Chapter 7.4

Crouching Tangents, Hidden Danger:
Assessing Development of Dangerous Misconceptions within Serious Games for Healthcare Education

Miguel A. Garcia-Ruiz
University of Colima, Mexico

Jayshiro Tashiro
University of Ontario Institute of Technology, Canada

Bill Kapralos
University of Ontario Institute of Technology, Canada

Miguel Vargas Martin
University of Ontario Institute of Technology, Canada

ABSTRACT

In this chapter, the authors examine different types of serious games for healthcare education and pose some hard questions about what they know and do not know about their effectiveness. As part of our analysis, the authors explore general aspects of the use of educational simulations as teaching-learning-assessment tools, but try to tease out how to study the potential such tools might have for leading students toward developing misconceptions. Being powerful instruments with the potential of enhancing healthcare education in extraordinary ways, serious games and simulations have the possibility of improving students' learning and skills outcomes. Their contribution is an overview of current education technologies related to serious games and simulations with a perspective of potential development of misconceptions in the healthcare education community, with a special focus on millennial students. In addition, the authors provide insight on evidence-based learning and give a perspective of future trends.

INTRODUCTION

Our work in the health sciences identified a number of issues in the literature that raise concerns about possibilities of health sciences students developing misconceptions while working within

certain types of instructional modalities. Some of these misconceptions could have deadly consequences as these students progress into positions of healthcare providers and become engaged in patient care. Misconceptions can be defined as students' mistaken thoughts, ideas, notions, an underdeveloped pattern recognition (Balkissoon, Blossfield, Salud, Ford, & Pugh, 2009), and can develop before, during, and after learning, leading to erroneous concepts in conceptual and performance competencies (Ozmen, 2004). A number of students' mistaken beliefs about the sciences are present in incoming student population, which affect students' performance in undergraduate and even graduate courses (Halloun & Hestenes, 1985; Ozmen, 2004). Literature describes a number of studies regarding students' misconceptions in the health sciences, including students' erroneous concepts, such as in respiratory physiology (Michael et al., 1999). Emerging computer simulations have been used to uncover and address serious health science students' misconceptions, such as erroneous preconceptions in clinical digital rectal examination (Balkisoon et al., 2009), a critical procedure used in the detection of colon cancer that needs to be properly learned and practiced.

In this chapter, we argue that serious games (video games whose main objective is educational in contrast to entertainment) and computer simulations appear to have a high potential for shifting the way content and skills are taught and possibly improving higher order reasoning. However, we also point out that evidence is lacking for a generalized theory of how and why to build serious games so that they "really work" to improve learning in predictable ways and so that they do not promote development of misconceptions. We feel there has been very little attention given to how misconceptions are developed. Certainly, there are some interesting and important contributions to research on misconceptions. As mentioned above, there have been studies of misconception development by medical students, undergraduates working in respiratory therapy,

and a major review of misconceptions developed by students studying chemistry (Balkissoon et al., 2009; Michael et al., 1999; Ozmen, 2004). And, we note very interesting work by Barab and colleagues related to conceptual understanding and consequential engagement in virtual, immersive learning environments (Gresalfi, Barab, Siyahhan, & Christensen, 2009; Barab, Scott, Siyahhan, Goldstone, Ingram-Goble, Zuiker, & Warren, 2009; Hickey, Ingram-Goble, & Jameson, 2009). Even so, given the importance of misconception development in healthcare training, the paucity of research is surprising.

What Really Works in Education

Over a decade ago, Tashiro & Rowland (1997) published a challenge to educators and researchers, posing the confounded questions of: What really works in instructional approaches and materials, for whom, when, why, and with what outcomes? At the time, they were focusing on biological and environmental sciences domains, but they extended their work to look more broadly into a variety of disciplines. In particular, they began to focus on essential problems related to how undergraduate students learn and what types of instructional materials are likely to address seven questions, first posed as an integral set by the United States National Research Council (2000, 2001, 2005):

1. How do instructional materials enhance disposition to learn?
2. How do the materials provide multiple paths for learning?
3. How does an instructional package help students overcome limitations of prior knowledge?
4. When, how, and why do the educational materials provide practice and feedback?
5. Can the instructional materials help students develop an ability to transfer knowledge acquired by extending knowledge and skills

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