

Producing guidelines for learning, teaching and tutoring in a mobile environment

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Abstract

We review the research on mobile learning and theories of learning in order to produce a pedagogically sound set of guidelines for learners, teachers, and policy makers who are considering adopting m-learning technology. The guidelines are not primarily intended as requirements for systems design, but they will be of use to systems designers, in alerting them to the settings in which the technology will be used and issues arising from deployment with teachers and learners. The paper offers an interpretation of the nature and utility of the guidelines, and describes a process for producing new guidelines. We propose an initial set of guidelines for deploying, managing and teaching with mobile technology.

1. Introduction

Mobile learning is an emergent paradigm in a state of intense development fuelled by the confluence of three technological streams: ambient computing power, ambient communication and intelligent user interfaces. The pedagogy of mobile learning, however, has yet to become clearly established. This has been one of the concerns of the MOBIlearn, a European Information Society Technologies (IST) project (www.mobilearn.org), within which we are researching ways of producing pedagogical guidelines for mobile learning. Our target is to produce guidelines in the form of theory-informed 'do and don'ts' that are validated and segmented by audience. The remainder of this paper presents the relevant work to-date. Section 2 introduces our views and concerns with regard to the nature of guidelines, and section 3 describes the process we are following in producing

guidelines. Section 4 outlines the set of guidelines that have been produced so far. Section 5 concludes with our plans for further developing this initial set of guidelines.

2. What are guidelines?

We define guidelines to be:

Rules or principles for action, encapsulating some combination of practitioner-determined best practices in a domain and research-based insights into factors relevant in that domain

On this definition, the relatively recent domain of mobile learning has little best practice to draw upon, in contrast to other domains involving media-based learning, most obviously text-based learning. Many sets of guidelines have been published on learning from text, as well as reviews of guidelines and critiques of articles about guidelines. [1] is an example from that mature field, and is particularly critical of pragmatically-based, low-level (i.e. detailed) guidelines which, if applied without sensitivity to their inevitably numerous exceptions, can do more harm than good. Pragmatically-based guidelines tend to be quite brittle, in the sense that their range of applicability is narrow. Well-grounded (research-based) guidelines are more desirable, since their theoretical basis is explicit, and it is clearer how to extrapolate from them, to handle cases not covered by the original evidence-base. Wright [1] notes that if only pragmatically-based guidelines are available, then a large number of guidelines will be needed to cover the range of real-life problems encountered in a given domain (in her case, text design).

Guidelines should never become detached from supporting evidence. The field of text design has many examples of breaking this rule, and mobile learning

must avoid this trap. Thus, a typical guideline might be ‘Use simple language (<author, date reference>), without detailing those circumstances under which simple language might be misleading, or what constitutes simple language. More seriously, on following up the reference given one can find that the cited author has simply remarked ‘Use simple language’ in a general context with no supporting evidence. Well-grounded (research-based) guidelines are qualitatively different from guidelines that cite research for persuasive purposes.

Mobile learning is characterised by being delivered through technology and interfaces that are fast-changing. This is a further reason to avoid over-dependence on pragmatically-based guidelines, which tend to be very contextual: if the context keeps changing, the guidelines will soon lose their value. Another weakness of such guidelines is that they are often neither detailed enough for exact application or generalisable enough through reference to a theory. As a consequence, they can appear to offer contradictory advice. Furthermore, it is also often difficult to bear in mind the number of guidelines that can apply to a design task. For example, in the context of designing interactive interfaces, Alm [2] observes:

“It is expected of a designer to consider at least a dozen, usually considerably more, different principles or guidelines in designing an interface. Such principles are associated with, for example, elegance and simplicity; scale, contrast and proportions; perceptual organisation; module and program; semiotics in image and representation; interaction style; task, user and context characteristics, etc. There is simply no possibility for a human being to consciously keep track of the interconnections between so many variables or to calculate all the consequences and constraints which may emerge from putting all of the principles and guidelines together.” (p. 110)

From a review of how guidelines are presented in other fields, we anticipate that mobile learning will evolve to a point where there are many checklists, and much borrowing between checklists, but few instances of systematic comparison between one checklist and another. Often, it is unclear what empirical evidence exists on the effect of adhering to the guideline on usability and learnability. Likewise, it is unclear why a particular guideline has been included or excluded. It is important that guidelines can be located within contexts, that they are verifiable and that the original sources for the guidelines are specified.

3. Process for producing guidelines

The MOBIlearn project is producing a database of guidelines that is being extended and updated on a regular basis. To avoid some of the problems already noted in section 2, we have adopted the following principles:

- *The guidelines will offer theory-informed ‘do and don’ts’*

This in itself is somewhat problematic, given the current lack of evidence on effective teaching and learning with mobile technologies. We shall have to be careful that the guidelines are based either on (a) theory and practice of learning with conventional tools that are relevant to MOBIlearn, (b) evidence from desktop e-learning which we have good reason to believe will transfer to m-learning, or (c) findings from those studies of m-learning that are available.

- *Guidelines will be validated*

Each guideline is grounded in either theory or relevant empirical studies. Thus, our guidelines will provide references to the relevant sources, and a justification for their inclusion in our database. Other information, for example known limitations to a particular guideline, will also be included.

- *Guidelines will be segmented into audiences*

A primary audience is direct users of mobile learning technologies, but there are other stakeholders, such as policy makers. This is a wide audience - ranging from teachers and students in higher education through health workers and other professionals in knowledge-intensive fields, to families and tourists, as well as system designers, usability engineers, content developers, etc.

To keep all these issues in mind, the template in Table 1 was developed, which is intended to guarantee that guidelines are not reduced to ‘slogans’.

Table 1: Template for guidelines for learning, teaching and tutoring in a mobile environment

Number	An reference number for the guideline
Title	A short title for the guideline
Description	What the guideline says
Audience	Who the intended audience is
Basis	Where the guideline derives from
Cross-references	Other guidelines in the database that relate to the present one
Notes	Considerations that need to be borne in mind about this guideline
Justification/elaboration	Justification or validation of the guideline, and elaboration of contexts in which it could be used

The literature on theories of learning, mobile learning projects, and any existing guidelines that we have identified (such as <http://www.w3.org/TR/NOTE-html40-mobile/>), are the starting points for populating the above template. To date, we have produced an initial set of 10 guidelines based on reviews of mobile learning projects that were identified in the literature. These will be presented in section 4. A review of major paradigms in learning theory and their influence on learning technologies is also underway. The intention is not just to produce a survey of the literature, but also a synopsis of the strengths and weaknesses of particular approaches, how they have in the past been applied to learning technology, and how they may be useful for future thinking about mobile learning contexts, both in formal and informal settings. We expect this review in the near future to give us a set of pedagogical guidelines complementary to those presented in this paper.

4. Guidelines drawn from mobile learning projects

In 2002 the first WMTE workshop in Sweden (<http://lttf.ieee.org/wmte2002/>) and the European Mlearn workshop (<http://www.eee.bham.ac.uk/mlearn>) hosted presentations from academia and industry where success stories of mobile learning were reported. In 2001-2002 in the US, Palm Inc. introduced the PEP (Palm Education Pioneers) program where sets of handheld computers were awarded to over 175 K-12 classrooms throughout the United States. The program was administered and evaluated by SRI International [3]. In the UK, BECTA has published a report on the use of handheld computers (PDAs) in schools [4]. Some 150 teachers in 30 schools within England have been given a selection of devices to evaluate. The first phase of the project focuses on senior management teams and how the devices support their work. The final phase involves a small number of schools being equipped with devices for the majority of staff and having access to class sets to support their teaching. Several other mobile learning projects of a smaller scale are underway in other parts of the world.

Such projects were reviewed in the process of seeking out early lessons to be learned for the implementation of mobile learning in general. These issues are presented below in the form of guidelines (for brevity, the ‘justification/elaboration’ field is omitted). We should emphasise that this is work in progress and will remain as such for the duration of MOBIlearn: as more mobile learning projects are completed and examined, more conclusions will be

possible to be made and more guidelines will be produced.

Guideline 1

Number	1
Title	Costs
Description	Research the cost model for infrastructure, technology and services
Audience	Institutions
Basis	[4-7]

Guideline 2

Number	2
Title	Usability – Systems design
Description	Observe the usability requirements of all those involved in the use of the system in any way (learners, teachers, content creators) to assure system acceptability
Audience	System designers / usability engineers
Basis	[5]
Notes	This guideline does not exhaust the issues of usability for small devices. The human-computer interaction literature can further inform usability guidelines, as well as the work done in other parts of MOBIlearn.

Guideline 3

Number	3
Title	Choice of technology
Description	Assess suitability of device / technology for learning task, and examine advantages and disadvantages of each technology before making a decision on which one to use
Audience	Institutions, teachers, system designers
Basis	[4, 7, 8]

Guideline 4

Number	4
Title	Roles
Description	Assign or assume necessary roles for initiating and supporting mobile learning
Audience	Institutions, decision makers, staff, users, beneficiaries of mobile learning
Basis	[3-5]

Guideline 5

Number	5
Title	Equipment management
Description	Develop procedures and strategies for the management of equipment when it is provided by the institution

Audience	Institutions / teachers
Basis	[3, 4, 7]

Basis	[5, 8]
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Guideline 6

Number	6
Title	Support for teachers
Description	Provide training and (ongoing) technical support to the teachers to enable them to use mobile technologies to enhance current, and to enable new instructional activities
Audience	Institutions, educational authorities
Basis	[3-5, 7, 8]

Guideline 7

Number	7
Title	Admin
Description	Consider the use of mobile technologies for student administration tasks
Audience	Institutions, teachers
Basis	[4, 5]

Guideline 8

Number	8
Title	Collaboration
Description	Consider the use of mobile technologies to support collaborative and group learning
Audience	Teachers
Basis	[4, 5]

Guideline 9

Number	9
Title	Services / applications
Description	Discover and adopt suitable applications that match the needs of your specific classroom and map directly to your curriculum needs
Audience	Teachers
Basis	[3-6, 8]

Guideline 10

Number	10
Title	Security / privacy
Description	Ensure security and privacy for the end users
Audience	System designers

5. Future Work

This paper has presented an ongoing effort to produce a pedagogically sound set of guidelines for the future deployment of mobile learning systems, based on a systematic review of the research on mobile learning. The list of guidelines presented in section 4 is not complete: the ten guidelines that have been presented were derived from a study of the practice of mobile learning to-date. In the next phase of this research we intend to extend the list of guidelines based on (a) further reviews of the literature on mobile learning practice, (b) reviews of the literature of the theory and practice of learning with conventional tools that are relevant to mobile learning, and (c) empirical studies of mobile learning.

6. References

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