

## Chapter 37

# Learning Maths with Mobiles: Cross-Cultural Design of Technology with Experiences in South-Africa and Finland

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### **ABSTRACT**

*This chapter presents an overview of our experiences on cross-cultural design of technology in the context of mobile learning focusing on supporting learners to study mathematics in two different countries. The aim of our study is to discuss design issues from the perspective of two different types of cultures and reflect culturally sensitive issues based on a longitudinal study, which included empirical data from altogether over 3500 learners of grades 9 and 10. As a result we outline two focus areas: content and concept for best design practices. Furthermore, we argue that cross-cultural design of technology can help to identify culturally sensitive areas such as attitudes towards informal and collaborative learning and recognizing the local context for the content. Cross-cultural design of technology supports development of good user experience of mobile learning services for different local learning contexts.*

### **INTRODUCTION**

During the mobile device era, it is suggested that learning can take place anywhere and anytime and learning with mobile devices is stated to be a global aim and phenomena, see e.g. UNESCO's Education for All principle and Mobile Learning Technology Concept Development (UNESCO ICT Education development). Indeed, mobile learning is a very global phenomenon, because not only in the developed countries but also in the developing countries the spread of mobile technology has been rapid during the past ten years. Mobile technology may enhance the learning in many ways compared to the traditional class room education, where both the teacher and the learner share the same space and context. With mobile technology, learners can be in different locations and can access learning content outside

DOI: 10.4018/978-1-5225-0783-3.ch037

the classroom. Mobile technology can also support the self-learning process outside the classroom and school hours. According Sharples, Taylor and Vavoula (2011, 87) “ A new generation of location-aware mobile phones will offer further possibilities of education services and educational media matched to the learner’s context and interests”. As mobile learning has become a global phenomenon and millions of learners are using their mobile devices every day to learn something at school or outside their school, either alone or as a member of a small or big local or global group, the design and implementation of learning services is a very important area to discuss and develop. But what is our understanding of the characteristic for the design and implementation of a good learning technology? Furthermore, if we state that learning can take place anywhere and anytime, is it culturally sensitive how we interpret anytime and anywhere, and above all, what do we mean by good learning technology in different local learning contexts? There is currently considerable globalization of markets for interactive systems such as mobile learning technology, which means that most of the products and systems are designed and targeted globally but users of these systems are always local. This means that different learners around the world have different needs and requirements for the mobile learning systems. These needs and requirements can vary locally from one country to another. We argue that to be able to support the design of good learning technology and consequently the learning with mobile technology in the best possible way, we must understand the local cultural context where learning occurs. This includes practical physical issues such as the availability of mobile network and services, mobile device penetration and access to information as well as more hidden issues such as motivations, attitudes, aims, hopes, as well as fears towards technology.

In general and as a starting point for the design of a learning service and a learning device, is that devices should be as easy and as efficient as possible to use. Thus, the focus should be on usability of the product or system as it is a fundamental design principle in supporting the learning with technology, interaction between mobile learner and /or groups of learners. In our study, by design we refer not only to interfaces or technologies, but to more general construction including design approaches, concepts, content and user interfaces. According to the ISO 9241-11 standard, usability is defined as “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.” By efficiency we mean how quickly the user performs tasks once she/he has learnt the system design and by satisfaction we refer to how pleasant the design is to use. However, in recent research of usability, the focus has turned to into a broader concept called user experience (UX), which should be analyzed when designing and implementing technology for diversity of users. User experience is defined according to ISO 9241-210 as “A person’s perceptions and responses that result from the use or anticipated use of a product, system or service” including users’ emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use. The ISO 9241-210 also lists three factors that influence user experience: system, user and the context of use. Furthermore, the design process of the interactive system in general is described in ISO 9241-210 (Human-centered design processes for interactive systems), which also underlines the aim to understand and specify the context of use, in addition to that user and organizational requirements should be specified and designs should be evaluated against these requirements. Therefore, in relation to design and development of mobile learning services, we argue that we must not only understand the interaction between the technology and the user/learner(s)/ teacher(s), but also the broader perspective of the context where learning occurs, for example, beliefs, attitudes and preferences. In the context of developing good mobile learning solutions human-centered design principles would mean that the design process and the actual product or service would not only

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