Up Close and Very Personal – A Proposed Conceptual Framework for Mobile Technology As a Participant

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Abstract: The purpose of this paper is to propose a conceptual framework for the integration and evaluation of mobile technology in educational settings. Research in the development of platforms and initiatives for and in education often display characteristics of either a pedagogical or technology focus. Only when the technology that supports a mobile learning event and the pedagogic considerations that underpin it, come together, does it produce a successful initiative. While both reflect a perspective, neither reveals it in isolation. By acknowledging this interdependent relationship in mobile learning and its incorporation into planning and evaluation, we are able to arrive at an understanding of the ensuing relationships between the individual, the community, the desired outcome and the mediating tool. In the development of this framework a case is made for considering the technology as a participating partner in learning events. This leads to new relationships that could influence the integration of technology. These relationships are dynamic and change as technology improves and new tools are introduced.

Keywords: conceptual framework, education, mobile learning.

1. Introduction

Mobile technology, because of its personal nature, lends itself to a unique integration into the user's life. Advances in technology during the past decade have created a worldwide boom in the sale of this kind of technology, permitting private individuals to enjoy personal, mobile wireless connectivity [1, 2]. The widespread ownership of mobile technology in the form of mobile phones, especially among young people, has created opportunities and challenges for educators.

These opportunities [3, 4] are facilitated by the development of relevant technology platforms and tools, and their effective use to reach a desired outcome. An essential feature relevant to education is that mobile technology removes the limitations of time, space and connectivity that characterise the conventional classroom and other forms of teaching and learning. Because of this it offers the individual user the capacity and freedom to connect to remote information and other resources; enriching, personalising and extending the learning environment.

In doing this, it eliminates some of the obstacles to learning encountered within the classroom setting, but, at the same time, adds another active partner that needs to be considered. Other than a tool that does not interact with the user, mobile technology brings with it a number of protocols and rules that have to be navigated by the user to effectively

utilise the tool in the learning event. Mobile Learning may thus be considered to be an "extreme form of flexible learning" [5].

2. Objectives

A literature study forms the background for expanding the Activity Theory to incorporate mobile technology as a partner in a learning event. The ensuing framework that is developed reflects the educational objectives, the technological affordances and the relationship of the user with the technology. This is by no means meant to offers a complete solution to all learning events that incorporate mobile technology, but presents a different perspective by which to plan, implement and evaluate mobile learning scenarios.

2.1 Dual Nature of Mobile Learning

A review of current literature confirms that writers tend to define mobile learning in terms of their particular research perspective. Technology-driven research tends to define mobile learning in terms of learning by means of mobile devices [6-9]. The emphasis on technology in this kind of research even influences the definition of learners; as they are referred to as "m-learners" when using mobile devices to "acquire and learn through a wireless transmission tool anytime and anywhere" [10]. This is contrasted to research driven by pedagogical concerns, defining mobile learning in terms of the extent to which it enriches a particular learning environment [11-13].

This dual nature of mobile learning can create tension as to the applications and focus of research taking place in the mobile learning environment. The different definitions of mobile learning lead to the assumption that there seems to be some disagreement about what mobile learning actually is.

Grohmann, Hofer and Martin [14] identify the origin of this as the duality of research focussing on the one hand, on the changed and enhanced learning environment, and, on the other hand, the development of the technical support for this environment.

A dual relationship, however, is acknowledged by many researchers and draw on the computer science, information systems, educational research and the field of human-computer interface. [15-17]

From the literature of reported mobile learning interventions the rationale for the dual identity of research in mobile learning is very apparent. It leads to the conclusions that the pedagogical underpinning and the technology that assist it are interdependent. Focussing on only one of the natures inevitably creates discord as a pedagogically sound mobile intervention cannot take place without acknowledging the technology to support it. In the same way a brilliant technological tool unsupported by sound pedagogic is educationally useless.

A challenge would be to accord equal weight and attention to the needs of pedagogy and the requirements of technology.

2.2 Activity Theory as a outline for the development of a conceptual framework

The roots of the activity theory may be located in the 18th century German philosophy of Kant and Hegel. Their work emphasises both the historical development and the active role of human beings in constructing ideas [18]. Activity theory has evolved through three generations of research, two of which are relevant to this paper.

The first generation was predicated on the earlier work of L.S. Vygotsky and focuses on the idea of mediation. This idea was crystallized in Vygotsky's famous triangular model in which the conditioned direct connection between stimulus (S) and response (R) was transcended by a "complex" mediated act (X) [19].

The second generation of activity theory, developed by Soviet psychologist, A.N. Leoniev, was based in the earlier work of Vygotsky. He developed his theory in reaction to
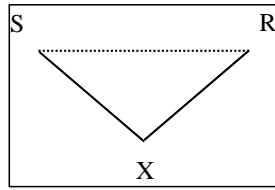
the doctrine that knowledge derives from experience, a tradition that conceptualises human beings as both passive and reactive [20].

Figure 1: Vygotsky's triangular model

The activity theory is not a comprehensive metaphysical-ontological theory in the ordinary sense of the word, but rather a set of

basic principles which constitute a general conceptual system which can be used
as a foundation for more specific theories. [21].

The basic principles of the theory include the hierarchical structure of activity, object-orientedness, internalisation/externalisation, tool mediation, and the notion of development [22]. In terms of this theory, human activity is attributed to the specific needs that human beings have to accomplish objectives. The activity then is mediated by one or more "tools" and is reflected through people's actions as they interact with their environment.

An activity is undertaken by a human agent (subject) who is motivated toward the
solution of a problem or purpose (object), and mediated by tools (artifacts) in
collaboration with others (community). The structure of the activity is constrained
by cultural factors including conventions (rules) and social strata (division of
labour) within the context [23].

This distinction between activity, action and operation is the basis of the three-level model of activity described by Leoniev who never undertook to expand or to describe his theory in detail. It was Engeström who extended Vygotsky's original conceptualisation to include the ideas of Leoniev.

This expanded third development incorporated the idea of *community,* resulting in two new kinds of relationship: the relationship of community-subject and the relationship of community-object. According to Engeström, the community-subject relationship is mediated by *rules* and the community-object relationship is mediated by a *the division of labour* [23-25].
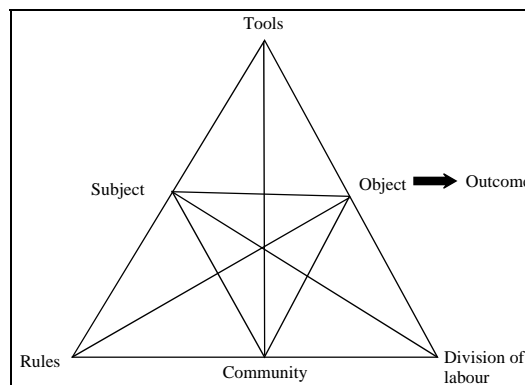

Figure 2: Expanded triangle of an activity system

The extended mediated relationship between the subject and the object offers a general model for human activity that reflects the collaborative nature of human actions. The "nodes" taken from Engelström's [25] model depicted in Figure 2, are:

- Subject: This refers to an individual or group.
- Object: This refers to that towards which the activity is directed.
- Tool/s: These may be either external or internal mediating instruments.

- Rules and regulations: These are explicit and implicit regulations, norms or conventions that constrain actions and interactions within an activity.
- Division of labour: This refers to the division of tasks between members as well as to a division of power and status.
- Community: This refers to multiple individuals or subgroups that share the same general object [26]

As a descriptive tool, the activity theory is geared towards practice. The activities in which people engage constitute a functional framework for the analysis of a learning event that is mediated by mobile technology as tool.

Although the activity theory states that artefacts are created and transformed and carry with them a particular history of development [27], it fails to address interactions with the tool and the relationships between individuals and the technology within a mediated activity. This limitation persuaded the researchers to adapt the activity theory so that it reflects the relationship of the user to the technology tool.

2.3 Conceptual framework

As stated, while the activity theory defines mobile technology as a mediating tool, it fails to address the particularities in the interactions between the learner and the technology. This form of interaction is dependent upon the kind of technology that supports the learning event and the specific technology that is used in the learning event itself.

The interaction of a user and the technology is subject to various protocols, rules and norms. It is especially true in the case of mobile technology, this because the mobile device becomes an intimate part of the user's world and because the virtual environment and the real world frequently overlap [15, 28].

The variables that arise from the interaction between technological tools and other elements in the environment are innumerable because each combination of platform, mobile technology and other technological mediating agents changes the way in which the activity at hand is approached and executed.

As the activity theory does not make adequate provision for the interaction of a subject with the mediating technological tool as part of object-related activity, we propose an extension that incorporates the technological tool as a component or partner in the activity taking place.
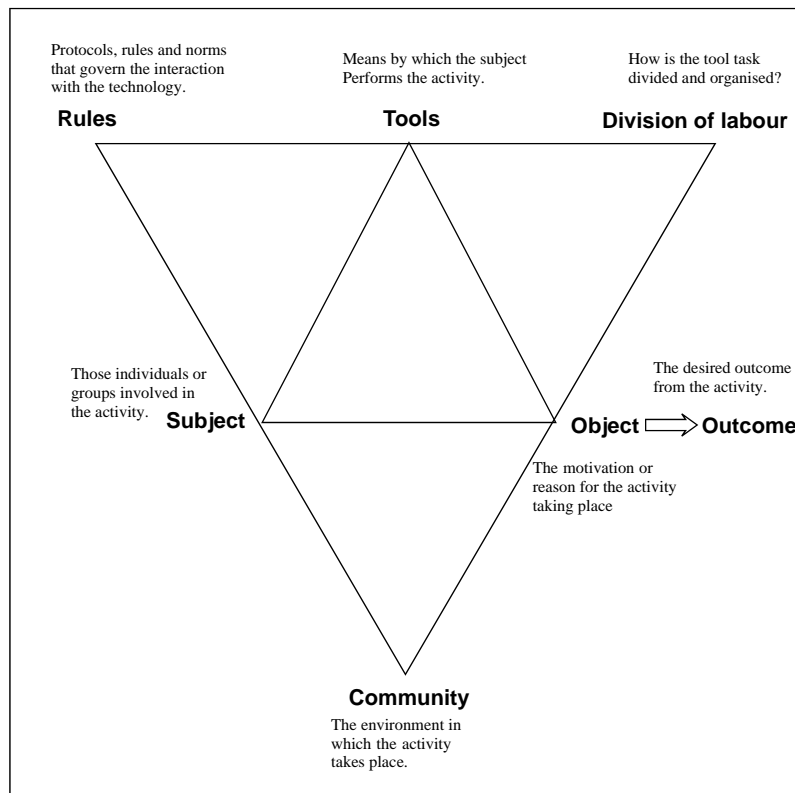
Figure 3: The technological tool component with possible new relationships

The figure 3 above contains a representation of this incorporation that focuses on the technology-driven perspective as one part of the dual nature of mobile learning.

The **community component** forms part of this framework because mobile technology is not restricted to a specific location or time. The community incorporates the physical and/or virtual environment in which the activity takes place.

The **technology tool as a component** comprises a single mobile technology or multiple technologies that support the same general object. The new relations that flow from this are:

- a subject-tool relationship
- an object-tool relationship
  These relationships are depicted in figure 3.

2.3.1 Subject-tool relationship

The relationship between the subject and the tool is characterised by specific norms, rules and protocols that regulate the user's interaction with the technology tool. These "tool rules" mediate the subject's interaction with the technology. Examples of such rules that govern the use of mobile phones as tools are predictive text for sending SMSs, the typical SMS slang that teenagers and other frequent users employ, and the variants in navigation found in the interfaces of different models of phone. Holzinger states:

> *The phenomenal growth in mobile computing, whereby a parallel growth of user*
> *sophistication has failed to take place, will increase the need for future research in*
> *fully adaptive and sensitive interfaces, aware of the requirements and proficiency*
> *of users [29].*

Reflection on this relationship offers the researcher opportunities to incorporate not only the usability of the technology but also the nuances in usage occasioned by each variant form of the technology. This would enable an understanding that acknowledges the user's possible ignorance of an interface or a technology.

2.3.2 Object-tool relationship

The relationship between the tools and the object is characterised by the specific abilities of the technology to achieve its objectives. These "tool labour divisions" enable the navigation of a specific task and mediates the tool's interaction with the object. An example of such mediation would be the use of a video to record an event in cases where another user might have had to use a voice recording because their phone (as specific technology) does not support the function. This relationship can thus be interpreted as the specific functions of the tool that can be accessed to reach a specific outcome.

This relationship offers researchers opportunities to reflect on the functions that are available and their adequacy in relation to the object. It would also direct the formation of groups in situations where there are limited resources and a pooling of resources are needed. This would be an important consideration in disadvantaged communities where insufficient funds are available for the financing of educational initiatives.

2.4 Expanded activity theory model

As we noted earlier, mobile learning can be divided into two main areas of concern and as such the model expands to the one illustrated below.

Figure 4 represents the dual perspectives of mobile learning. These two perspectives are considered complementary to each other in a mobile learning environment. This model indicates that there are five main components (figure 5) that need to be considered when one is evaluating or implementing a mobile learning event.
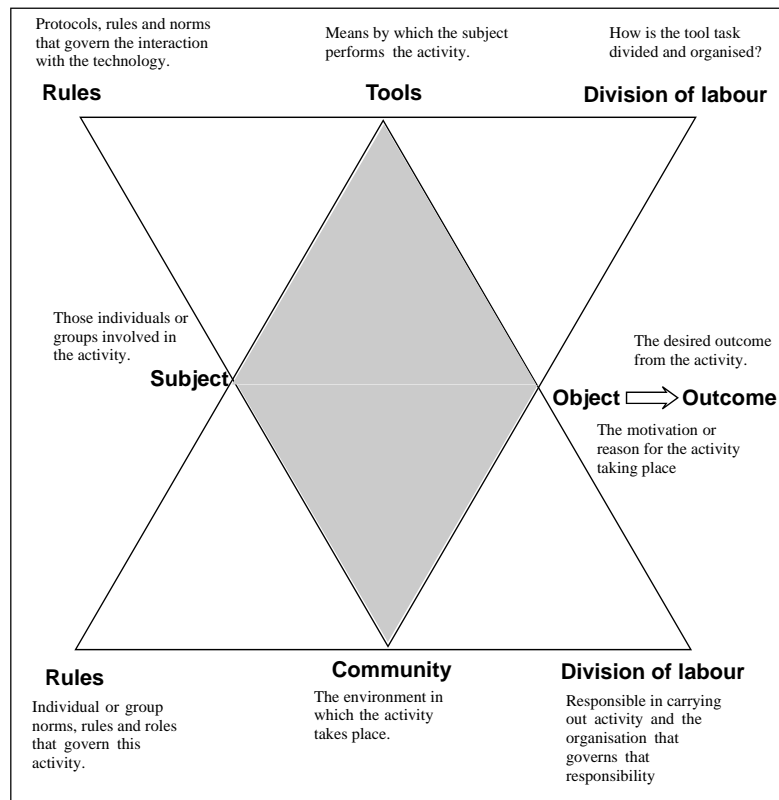

Figure 4: Activity theory model expanded to reflect the dual nature of Mobile learning
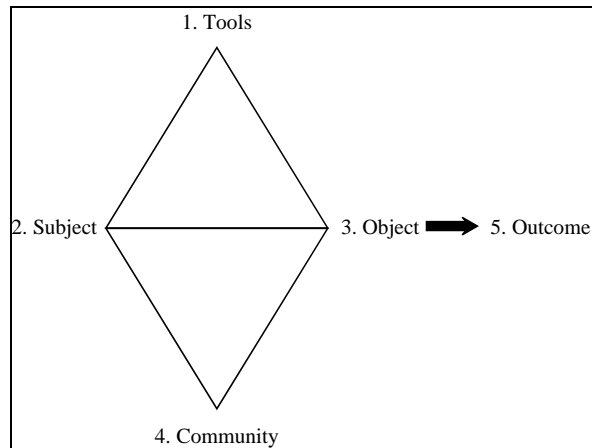
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Figure 5. Components of conceptual model

The five main components derived from the expanded model are:
1. The tool/s: Tool/s or technology that are used to mediate the activity.
   1.1. Tool rules: Protocols and rules that govern the interaction with the tool.
   1.2. Tool division of labour: the functions of the tool utilised to achieve the outcome.
2. The subject: Groups or individuals involved in the activity.
3. The object: The motivation for the activity to take place.
4. The community: The physical and/or virtual environment/s in which the activity is taking place.
   4.1. Community rules: Protocols, norms and rules that govern the community.
   4.2. Division of community labour: Who it is that assumes responsibility for what happens in the activity and how participants are organised.
5. The outcome: The desired product of the activity.

4. Conclusions

For the successful application of even the most basic functions of mobile technology with support from a third-party server, the limitations and opportunities inherent in the extension of learning beyond the classroom and curriculum is reliant on
- the extent to which the technology is able to support the desired educational outcome and
- the ability of the users to navigate the technology to reach this outcome.

When mobile technology is seen as a partner in the learning event, it implies that there is an additional relationship that needs to be considered and planned for. This relationship is mediated by the protocols, rules, customs and conventions that users consent to as they pursue interactions and assign symbolic significance to the technology itself. The proposed conceptual framework affords practitioners and researchers the opportunity to anticipate the use of technology in a nuance rich structure.

Acknowledgement

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