

# Chapter 7

## Three Dimensional Virtual Laboratories and Simulations for Education: Classification, Criteria for Efficacy, Benefits, and Criticism

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### **ABSTRACT**

*This chapter provides a detailed study of the current literature surrounding instructional animation. After discussing definitions and classifications of these technologies, the chapter reviews how they can be differentiated from games. The chapter covers subtypes of instructional animation, including experiential, symbolic, and forms considered animation but lacking criteria of effective animation. The three types differ in some points. Important criteria must be considered before, during, and after designation when designing educationally effective software of these animations. If simulations are prepared according to evidence-based guidelines mentioned in the chapter, many benefits will be developed, including pedagogical, motivational, and daily life profits. However, disadvantages exist. Criticisms in literature will be mentioned on an evidence-based level.*

### **INTRODUCTION**

Simulation technologies have markedly invaded the field of education and many highly prestigious universities around the world have integrated them into their official training programs to solve the problem of complexity of subjects they teach such as education and training of surgery in University of Stanford simulator and University of the State of Ohio simulator (OSU simulator), Seymour, N.E., Gallagher, A.G., Roman, S.A., O'brien, M.K., Bansal, V.K., Andersen, D.K. and Satava, R.M., (2002 p.459) said that 'since the onset of the 21st century, the surgical education establishment is searching for new and

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innovative training tools that match the sophistication of the operative methods' consequently several types, definitions and classifications of animation technology or virtual reality methods have popped up in literature and it has become essential for all educationalists to have comprehensive knowledge about the most recent classifications and definitions and to know the minor and major differences that distinguish them. But the most important is to be aware about the difference between simulations in general, games and instructional technologies.

Many researchers support integration of the animation into education thanks to their cognitive, pedagogical and daily life benefits like Jhurree (2005, p. 468) and (Prensky, 2005, p. 8) however other researchers criticize simulations and their role in improving the output such as Koroghlanian and Klein (2004, p. 23) and Thone, N., Winter, M., García-Matte, R.J. and González, C., (2017, p. 117) who believe that such complex methods may hinder the process of education rather than helping students.

So that author has found it is of critical importance to search for and reach some guidelines for effective animations to help educationalists to select the beneficial programs to use and avoid those are so sophisticated and complicated that hinder student performance.

So that the following are the main objectives of the chapter that are expected to solve some of the above mentioned controversies about animations.

## **OBJECTIVES**

After reading this chapter, the audience will understand the:

1. Definition and classification of educational technology
2. Definitions of games, simulations, and animation as instructional technologies
3. Categories and examples of instructional animation
4. Criteria of effective instructional multimedia (EIM)
5. Benefits of the integration of educational animation technology
6. Criticism of instructional animation in literature

## **Instructional Technology**

There are several definitions of educational technology. Roblyer (2002, pp. 14-15) mentioned that “it is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources ... the full range of digital hardware and software used to support teaching and learning across the curriculum.”

The latter definition indicates that educational technology has a process and a tool component. Process is the instructional procedure for applying tools to deliver educational technology to learners. However, it is difficult to determine educational technology tools in names because technological devices are protean (usable in many ways, Papert, 1980), unstable, rapidly changing, and opaque (inner workings are hidden from the user, Turkle, 1995).

The broad term of educational technology includes instructional technology, productivity technology, and administrative technology. Instructional technology, which is the focus of this chapter, is defined by Robert (2001, p. 53) as “analysis, and design, development, implementation, evaluation and manage-

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