

Chapter 10

Three Dimensional (3D) Simulation for Ubiquitous and Inclusive Learning in a Digital Era

Maria Antonia Lima Gomes

Bahia State University, Brazil

Ramesh Chander Sharma

Ambedkar University Delhi, India

Alfredo Eurico Rodrigues Matta

Bahia State University, Brazil

Lucas Robatto

Federal University of Bahia, Brazil

ABSTRACT

With the advances in web technologies, learning of scientific phenomena has taken a new dimension. Emergence of 3D Simulation, virtual and augmented reality has added a new dimension to the way we learn a particular concept. These digital technologies provide us an opportunity to create representations of scientific, technical and historical phenomena. Pictorial models have been reported to be effective in representing molecular reactions to explain concepts which involve invisible structures and dynamic characters. Researchers have suggested that a combination of virtual labs and physical experiments can enhance students' conceptual understanding of scientific phenomena more than the use of virtual tools or lab experiments alone. This chapter will explain the development of the São João da Bahia Virtual Museum, a project consisting of a three-dimensional (3D) modeling and imaging program as a means of ubiquitous and inclusive learning in a digital era.

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INTRODUCTION

With advances in web technologies, the learning of scientific phenomena has taken on a new direction. The emergence of virtual and augmented reality has added a new dimension to how we learn a specific concept (Sharma, 2014). These digital technologies give us the opportunity to create representations of scientific, technical and historical phenomena. Lantz-Andersson, Linderöth and Säljö (2009) reported specific and effective models for representing molecular reactions to explain concepts involving invisible structures and dynamic characters. Chao et al. (2016) and Olympiou and Zacharia (2012) have suggested that a combination of virtual labs and physical experiments can enhance students' conceptual understanding of scientific phenomena more than the use of virtual tools or laboratory experiments alone. Chu (2007) found that online scenario-based learning provides an opportunity for students to immerse themselves in practically a scenario that can enhance their learning and knowledge. Gomes (2017) shows the applicability of this new facet of the virtuality, mainly, in the educational field through three-dimensional modeling and 3D images program of the Virtual Museum of São João da Bahia, which offers an immersive environment where the visitor practically experiences the culture and society of that period in time.

In this sense, of new advancements in the virtual age and its ubiquitous developments, our chapter explains how the ubiquitous and inclusive learning in digital era can be accomplished using 3D simulations. We support our discussion by examining the development of the Virtual Museum of São João da Bahia, that consists of modeling and three-dimensional (3D) image as a means of learning omnipresent and inclusive in a digital age. The modeling, 3D simulation, of the São João da Bahia Theater (TSJBA) has a great historical and cultural significance for the city of Salvador, Bahia and Brazil, since it represented an inheritance that was in tune with the nineteenth century, and still echoes today. The computational and virtual environment for this 3D simulation was built around epistemological principles of socio-constructivism and with interdisciplinary argumentation, since there was a need for dialogues, not only with History itself, but with diverse areas such as Music, Architecture, Technologies and Graphic Design. The method adopted was DBR (Design Basic Research), which allowed us to seek practical and applied solutions backed by methodological epistemology in Gramsci (1989), Praxiology and socio-constructivist principles (Vygotski, 2007; Bakhtin, 2010).

The objective of this chapter is to highlight the significance of 3D modeling and simulation for ubiquitous and inclusive learning because in digital era we can successfully create such environments where learners can participate and involve in immersive environments. EDUCAUSE (2018) in its NMC Horizon Report Preview > 2018 Higher Education Edition identifies adaptive learning technologies and

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