# Chapter 5.13
# Learning by Pervasive Gaming:
## An Empirical Study

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## ABSTRACT

This chapter investigates how mobile games can be used for an efficient transfer of knowledge in learning processes that connect between the real world and the virtual world. In this chapter, the pervasive game concept is implemented on mobile phones as a means of enabling interaction and communication to support learning activities. The chapter presents the design of a new pervasive learning game, which was compared with a conventional pedagogical approach in terms of long-term learning results and learning efficiency. The empirical results revealed that the pervasive game led to higher energetic activation, more positive emotions and attitudes towards learning activities, and more efficient knowledge transfer than the conventional case-study approach.

## INTRODUCTION

The current debate about effective and efficient learning can be characterized by the learning environments that support learners' autonomy and enable cooperative learning for authentic problems (Euler, 2005; Gräsel, 1997). This approach should allow the effective transfer of core competencies such as the capacity for teamwork, autonomy or readiness to take on responsibility, because in professional life these features are often even more important than simple professional competence. This claim originates from the view that knowledge imparted by conventional learning methods, such as pure "tell-test teaching," leads to accumulation of inert knowledge. This kind of knowledge is sufficient for passing exams in school, but fails when applied in real situations,

especially in professional life (see also chapter XIV for this professional learning experience). In a more open and complex situation students (or learners) often fail to translate the things learned into real-life problem solving.

As a reaction to this situation, application-oriented learning environments, such as the traditional paper-based case study, which are conducted in teams, have been introduced. Empirical studies (e.g., Thomas, 2000) for learning by case studies have been in existence for many years. However, this approach neither enables a direct interaction with the real world nor includes technologies that are frequently used by students. In order to address this problem, one should look for Web, mobile, and interactive learning methods. We personally believe that this would be possible by means of a special type of digital game, namely pervasive games.

In general, digital games are considered to involve participants more actively in a learning process. However, commercial games often lack such pedagogically desired learning content. Digital game-based learning—the combination of digital games and high-quality learning content—would be in this context an invaluable pedagogical-didactic medium, engaging the student in the learning process.

The combination of digital games, in particular, with the real world, for example in the form of pervasive games, provides immense opportunities, but at the same time also represents a challenge. Mobile phones are the most important communication devices for young people, with penetration rates of over 100 percent in many European countries. It would therefore seem logical to use them for innovative learning models as well. However, up to now, mobile phones have mostly been used exclusively as devices for simply delivering certain learning modules, not as an interactive medium for learning. Consequently, we chose the "low tech–high involvement" approach in developing a system that does not require sophisticated devices and can be used in a large

variety of situations.

The objective of this chapter is to employ currently available technological opportunities to develop an innovative learning platform that enables efficient, practice-oriented transfer of knowledge. In this context, learning games based on pervasive gaming would present a very promising approach. The concrete implementation of pervasive learning games would facilitate empirical research of this novel learning environment and an accompanying analysis of the games' potentials. The results could provide an innovative contribution to coping with current challenges in knowledge transfer.

## BACKGROUND

Traditional learning methods no longer suffice to fulfill the requirements of a modern teaching structure and do not sufficiently contribute to the acquisition of core competencies such as teamwork, independence and willingness to take on responsibility. It is against this background that current problems and constructivist solution approaches (see also chapter I of this book for more details) and their limitations are discussed. In addition, the potentials of mobile technologies, which present high-level, emotional information and communication channels, are discussed. Using these potentials in pervasive games leads to the development of a new type of game-based learning that can be employed in the creation of an innovative learning environment and for the expansion of constructivist solution approaches.

## Transferring Knowledge

Traditional teaching methods in schools and universities often build upon the principle of the "Nuremberg funnel" (Hirschfelder, 2006) in which all content can be learned as expertise through a methodology which is purely based on lectures. The teacher is assumed to know

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