

Chapter 5

Student Learning Experience through CoSpace Educational Robotics: 3D Simulation Educational Robotics Tool

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EXECUTIVE SUMMARY

CoSpace educational robotics is a new educational digital media that enables users to try out programs and strategies with both virtual and real objects. The CoSpace educational robotics program was created to integrate digital game- and simulation-based learning with educational robotics—both are popular amongst young generation—in order to attract different populations of students into the STEM field. The chapter introduces the concept of CoSpace and CoSpace educational robotics, the educational theories that support learning through CoSpace educational robotics, and a case study of RoboCupJunior CoSpace educational robotics. During the RoboCupJunior 2011 competition, held in Istanbul, Turkey, 14 teams participated using the CoSpace platform in the demonstration league events—CoSpace Dance and CoSpace Rescue. A survey of participating students was conducted during the

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competition. The results suggest that CoSpace educational robotics promotes learning of collaborative skills and indicates that CoSpace educational robotics might be able to provide the users Csikszentmihályi's flow state (Csikszentmihályi, 2008).

INTRODUCTION

In recent years, there has been strong interest in using interactive digital media and digital gaming in education (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Carlson, 2004; Chatterjee, Mohanty, & Bhattacharya, 2011; Everett, 2008; Gee, 2003; Metzger & Flanagin, 2008; Prensky, 2001). Because of the recent advancement of technology easily accessible by students, computer simulations are recognized as more feasible tools for promoting adaptive learning in K-12 population (Park, Lee, & Kim, 2009). Prensky (2001) explains, "digital-game based learning represents one of the first *effective* and *doable* means to alter the learning process in a way that appeals to, and excites, people from the *Game Generation*" (p. 18). It is also reported that "the next generation of games and simulations has the potential to dramatically improve students' motivation and educational outcomes, as well as generating new insights about the nature of learning" (Gibson, Aldrich, & Prensky, 2007).

In addition, since the invention of the Logo Turtle based on the work by Seymour Papert in late 1960s, educational robotics has been highly regarded in education through projects and team-based robotics tournaments. Educational robotics tournaments have shown the greatest impact on the growing popularity of educational robotics in K-12 setting around the world (Eguchi, Hughes, Stocker, Shen, & Chikuma, 2012; Stubbs, Casper, & Yanco, 2012). A growing number of robotics competitions and events are available both at national and international levels such as the FIRST Robotics Competition, the FIRST Tech Challenge, FIRST LEGO League, and Junior FIRST LEGO League organized by The FIRST organization (<http://www.usfirst.org/>), BotBall (<http://www.botball.org/>), RoboCupJunior (<http://www.robocupjunior.org/>), and World Robot Olympiad (<http://www.wroboto.org/>). Many of the tournaments that started in late 1990s to early 2000s have brought robotics to a large population of students (Stubbs, et al., 2012). The learning process provided by designing, building and programming robots provides excitements among students (Nourbakhsh, Hamner, Crowley, & Wilkinson, 2004). Mataric also states that educational robotics has "the potential to significantly impact the nature of engineering and science education at all levels, from K-12 to graduate school" (Mataric, 2004, para 1).

The reports mentioned above all address the positive learning experiences that students have through interactive digital media, namely digital simulation, gaming, and educational robotics. Why not combine them all together to create an advanced digital interactive media that would support the positive learning experience? The

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