Chapter 4

Design and Development of an Instructional Program for Teaching Programming Processes to Gifted Students Using Scratch

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ABSTRACT

This chapter examines practical applications of an educational program designed to teach Turkish gifted second, third, and fourth grade students programming using Scratch, an online programming website (https://scratch.mit.edu). This qualitative research study was conducted with gifted identified students in an elementary school in Ankara’s Altındağ district. Qualitative data collection methods were used. The study found program strengths included practical orientation, student independence, student free expression, computer literacy, and interdisciplinary connections. Additionally, providing a variety of tools and equipment, using Scratch, having a course web site, and on-line resource sharing were also seen as strengths by the participants. Perceived weaknesses were technical difficulties, the limited number of course hours, some of Scratch’s negative features, inadequate help at particular points, and negative situations caused by gender and grade level differences. Results indicate preliminary knowledge of participant computer literacy as important to programming success.

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INTRODUCTION

Computer programming can aid in the development of higher level thinking in children (Brichachek, 2014) and is currently seen as one of the important qualifications that every 21st century student should have (Computer Science Teachers Association [CSTA], 2010; DiSessa, 2001; Einhorn, 2011; Fessakis, Gouli, & Mavroudi, 2013; Grover & Pea, 2013; Yen, Wu, & Lin, 2012). Programming education that begins in the early grades may aid in development of 21st century skills like creativity, critical thinking and problem solving (Clements & Nastasi, 1999; Lau & Yuen, 2011; Lee, 2011; Liao & Bright, 1991; Kalelioğlu & Gülbahar, 2014; Partnership for 21st Century Skills, 2007). Moreover, children involved in programming can improve their communication skills (Clements & Nastasi, 1999).

One of the biggest obstacles in implementation of early age programming education is that traditional programming languages are hard to learn (Çatlak, Tekdal, & Baz, 2015). Programming settings that prioritize visual learning, such as the website community at http://scratch.mit.edu, make it easier to learn programming. (Shin, & Park, 2014). Likewise, according to Buckleitner (2007) Scratch can be seen as compatible with a constructivist approach because of both its code block’s drag-drop form and puzzle-like programming format. The Scratch environment has the ability to merge different media types (image, audio, video, etc.) to help improve 21st century skills (Romero, 2010). Scratch enables preparation of multimedia projects and can be used in lectures as well as in programming. These features are also motivational for students while enabling the development of critical thinking (Calder, 2010). Moreover, Scratch can be used as an appropriate educational tool in the education of highly gifted students (Shin, Park, & Bae, 2013).

Gifted children have a special place in studies on teaching programming to children due to their higher-level thinking and problem solving skills (Davis, Rimm & Siegle, 2013; Gagne, 2004; Kontaş, 2010; National Association for Gifted Children [NAGC], 2014; National Society for the Gifted & Talented [NSGT], 2014). Likewise, personal gifted student needs and potential should be developed and opportunities in education should be created to meet the specific needs of these high functioning students. For that, programs designed for gifted children that prioritize learner’s needs beyond the traditional education given in schools should be developed (Gagne, 2004). Accordingly, this study
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