

We could define m-learning as an e-learning system which is aware of (and can deal with) the learners' possibly changing locations. This new parameter, may be taken into account *defensively* (i.e. a system to overcome problems related to the learners' motion) or *constructively* (i.e. a system that deals with the learners' motion as an educational opportunity). In a minimal, defensive, m-learning system the only thing that depends on the learners' locations is delivery of educational content. In constructive m-learning, the learner's location positively affects the learning content and method as well.

2.1. A constructive m-learning scenario

The following educational activity (Figure 1), is based on several projects run and integrates, in abstracting, the experience collected, although it has not been applied as described in a single case. The aim of this 10th grade history class 8-week-long project is to construct a multimedia representation of a major archeological site. The interdisciplinary educational goals are: to understand the historical period through reading and seeing buildings and artefacts; to obtain information from museums, electronic and book sources and on-site visit; to make verbal descriptions of architectural monuments; to follow and draw maps; and to use ICT tools.

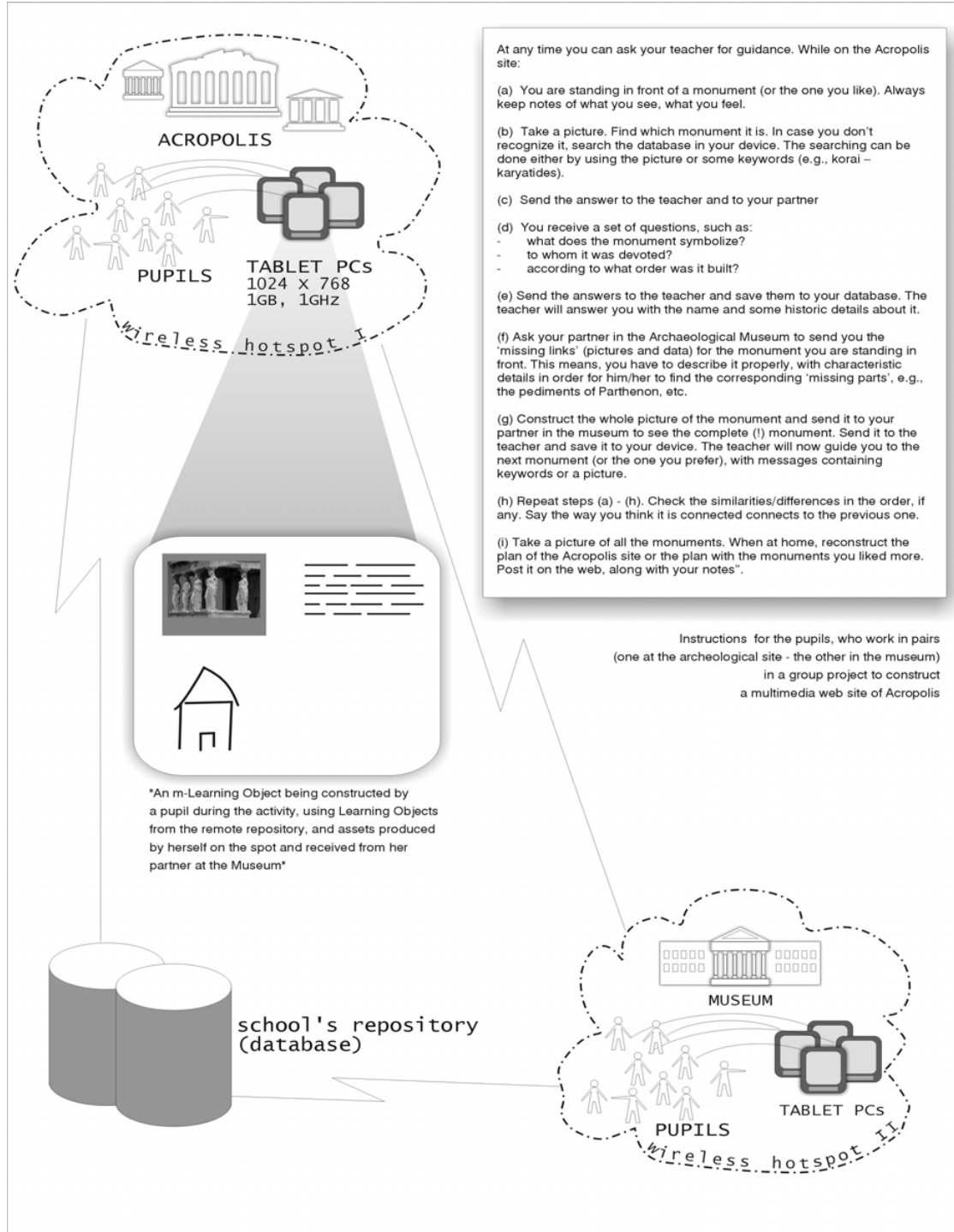


Figure 1. A constructive m-learning activity for 10th grade history class

The pupils will visit the archeological site and the museum several times, working in pairs (one at the site viewing monuments the other at the museum 'completing the picture' with related artifacts) before they combine their work into the whole class representation; personal interests may lead pupils to particular focuses. At field they will be equipped with inter-networked tablet PCs, initially loaded with some information from the standard school curriculum.

3. Data issues in constructive m-learning

Most information in any type of learning environment is of *educational content*. In traditional education, the learners find educational content in textbooks and lectures. In e-learning systems, content is best bundled in *learning objects* (LO's) [5], while educational context is handled by the *learning management system* (LMS) software. So, what is special in constructive m-learning?

3.1. Learners' locations dependencies

In constructive m-learning, the learner's location positively affects the learning content and method as well. Based on the learners' location system dependencies (delivery, content, method) we can distinguish levels of m-learning system sophistication:

- I. e-Learning delivered to m-learners (possibly from a mobile teacher).
- II. Level I, plus content depends on the current learner's position.
- IIa: Level II, plus content depends on learner's movement (past and expected future locations).
- III. Level II/IIa, plus educational activities depend on learners' positions/movement.

3.2. Dynamic m-learning objects

For the educational content, we propose the concept of dynamic m-learning objects (m-LO) in constructive m-learning. m-LO's are dynamically-created based on learner's *location* and *movement*, learners' *profile* and *curriculum*. More specifically, *dynamic m-learning objects*: (a) allow "write" (not read-only) for the learners, (b) allow "Rewrite" (not write-once) for the authors, (c) can be *incomplete* (by design), e.g. polygon closure based on actual approximate measurements, (d) are *personalized*, (e) are *multimedia* and *hypermedia* objects, (f) are *versioned*, and (g) are *interactive* (evolving along the educational process).

In our scenario the m-learning object sent to the student could be related to the particular monument or artefact the student is standing in front of when she requested the LO, along with a selection of aesthetic,

construction or architectural data depending on the student's interest as specified in her profile, and with historic information according to the curriculum of the grade of the students.

4. On-going research

Our current research [3] focuses in an architectural proposal as well as a full formal model for constructive m-learning environments, and on the design and implementation of m-LOs. On the educational side, the challenge is to deploy such constructive m-learning activities by training the teachers to do it themselves, rather than through projects involving academics directly; the latter is not scalable.

5. References

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