

On the Role of Mobile Scaffolding in Learning

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Abstract. The widespread use of mobile devices, particularly by young people, offers new and exciting possibilities for learning. The mobility and pervasiveness factors inherent to mobile technologies allow learning at any time and in any place. This has led to some new developments in educational pedagogy based on the affordances that mobile technology brings to learning. “Mobile scaffolding” is a new research area which brings together the fields of traditional pedagogy with mobile learning. In mobile scaffolding the learner is provided with assistance and support by means of communication through their mobile devices with a More Knowledgeable Other (MKO). The purpose of this paper is two-fold: firstly to address the question of whether the ubiquitous availability of scaffolding significantly improves the learning and secondly to identify and characterise usage patterns of learners in mobile settings and secondly to compare the effectiveness of different types of scaffolding (none, scaffolding via email, scaffolding via mobile).

1 Introduction

A common problem among young undergraduate students is that many are unmotivated to learn. Many can be described as dependent learners relying on their educators to provide them with the enthusiasm and motivation needed as well as the learning materials [4]. The widespread use of mobile devices, particularly by young people, offers new and exciting possibilities for learning motivation since they attract a lot of attention among young people [6]. Some of the key benefits identified by UK government research are the general student learning gains derived from increased enthusiasm, motivation, confidence and a sense of ownership [1]. Other benefits of m-learning are the increased independence and self-initiated learning in students, and the extension of learning beyond the classroom. Ericsson’s Leonardo Da Vinci Project Online has shown that m-learning gives students more flexibility and choice in where and when they learn outside of the classroom [3].

Research is being conducted into effective pedagogical models for m-learning based on the affordances that mobile technology brings to learning [9, 10]. One such development is “mobile scaffolding”, which brings together the fields of traditional pedagogy and mobile learning [2, 8]. Another is the ubiquitous support for learning

that mobile technologies offer, which is the subject of two research studies which were conducted and which are outlined below.

2 Studies

The objective of the first study was to look at the undergraduate students' attitudes towards mobile learning and their requirements for any future mobile learning systems. The study was based on an extensive survey of 37 undergraduate students and their use of mobile devices. One thing that was highlighted by the survey was the extensive use of text messaging by students and their wish to receive administration information about the course by text message.

This leads on to the second study that involved a group of 14 undergraduate students who volunteered to take part in an eight week study. For the eight week period the students were supported in their learning outside of the classroom by their lecturer via SMS text messaging. The messages were of three basic types, content-related messages (e.g., a small amount of learning material), motivational messages (e.g., encouragement) and administrative messages (e.g., assignment reminders or room changes). The students were also regularly sent short summaries of lectures and asked one or two short questions via text message after class. There were no extra marks for responding but the response rate per question from the students was on average over 40%. At the end of the field trial the students each filled out a confidential survey, the results of which are presented in this paper.

3 Results

The results of the first study provided useful information on students' perceptions of m-learning. While m-learning is a new concept to most of the group, 75% of the group felt that the use of mobile devices to aid learning objectives would benefit their studies. SMS text messaging was identified by the study as a very highly used function by undergraduate students. 30% of the group who took part in the first study said they send between 15 and 30 text messages a week, 32% of the group send between 30 and 50 messages per week and 30% of the group also reported that they send over 50 messages a week.

The final survey of the second study, which is based on supporting students via SMS text messaging, produced some interesting results. A summary of the results of the final survey is shown in Table 1 below.

Table 1. Results of Final Survey on Mobile Learning Support Field Study.
Participants were asked to rate their replies on a 1-6 Likert scale.

No	Question	Type	Mean	Std Dev.
1	Do you think receiving text messages from your lecturer is a good idea?	1 = Definitely not 5 = Very much so	3.7	0.7
2	Do you think that sending and	1 = Definitely not	3.0	0.9

	receiving text messages has increased your motivation?	5 = Very much so		
3	The mobile phone can be used anytime and anywhere to send and receive messages. Do you think that this has a positive effect on your motivation?	1 = Definitely not 5 = Very much so	3.3	0.7
4	Do you think that sending/receiving text messaging is an effective approach to supporting learning?	1 = Definitely not 5 = Very much so	4.1	0.7
5	Do you think the features of a mobile phone (e.g., size and type of the display) is sufficient to support learning?	1 = Definitely not 5 = Very much so	3.3	0.5
6	Do you think text messaging is useful for the organisational side of learning such as announcements about room changes etc.?	1 = Definitely not 5 = Very much so	4.6	0.7
7	Do you think the text messaging has improved your relationship with the lecturer?	1 = Definitely not 5 = Very much so	3.6	1.1
8	Are you concerned about the potential cost of replying to the text messages?	1 = Definitely not 5 = Very much so	2.2	1.0
9	Do you feel that receiving text messages from your lecturer is intrusive?	1 = Definitely not 5 = Very much so	2.0	0.7

4 Mobile Scaffolding

The results of the two initial studies indicate that students are well disposed to the idea of receiving support from their lecturer via text messaging. The second part of this paper explores the concept of mobile scaffolding and whether or not it leads to improved learning. Mobile scaffolding is the provision of this type of support via mobile communication. The term 'scaffolding' was developed to describe the type of support offered by a teacher or peer to support a student's learning. During scaffolding the teacher helps the student master a task or concept that the student is initially unable to master on their own. The teacher only offers support with tasks or concepts that are beyond the student's capability. This is the *Zone of Proximal Development* (ZPD) as described by Vygotsky [10]. Vygotsky believed that when a student is at the ZPD for a task or concept, providing the appropriate scaffolding will give the student enough of a "boost" to achieve the task [5]. It is very important to allow the student to complete as much of the task as possible, unassisted [7]. Once the student has mastered the task or concept the scaffolding is removed and the student will then be able to complete the task on their own.

In Mobile Scaffolding, students receive the support through their mobile device from a *More Knowledgeable Other* (MKO) [7]. The MKO refers to someone who has a better understanding than the learner, with respect to a particular task or concept. Although the MKO is usually a teacher or tutor, it could also be the student's peers who provide the assistance in terms of their superior knowledge or experience. In

fact, the MKO need not be a person at all. Intelligent tutoring systems (ITS) can also be used to support and scaffold the learner [5]. The personal ownership of mobile devices makes them ideal for delivering the individualised instruction to the learners. It is unlikely that mobile scaffolding will be used in isolation from other types of scaffolding (e.g. classroom instruction) and therefore it is difficult to assess its effectiveness in isolation. One of the ways it can be studied is by comparing its effectiveness to other types of scaffolding (or their absence).

5 Mobile Scaffolding Experiment

A research experiment is now described that compares the effectiveness of different types of scaffolding. Scaffolding is conducted in addition to classroom-based instruction. A group of undergraduate students doing a particular module (e.g., Data Communications) who volunteer to participate in the experiment will be divided at random into three groups (A, B, C) of roughly equal size. Next each participant will be surveyed to ascertain their a priori knowledge of the module and initial feeling and attitudes towards the experiment. This survey will reveal the level of understanding the students are currently at and thus will reveal the lower entry point to their ZPD.

Subjects of the control group receive no extra scaffolding. Those in group B will receive regular informative messages about some of the concepts covered in the module. The messages will be sent via email. Those in Group C will receive the same messages but via SMS to their mobile device. Replies by the students to the messages will be recorded and a scaffolding dialogue may begin. In this way the scaffolding will be implemented. At the end of the scaffolding period, approximately 10 weeks, a final survey will be conducted to ascertain how much each participant has learnt due to the scaffolding during the period. The results of the survey taken together with the number and contents of the messages that have been sent and received should provide valuable insights into the effectiveness of the mobile scaffolding as compared with the email scaffolding and the case where no extra scaffolding outside the classroom is provided. An additional survey of the scaffolded participants will reveal their attitudes towards and experiences with the different types of scaffolding and could cast light on the usage patterns of the learner.

6 Conclusion

It is tempting to conceive of a distinction between learning and organization of the learning process with mobile devices supporting rather the latter than the former. In fact, however, there is no sharp dividing line between learning and organization of learning (e.g., by providing information where to find literature etc.). This is true both for classical classroom learning and for more complex learning-teaching scenarios made possible by mobile devices. Mobile scaffolding addresses both teaching-learning issues (e.g., clarifying misunderstandings) and organizational issues that relate to learning (e.g., providing information)

In this paper, two research studies in m-learning have been outlined and some of the results have been presented. The first study shows the extensive use of mobile devices amongst students and the fact that very many are willing to use their mobile device to meet a learning objective. The second study demonstrates how the use of text messaging to support students can have significant advantages. These advantages, as identified by the participants, are outlined in this paper as are a number of possible disadvantages. The potential for mobile technologies in education is enormous.

More research is needed in complex teaching-learning scenarios enabled by mobile devices that casts light on the tight interaction between the different aspects involved.

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