

# Chapter 47

## Ubiquitous, Wearable, Mobile: Paradigm Shifts in E-Learning and Diffusion of Knowledge

**Sebastiano Nucera**

*University of Messina, Italy*

**Gennaro Tartarisco**

*Institute of Applied Sciences and Intelligent Systems, Italy*

**Aldo Epasto**

*University of Messina, Italy*

**Donatello Smeriglio**

*University of Messina, Italy*

**Alessandro Mazzeo**

*University of Messina, Italy*

**Giovanni Pioggia**

*Institute of Applied Sciences and Intelligent Systems, Italy*

**Alessandra Anastasi**

*University of Messina, Italy*

### ABSTRACT

*Ubiquitous devices and wearable technologies are becoming smaller and more rich in features to meet user demands and applications. The emergence of ever more sophisticated technologies has created new relationships between real, virtual, and augmented world. This is quite evident, within educational contexts. This chapter will explore new learning approaches based on virtual and augmented reality technologies. Virtual and augmented realities dispense specific knowledge and information. This chapter will discuss augmented reality and education applications based on virtual reality. The chapter will differentiate between ways in which wearable technologies enhance and restructure teaching and learning processes. To circumscribe a well-defined level of analysis, the chapter will examine experiences of using wearable technology within educational contexts.*

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## **INTRODUCTION<sup>1</sup>**

Advances in technological systems have promoted the creation of interactive environments that exceed an instrumental perspective, creating the optimal settings for a culture of interaction between individuals and contexts. The application of computers related to learning and teaching environments dates to the development of language laboratories facilitating the growth of speaking and listening skills (cf. McCarty, Obari & Sato, 2017; Ogata et al., 2015). Shifts in technological enhancement have led to the development of ecologically-adaptive technologies embedded in educational systems (for a review of empirical studies, see Pimmer, Mateescu, & Gröbriel, 2016). For example, small components with excellent operational performances can now be worn on the human body. The changes to society that are brought about through this connectivity between technology and the human body have been explored by Marshall McLuhan (1994):

*The new media and technologies by which we amplify and extend ourselves constitute huge collective surgery carried out on the social body with complete disregard for antiseptics. If the operations are needed, the inevitability of infecting the whole system during the operation has to be considered. For in operating on society with a new technology, it is not the incised area that is most affected. The area of impact and incision is numb. It is the entire system that is changed. (p. 86)*

The complexity of knowledge systems and managements, particularly in the education area, required the inscription of high-level performance and functioning components (Derboven, Geerts, & De Grooff, 2017). The present technological generation tends toward contextual and personal attributes. The discourse of incorporating (and accepting) it within the educational system requires a change in understanding the implications of wearable, ubiquitous and portable technologies related to learners (Peña-Ayala, Sossa & Méndez, 2014; Şad & Ebner, 2017). The enhancement of learning is provided for by the ability to relate real-life knowledge and experience in the learning context (structured and unstructured). The proposal recently suggested by Peña-Ayala and Cárdenas (2016) summarizes the ongoing restructuring within the education and training sectors, substantiating what the authors define as mobile, ubiquitous, and pervasive learning or MUP-Learning that is based on the ability to access knowledge without physical constraints, which is adaptive and relates to the degree of wearability.

Contrary to traditional systems of learning and teaching, the realization of effective computing in knowledge dissemination has created an opportunity for the development of platforms and activities in modern education. The sensorial multidimensionality generated by the corporeal prosthetic process (also due to a geographically unbalanced technological evolution and heterogeneous social uses) leads us to consider these findings as an interim step in a paradigmatic line of an investigation linked to unpredictable dynamics.

The discovery of effective computing as a tool for knowledge dissemination (e.g. Shirky, 2010) presented new possibilities for modern education platforms and activities unlike those offered by traditional learning and teaching platforms. Despite the educational importance attached to virtual reality, augmented reality models are fierce rivals. According to Chen et al. (2008) and Crompton (2016), both augmented and virtual reality have impacted the restructuring and enhancement of teaching and learning by wearable technologies. This chapter will review a series of technology applications in the education

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