MOBILE LEARNING AS TECHNOLOGY-MEDIATED EDUCATION: AN 'ACTIVITY' APPROACH

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ABSTRACT

This research paper looks at how the introduction of mobile learning will be a catalyst for educational change, making learning more ubiquitous. We look back at the evolution of education and point out the historical evidence for such change such as the effect of books becoming widely available. We also examine the application of Activity Theory to mobile learning and show that it can be used to help understand the complex mobile phone-mediated activities of young people. Such an understanding will point the way towards the design of future mobile learning activities that will harness the affinity of young people with their mobile phones. Activity theory is a psychological theory with a naturalistic emphasis that emerged from the Soviet Union during the 1920s. It can be used to depict the mobile phone as a mediation device between young people and their social networks. It indicates that future mobile devices should provide flexible means through which young people can express themselves. This lends itself naturally to mobile device-mediated social-constructivist learning and enhanced learning ubiquity. The research was undertaken as part of a collaborative project between National College of Ireland, EMRC - Educational Media Research, University of Limerick and Estuary Technologies, a commercial learning technology company.

KEYWORDS

Mobile, Mediated, Technology, Activity, Psychology, Artefacts

1. INTRODUCTION

Recent research has suggested that the introduction of technology in learning can lead to educational change (Papert 1980, David 1991, McClintock 1992, Dwyer 1994). This paper uses Activity Theory (Nardi 2001) to attempt to understand the relationship between technology and education, particularly in mobile learning, and to suggest some future directions for technology-enhanced learning. Activity Theory is appropriate for this task as it is a comprehensive framework than can be used to understand the changes that are brought about by technological innovation in education as part of a general process in which artefacts mediate human activity (Bellamy 2002). In Activity Theory artefacts can be such things as instruments, machines, computers, mobile devices, as well as laws, methods, procedures etc.. There is historical evidence that the introduction of new artefacts, such as mobile devices, can have a huge effect on education (Bellamy 2002) as was the case when books became widely available.

There are numerous examples of the creation and development of new tools or artefacts that altered peoples' lifestyles in terms of the ways they communicated, worked, learned etc. (Waycott 2001). One example was the effect of the introduction of writing on the way information was recorded and disseminated

(Saljo 1999). This led to the introduction of books that radically changed the way learning was carried out and made it more accessible to large numbers of people. Education was the result of the interaction of three entities, the knowledge, the teacher and the pupil. Initially all the transmission was oral, information was in the minds, when writing was developed the information could then also be stored in documents but still the interaction between the teacher and the pupil was of primary importance.

Over centuries this changed and education started becoming more and more widespread, more organized and regulated by governments and more commercial. In more recent times the book has been joined by the use of information and communication technologies (ICT) in education and training, as with the use of radio, television, computers and network technology. This use of ICT in education has undergone several paradigm shifts over the last three decades (Bransford et al. 1999). E-Learning, which is learning supported by digital "electronic" tools and media, has emerged. More recently there has been a shift towards portable computing in education that has become known as m-Learning, e-Learning using mobile devices and wireless transmission. It has been compared to the shift from reading as an activity for the elite in centres of education to reading as a part of everyday life (Waycott 2001). By its nature mobile learning is socio-constructivist. Knowledge which is the result of learning must be actively constructed by the learner who acquires the knowledge from many different sources including other learners (Hadjerrouit 2005, Sharma and Kitchens 2004). Activity theory discussed later supports this perception by treating the learner not as an isolated individual but as part of a social network, interacting with other learners and the environment.

2. MOBILE LEARNING

As our society is entering a knowledge-based, Internet/Web-driven economy, education becomes a necessity for any individual who wants to be competitive and successful, regardless of his or her age, gender, and race (Sharma et al 2004). As computers and the Internet become more essential educational tools, the technologies become more portable, affordable, effective and easy to use (Wood 2003). A paradigm shift is occurring in the access people have to educational materials due to the ubiquitous availability of these materials. This ubiquity is brought about by the mobility and pervasiveness factors which are inherent to mobile technologies, thus allowing learning at any time and in any place. While mobile technology is still new and emergent, its application to teaching and learning has the potential to offer significant advantages. The potential for mobile technologies in education is enormous and research is being conducted into an effective pedagogical model for m-Learning (McManus 2002). Research evidence about m-Learning can be found across most subject areas, and across all phases of education. Some of the key benefits identified by the British Educational Communications and Technology Agency (BECTA 2003) were the general student learning gains derived from increased enthusiasm, motivation, confidence and a sense of ownership. M-Learning supports shared assignments and collaborative working.

Other benefits of m-Learning are the increased independence and self-initiated learning in students, and the extension of learning beyond the classroom. M-Learning is instant, supports collaborative learning and enables learners to ask and to receive answers to questions quickly and easily. Young people have embraced the technology but educational institutions have yet to accept its use in the mainstream.

The activities used in mobile learning are social-constructivist since the learners work in collaborative groups (Dede & Sprague 1999), thereby increasing motivation, promoting interactive learning, developing cognitive skills (ordering, evaluating, synthesising), and facilitating the control of the learning process and its relationship with the real world (Valdez et al. 2000, Zurita and Nussbaum 2004).

In this paper we look at applying Activity Theory to mobile learning. Mobile learning can be perceived as education mediated by technology. Mobile devices are examples of the types of artefacts that Activity Theory is concerned with. Activity Theory does not treat the learner in isolation but as part of a social network, interacting and collaborating with other learners. By using Activity Theory we can come to understand the use of mobile devices in a socio-cultural context and thus ascertain how best they can be used to support learning.

3. ACTIVITY THEORY

To truly study the use of mobile devices we must understand the social context in which they are used. The mobile user is a social being who has interactions with real people, as well as interactions with the tools, or artefacts, other people have designed and left as part of their culture (Nardi 1998). Therefore we need to look beyond traditional theories to understand the behaviour of the mobile user. One such theory which takes into account the context of the use of tools is Activity Theory.

Activity Theory, which had its origin in the former USSR, was developed by Russian psychologists Vygotsky, Rubinshtein, Leontjev and Lurija. Except for a few publications in western journals, it remained unknown outside the Soviet Union until the mid-1980s, when it was picked up by Scandinavian researchers (the first international conference on activity theory was not held until 1986). This resulted in a reformulation, some changes were introduced, by importing notions from Human-Computer Interaction theory; for instance, the notion of *rules*, not found in Leontjev, was introduced. Activity Theory can be used to provide a broad conceptual framework to describe the structure, development and context of tasks that are supported by a computerised system. It offers the possible integration of many HCI theories and concepts, thus helping to maintain conceptual integrity in terms of design, evaluation and usage (Wikipedia 2005).

The two people most responsible for the application of activity theory to information systems are Bonnie Nardi and Kari Kuutti. Nardi saw activity theory as "...a powerful and clarifying descriptive tool rather than a strongly predictive theory. The object of activity theory is to understand the unity of consciousness and activity... Activity theorists argue that consciousness is not a set of discrete disembodied cognitive acts (decision making, classification, remembering), and certainly it is not the brain; rather, consciousness is located in everyday practice: you are what you do." Up to now the field of Human-Computer Interaction has largely ignored the study of artefacts, insisting on mental representations as the centre of study and activity theory is seen as a way of addressing this deficit (Nardi 2002).

The main unit in Activity Theory is an activity. Activities can be modelled in a hierarchical structure with three distinct levels, activity, action and operation. Activities are the highest level and are based on conscious motives. An example of an activity is educating students. Actions are basic components of activities. The goal of an action is a conscious goal that is subordinate to the motive. For example giving a tutorial could be an action. Lastly operations are ways of executing actions and may become unconscious. For example teaching the same basic thing repeatedly (Kuutti 1996).

Activity theorists use a framework for representing activities. In the framework an activity is oriented by an object (also called motive). The activity is acted out by a subject, the individual or group that is the focus of the activity. The relationship between the subject and the object of activity is mediated by a tool. A tool can be anything used in the transformation process, including both material tools and tools for thinking. The basic factors influencing an activity are shown in Figure 1 below.
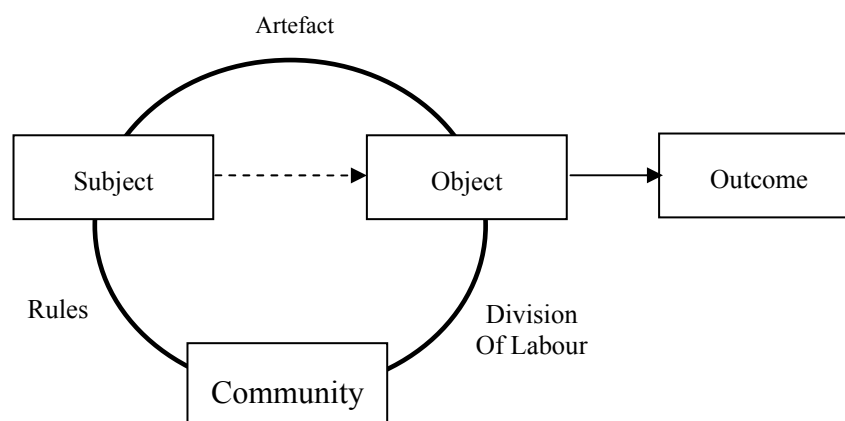

Figure 1. Entities and relationships in Activity Theory - based on (Hasan 1998)

An activity is undertaken by a person (subject) who is motivated toward the solution of a problem or purpose (object), and mediated by tools (artefacts) in collaboration with others (community). The structure of the activity is shaped and constrained by cultural factors including conventions (rules) and social divisions (division of labour) within the context.

Artefacts include such things as sign systems, instruments, procedures, machines, methods, laws, processes and anything else that shapes work. The importance of artefacts in Activity Theory is that they have a mediating role in that there is rarely a direct relationship between elements of an activity but that these are mostly mediated by artefacts. Artefacts in turn get created and transformed during the development of the activity. They also are influenced and shaped by the culture and history of use. The use of artefacts introduces new possibilities and introduces constraints that often radically change the purpose for which the artefact was originally developed (Carroll at al 1991). One example of this is the use of text messaging, especially in Europe, which wasn't initially intended as an important communications function of mobile devices but has since become one.

4. STUDY

There have been many reasons outlined for the suitability of Activity Theory for m-Learning. However, what is really needed is an empirical study to show that its use in m-Learning can bring about significant learning gains. Based on the theories of mediation, collaboration and social interaction we are engaged in a process of designing, building and evaluating an m-Learning system which will be used to study the complex social interactions of young people in and out of the classroom environment and determine how learning takes place. The findings of the research will point the way towards appropriate pedagogical strategies that can be evolved to effectively exploit the affinity of young people with mobile devices to educational advantage.

5. CONCLUSION

Education has, overtime, undergone major paradigm shifts often made possible through scientific and technological inventions and discoveries. ICT, used as a tool in education for quite some time, was the catalyst for a shift to e-Learning and has now spawned a new buzzword and paradigm – mobile learning (m-Learning).

Pedagogy has also changed from ancient times, constructivism is the best match for all types of technology enhanced learning, be it e-Learning or m-Learning. In constructivist philosophy the learner constructs their own knowledge on the basis of resources, lectures, tutorials and group discussion etc. The ancient Indian philosophers believed that knowledge is drawn out of the learner and modern constructivism concurs. This approach is in the form of group discussions, social-constructivist activity and collaborative learning to enable the learner to build an understanding of, and meaning for the issues, and to construct new knowledge on the basis of information (O'Reilly and Morgan 1999, Mioduser, et al 2000).

In this paper we have outlined the possible application of Activity Theory to mobile learning and have hypothesised that it can be used to help understand the complex mobile phone-mediated activities of young people. We are designing a study to validate the hypothesis empirically. Such an understanding will point the way towards the design of future mobile learning that will harness the affinity of young people with their mobile phones. Such future mobile devices should provide flexible means through which young people can express themselves. This lends itself naturally to mobile device-mediated social-constructivist learning.

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