

# Mobile Pedagogical Framework: a socio-cultural model for mobile learning

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New educational technologies are constantly being developed. With their emergence arise questions of their impact on pedagogical practice and knowledge. My presentation discusses the Mobile Pedagogical Framework developed with colleagues, which presents a socio-cultural model for mobile learning. I suggest that the use of a framework such as this one identifies the key affordances that mobile technologies bring to learning and assists teachers to use mobile technologies with their students. The Framework has three major dimensions: authenticity, collaboration and personalisation. Each of these will be examined for what they can tell us about knowledge and pedagogy in maths education.

## Introduction

Mobile technologies, such as smart phones, tablets and game consoles, have increasingly powerful multimedia, social networking, communication and geo-location (GPS) capabilities. They are changing the way we live, learn and work. The ubiquity, flexibility, ease of access and diverse capabilities of these technologies make them valuable but under-utilised assets for school education (Churchill, Fox & King, 2012).

School education is being exhorted to build a creative, well-informed, digitally capable society with the flexible knowledge and skills to advance in an unpredictable 21st century Australia (Ainley, 2010). However, technological adoption is occurring without an empirical understanding of the complex, dynamic relationship between these technologies and the epistemological and pedagogical systems that underpin teaching and learning.

School, teacher and student engagement with technology for learning is a key policy issue in Australia (DEEWR, 2013) and internationally (OECD, 2010). The national curriculum (ACARA, 2014) encourages the use of new technologies and emphasises the importance of multiliteracies. At the same time, teachers face the challenge of implementing a new curriculum at a period of strong investment in new technologies, with high community and political expectations of improved learning outcomes (Digital Education Advisory Group, 2013). There is a need for a strong empirical and theoretical basis to inform the investment in and engagement with mobile technologies in Australian schools. The challenge is to develop and facilitate the use of effective mobile pedagogies based on evidence of how they contribute to quality learning of school curricula (Pegrum et al., 2013). This paper introduces the Mobile Pedagogical Framework (Kearney, Schuck, Aubusson & Burden, 2012), which was developed to provide a pedagogical framework for m-learning, a framework which foregrounds pedagogy rather than technology.

## Framework for m-learning

Numerous frameworks for m-learning exist, but a feature of many of them is the focus on technological affordances. The framework under discussion here is based on socio-cultural theory. It has been developed to consider aspects of learning that are particular to m-learning.

Governments are faced with making important and costly decisions about the deployment of mobile technologies in teaching and learning (Digital Education Advisory Group, 2013). Understanding the impact of these technologies on learning and teaching requires an understanding of decisions made by educational stakeholders. Choices currently being made by governments, schools and teachers, in a country with one of the highest penetration rates in the world in mobile technologies (Google & Ipsos, 2012), will profoundly influence Australia's future education, social fabric and national capability. Educational leaders and technological innovators are making critical decisions about what pedagogies should be promoted and what technologies are made available in schools. Maths and science teachers are making daily choices about what technologies they employ in teaching and about how their students use these technologies (Schuck et al., 2012).

The challenge of effective adoption and utilisation of new ICTs in schools can only be addressed if we understand the interactions between the complex social dynamics of the learning environment and the technology (Salomon & Perkins, 1998; Wertsch, 1991). To understand and influence this complex socio-technological-educational environment of schools, a bricolage of research theories and methodologies is essential (Kincheloe, 2005). Facer et al. (2003, p. 226) recognise that there is "no single theoretical framework available sufficiently rich to allow us to prise open all of the complexities" inherent in educational technology innovation.

Teacher and student decisions about adoption and use of mobile technologies are influenced by the type of technology, its design, and existing patterns of use. They vary according to a wide range of interacting factors such as: pedagogical beliefs and confidence levels (Ertmer & Ottenbreit-Leftwich, 2010); socio-economic gaps between student cohorts that affect access to technology (Somekh, 2004); user choices that trade off various benefits and costs; ease of use; and school contextual factors that promote or inhibit innovation (Aubusson et al., 2014).

The Mobile Pedagogical Framework (Kearney, et al., 2012) consists of a validated set of central dimensions of mobile learning: authenticity, collaboration and personalisation. In analyses of learning activities, location on these dimensions provides a nuanced interpretation describing and articulating the underpinnings of quality mobile learning and pedagogy. The framework is useful in scrutinising the extent to which these fundamental dimensions of mobile pedagogies are being employed in classroom practices.

Figure 1 below demonstrates what the Framework looks like, and takes into account, the malleability of time and space that is characteristic of mobile learning. By this we mean, that mobile learning allows learning to take place at the time and place of the learner's choosing and this is a factor that needs to be considered by teachers if they wish to utilise the full power of mobile learning.

### *The framework for maths teaching and learning*

In what follows, each of the dimensions is explored with a focus on what the framework tells us about knowledge and pedagogy in maths education.

The dimension of authenticity: Here the fit to context is considered. Two sub-dimensions of authenticity are the contextualisation of the mobile activity and the situatedness of that activity. These sub-dimensions fit well with developments in maths education over the last two decades. A focus in the Australian mathematics curriculum is on "numeracy capabilities that all students need in their personal, work and civic life, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built." (ACARA, 2014). To develop these capabilities there is a need to

teach maths that is both authentic in terms of the tools, settings and people and that is useful for future work. Examples of mobile learning in maths that are located on the ‘high-end’ of the authenticity scale would be the use of geo-location apps to investigate distances, and data capture apps that allow common social issues to be investigated e.g. water quality or calculation of ‘food miles’. Importantly, these activities need to be followed by discussion on what the data means and how it can be used.

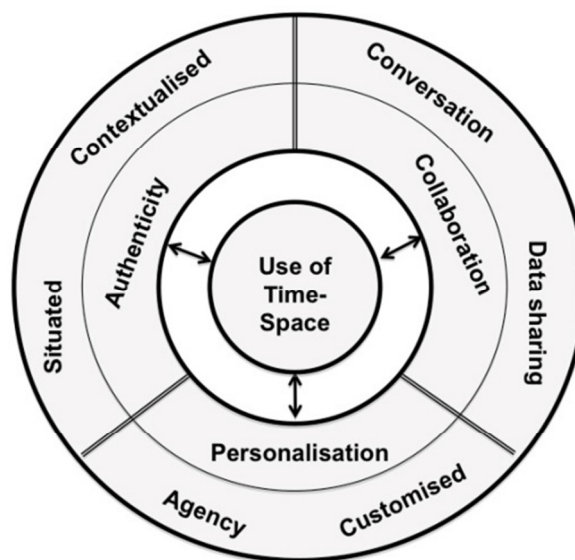


Figure 1. Current framework comprising three distinctive characteristics of mobile learning experiences, with sub-scales. From Kearney et al. (2012).

The second dimension is that of collaboration: comprising two sub-dimensions of conversation and data sharing. Examples such as the ones above would fit here as would conversations with a community of mathematicians to find out what maths they need to solve problems of the day (as in the Maths Inside project that is currently under development by the author and others). Data can be shared, stored and collected through the mobile device and then analysed collaboratively using collaborative spreadsheets and documents.

The third dimension is the personalisation one. The dimension has two sub-dimensions, agency and customisation. This dimension refers to the way that the user is able to design their own experiences and can customise both the device and the activities to suit them. With respect to mobile learning in maths, this dimension would enable students to collect data as and when they wish to, to develop their own projects to investigate, using inquiry-based learning and to work at individual levels in a differentiated way.

The research program in which I am currently engaged considers how to support teachers to use mobile-intensive pedagogies in maths education, in ways that are authentic, collaborative and personalised. These pedagogies align well with ongoing moves in maths education to encourage the use of rich tasks, differentiation and ways of engaging students in mathematics. Communities of learners are also encouraged and fit well with ideas of collaboration indicated by the Framework.

The challenge is now to provide form and substance to the ways that the Framework can be used in maths teaching. The projects I am currently engaged in are investigating this challenge.

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