

Students' Interest for and Work with Applet-Enhanced Word Problems

K. Ann Renninger¹, Nathalie Sinclair, Victoria M. Hand, Hollylynn Stohl,
Suzanne Alejandre & Jody S. Underwood

¹Educational Studies, Swarthmore College, 500 College Ave., Swarthmore, PA 19081-1397

Tel: 610-328-8347, Fax: 610-690-6892

Email: krennin1@swarthmore.edu

Study of student interest for and work with interactive nonroutine mathematics problems (ESCOT Problems of the Week (EPoWs); mathforum.org/escotpow/) posted on The Math Forum site was undertaken to address two questions: (1) What is the contribution of applet-enhancements to students' interest for and work with nonroutine challenge problems? And, (2) what are the effects of story context and other person scaffolding on student interest for and work with interactive online problems?

Method

A total of 82 (37 g, 45 b) seventh grade students participated in four related studies. A total of 18 (15 g, 3 b) students received applet-enhanced problems with both story and no story contexts, and worked independently; 16 (8 g, 8 b) students received applet-enhanced problems with a story context, and worked with a mentor; 8 (4 g, 4 b) students received applet-enhanced problems with a story context, and worked with a peer partner; and 40 (18 g, 22 b) students participated in an adjunct study in which they received applet-enhanced problems with a story context, and worked with both a peer partner and a mentor.

Each of the studies shared a similar procedure. Students first completed a questionnaire that assessed their interest for, competence in, and feelings of self-efficacy in working with mathematics prior to work with the EPoWs. The students then worked with one or more EPoWs depending on the study. Following work with the EPoWs, students were interviewed about their perceptions of and work with the problems. Dependent variables included mathematical thinking (connections, strategies, and need for support) and accuracy of problem solution. Independent variables were gender, interest, self-efficacy, conceptual competence, and standardized achievement scores.

Results and Discussion

Overall, findings suggest that interactive online problems appear to override differences that would typically be found as a function of students' individual interest for and feelings of self-efficacy about mathematics. An analysis of students' problem solving further suggests that especially for weaker students, this type of environment provides support for developing a mental map for working with nonroutine challenge problems as well as resilience and resourcefulness necessary for successful problem completion. Interview data allow elaboration on these findings. They further suggest that students enjoyed working with the applet-enhanced problems and that they did not necessarily consider the problems to be math problems. Students' differing levels of conceptual competence and achievement tend to account for differences in problem-solving across experiments.

Differences between scaffolding conditions suggest the usefulness of providing a story context over a no story context to accompany the applets. Few differences appeared as a function of the other scaffolding conditions, although strong student pairs in the story-partner study were more likely than the weak student pairs to make real world connections, identify what the problem involved, and recognize alternate solution strategies. These findings replicate and extend those in the existing literature (e.g., CTGV, 1997; Mitchell, 1993; Lepper & Cordova, 1992; Cordova & Lepper, 1996) and suggest that applet-enhanced word problems provide conditions that can optimize student learning. Further study is warranted to determine the extent to which problems of this type support students' learning of specific mathematical content.

Acknowledgements

Support for this study from the National Science Foundation (Grant REC-9804930) is gratefully acknowledged. The findings and their interpretation do not necessarily reflect the views of the National Science Foundation.