Chapter 53
An Examination of High School Students' Online Engagement in Mathematics Problems

Woong Lim

Department of Teacher Education, Educational Leadership & Policy, University of New Mexico, Albuquerque, USA

Ji-Won Son

Department of Learning and Instruction, University at Buffalo, The State University of New York, Buffalo, USA

Susan Gregson

Department of Curriculum and Instruction, University of Cincinnati, USA

Jihye Kim

Department of Secondary and Middle Grades Education, Kennesaw State University, Kennesaw, USA

ABSTRACT

This article examines high school students' engagement in a set of trigonometry problems. Students completed this task independently in an online environment with access to Internet search engines, online textbooks, and YouTube videos. The findings imply that students have the resourcefulness to solve procedure-based mathematics problems in an online environment without formal instruction. This article suggests that self-directed online learning could be more effective for solving procedure-based problems than multi-step problems. Moreover, to be successful in online learning environments, students may need training to improve keyword searching skill and their ability to utilize various online learning tools.

INTRODUCTION

Studies report that students who take mathematics courses online can be as successful as those taking similar courses in face-to-face classrooms (Cavanaugh, Gillan, Bosnick, & Hess, 2008; Heppen, et al., 2012). For instance, Heppen et al. (2012) found that students with access to online Algebra I in the eighth grade learned more algebra that year than their peers in regular classrooms and were twice as likely to take advanced mathematics courses in high school.

As online learning programs proliferate, researchers have examined the effectiveness of online learning by content area (e.g., Carr, 2000), type of student (e.g., Clark, 1983), and nature of online learning practice (e.g., hybrid, instructor-directed, self-directed) (e.g., Clark, 1983; Means, Toyama, Murphy, Bakia, & Jones, 2009). As high schools expand opportunities for students through online learning programs, research about the suitability of online programs for the students involved will be required. Specifically, it will be useful to know more about how students with different needs respond to the constraints and affordances of self-directed online environments. Thus, more studies analyzing students' autodidactic efforts to solve mathematics problems in online environments are warranted.

In this study, we seek to extend the current literature by identifying barriers and supports for online mathematics learning, and providing details about when and how self-directed learning of procedure-based mathematics problems can be most effective. Specifically, this study examines high school students' performance in an autonomous online environment with respect to four key factors that impact learning – persistence, use of online tools, Internet skills, and motivation. In this study, 53 U.S. high school students participating in an afterschool program, engaged in an untimed online mathematics task involving 10 elementary trigonometry problems that had not been taught in advance. The students had access to the Internet and online textbooks, but worked independently. We examined the differences in persistence, use of online tools, Internet skills, and motivation demonstrated by students in this environment. Our study was guided by the following research questions:

1. How did pre-calculus students perform on trigonometry problems in a self-directed online environment?
2. Did students' persistence, use of online tools, Internet skills (keyword searching and speed), and motivation align with their performance (below vs. above average) on a procedure-based mathematics assessment?

LITERATURE REVIEW

Student Interaction in Online Learning

Because of their potential to provide more flexible access to content and instruction at any time, from any place, online learning programs continue to proliferate. Given the rapid and expanding use of online learning in K-12 education, educators, researchers, and instructional designers are faced with the on-going task of understanding the pedagogical implications of online learning for students. Highlighting both the unique aspects of computer mediated learning environments, and their paradigmatic potential for shifting the way we think about teaching and learning, requires attention to multiple student interactions. Rourke and Anderson (2002), who studied computer-based education, identified three kinds of

15 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/an-examination-of-high-school-students-online-engagement-in-mathematics-problems/271196

Related Content

The Growth of Contemporary Music Subject and the Reform of Music Teaching in Universities
Binbin Zhaoand Rim Razzouk (2024). *International Journal of Web-Based Learning and Teaching Technologies (pp. 1-15).*
www.irma-international.org/article/the-growth-of-contemporary-music-subject-and-the-reform-of-music-teaching-in-universities/338362

Getting "Girly" Online: The Case for Gendering Online Spaces
Jen Almjeld (2017). *Handbook of Research on Writing and Composing in the Age of MOOCs (pp. 87-105).*
www.irma-international.org/chapter/getting-girly-online/172581

MOOCs in the Global Context
Sushil K. Oswal (2017). *Handbook of Research on Writing and Composing in the Age of MOOCs (pp. 39-55).*
www.irma-international.org/chapter/moocs-in-the-global-context/172578

Crowdsourcing and Education with Relation to the Knowledge Economy
Kathleen Scalise (2011). *International Journal of Web-Based Learning and Teaching Technologies (pp. 1-13).*
www.irma-international.org/article/crowdsourcing-education-relation-knowledge-economy/62089

Improving E-Learning Support and Infrastructure: An Evidence-Based Approach
Carmel McNaught, Paul Lam, Christina Keingand Kin Fai Cheng (2006). *Technology Supported Learning and Teaching: A Staff Perspective (pp. 71-90).*
www.irma-international.org/chapter/improving-learning-support-infrastructure/30231