Chapter 16
Digital and Spatial Education Intertwining in the Evolution of Technology Resources for Educational Curriculum Reshaping and Skills Enhancement

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ABSTRACT

The aim of this research is to deepen how digital education has been intertwined with spatial education throughout the evolution of technology resources. In the last years, the user experience has been improved by open-source, collaborative user-generated, and immersive content – starting from multimedia/hypermedia architectures to synthetic learning environments. This research analyses which spatial design principles have influenced multimedia/hypermedia, collaborative web 2.0 interfaces, and more recently the synthetic environments of virtual worlds. The evolution of technology resources supports the hypothesis of a continuous intertwining between digital and spatial education since multimedia/hypermedia architectures, in which spatial knowledge may play a significant role in web-based design according to individual differences in hypermedia fruition, prior knowledge in the field, and personal experience in web-based instruction. In collaborative user-generated content technology, visual presentation facilitates learning co-construction and spaces are intended as synchronous and asynchronous virtual knowledge spaces of communication. In 3D virtual learning environments, spatial interaction is really developed and may open full accessibility to further studies on digital and spatial education. In the joined field of learning and ICT, the main scope of digital technology knowledge sharing, and re-shaping, is the enhancement of digital skills based on experiences in educational activities and the re-thinking of the nature and the format of educational curriculum to implement more experiences in the digital – and, possibly, spatial – fields.

INTRODUCTION

Technologies are generally considered neutral in relation to the aims for which they are developed or to which they are applied (Lewin, Lundie, 2016). But digital education cannot be seen as neutral towards technology; 'pedagogy is never innocent' (Santoianni, 2006). Any educational resource, and in particular educational technology resources, is indeed influenced by specific pedagogically oriented criteria. Since the increased use of ICT has not yet really produced the expected and predicted relevant changes in learning (Means, Roschelle, 2010), to gain ground-breaking pedagogical shifts in the joined field of learning and ICT, educational technology resources should be designed accordingly both to the evolution of technology resources' own design and to the educational trends of digital education, possibly intertwined with spatial education (Boniello, Paris, Santoianni, 2017).

The recent 'spatial turn' in many fields of research (Warf, Arias, 2008) has encouraged research in spatial education as a new worthwhile challenge (Newcombe, Frick, 2010) and a new frontier (Montello, Grossner, Janelle, 2014). Spatial skills[1] are actually required in digital education since new technologies have highly demanding spatial tasks (Bodenhamer, Corrigan, Harris, 2010). Even if spatial thinking has been linked to performance across a range of academic disciplines and it can be improved in all ages learners, it has been recently defined as to be still "a neglected area of teaching and learning" (Hawes, LeFevre, Xu, Bruce, 2015).

In the last years, the user experience has been improved by education in classroom and in digital world, in formal and non-formal educational settings, passing throughout open-source, collaborative user-generated, and immersive content – starting from multimedia/hypermedia architectures to synthetic learning environments. The aim of this research is then to deepen how digital education has been intertwined with spatial education throughout the evolution of technology resources and which spatial design principles have influenced multimedia/hypermedia, collaborative web 2.0 interfaces, and more recently the synthetic environments of virtual worlds.

SPATIAL NAVIGATION IN MULTIMEDIA/HYPERMEDIA ARCHITECTURES

Web-based online learning has been rooted in education and training since the 1990s in the Anglo-Saxon context (Means & Roschelle, 2010) through multimedia/hypermedia architectures, which are learner-controlled interactive technologies (Dede, 1996) mainly designed to increase the accessibility of learning experiences, to enhance high quality of instructional content, and to better handle more groups of students through distance education (Trefftz, Correa, Gonzalez, Imbeau, Restrepo, Velez & Trefftz, 1998). Multimedia/hypermedia architectures use synchronous, asynchronous online, and blended formulas, which display data in multiple formats in order to allow personal approaches to content.

The earliest cognitivist idea (Santoianni, 2010) – started up since the 1960s – to identify learner's preferences and state of knowledge to individualize content's fruition is developed by multimedia/hypermedia research, which focuses on individual differences and learning styles for managing knowledge webs to analyze learner's preferred mode of communication.

Multimedia/hypermedia research deepens indeed how individual differences may influence students' patterns in web-based instruction and how a web-based instruction program can be designed to accommodate individual differences (Chen & Paul, 2003). Web-based instruction allows students – coming from heterogeneous backgrounds in terms of preferences, skills, and needs – to have a non-linear interaction

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