Chapter 12

Mobile Learning: Benefits of Augmented Reality in Geometry Teaching

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ABSTRACT

As a consequence of the technological advances and the widespread use of mobile devices to access information and communication in the last decades, mobile learning has become a spontaneous learning model, providing a more flexible and collaborative technology-based learning. Thus, mobile technologies can create new opportunities for enhancing the pupils' learning experiences. This chapter presents the development of a game to assist teaching and learning, aiming to help students acquire knowledge in the field of geometry. The game was intended to develop the following competences in primary school learners (8-10 years): a better visualization of geometric objects on a plane and in space; understanding of the properties of geometric solids; and familiarization with the vocabulary of geometry. Findings show that by using the game, students have improved around 35% the hits of correct responses to the classification and differentiation between edge, vertex, and face in 3D solids.

DOI: 10.4018/978-1-5225-5023-5.ch012
INTRODUCTION

Mobile platforms are now part of young people’s life. Their pervasiveness makes them an ideal vehicle for the development of educational content both for classroom activities and informally. The possibility of learning anywhere and at any time is one of the most remarkable features of mobile learning. The past years have seen a great increase in mobile learning, alongside a larger offer of contents and technological possibilities and a greater interest among people in buying and using mobile platforms. Mobile technologies are becoming more embedded, ubiquitous and networked, with enhanced capabilities for rich social interactions, context awareness and internet connectivity. Such technologies could have a great impact on learning (Naismith, Lonsdale, Vavoula, & Sharples, 2004). As a research field, mobile learning is relatively new. According to Catenazzi & Sommaruga (2013, p. 9), ‘the first initiatives date back to the last decades of the 1900s, but the wide diffusion of mobile learning took place starting from 2000 as a result of the large availability of mobile technologies’.

Mayer (2005) describes the cognitive theory of multimedia learning as several cognitive processes that include the selection of relevant visual and verbal materials, organization of these visual and verbal mental representations in coherent structures in working memory (short-term memory), and integrating the representations among themselves and with prior knowledge. The author also refers to the importance of design to prime these different cognitive processes in order to create multimedia instructional messages, in other words, to communicate containing images and words intended to foster learning (Mayer, 2005). Furthermore, the Cognitive Load Theory complements this process model by describing three types of cognitive load: intrinsic cognitive load, which describes the natural complexity of the information, germane cognitive load, which describes the amount of mental effort in the acquisition of knowledge by the learner in comprehending the materials, and extraneous cognitive load, which describes processing demands of information that is not directly related to the learning task, but to the manner in which instruction materials are designed. (Sweller, 2010). Therefore, in this cognitive perspective, the design of educational materials has effects on the cognitive process.

Pupils’ motivation is probably one of the most important factors for teachers in the enhancement of the learning process (Williams & Williams, 2011). Motivation is an inner state which stimulates pupils to engage in a certain task (Lei, 2010). In this context, by promoting entertainment and voluntary performance, games are related to a cognitive process of intrinsic motivation (Dichev, Dicheva, Angelova, & Agre, 2014).

Given the current technological possibilities and the popularity of games, the interest in games in a learning context has been on the rise (Bie & Lipman, 2012;
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