

Chapter 14

Assessing Self-Regulation Development through Sharing Feedback in Online Mathematical Problem Solving Discussion

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ABSTRACT

This study examined the relative efficacies of two different metacognitive teaching methods – problem solving (M_PS) and sharing knowledge (M_SK). Seventy-two Israeli sixth-grade students engaged in online mathematical problem solving and were each supported using one of the two aforementioned methods. M_PS students used a problem-solving and feedback process based on the IMPROVE model (Kramarski & Mevarech, 2003). In contrast, M_SK participants were instructed to reflect and provide feedback on the solution without an explicit model. This study evaluated each method's impact on the students' mathematical online problem solving. It also examined self-regulated learning (SRL) processes by assessing students' online feedback using a rubric scheme. Findings indicated that M_PS students outperformed the M_SK students in algebraic knowledge and mathematical reasoning, as well as on various measures of sharing cognitive and metacognitive feedback. The M_SK students outperformed the M_PS students on measures of sharing motivational and social feedback.

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INTRODUCTION

Self-Regulated Learning in ICT Education

Although Information Computer Technology (ICT) environments present significant opportunities for fostering learning (e.g., Lajoie and Azevedo, 2006), relatively little focus has been placed on understanding how students of different ages successfully manage these environments. Researchers and educators recommend investigating methods for the effective use of these powerful but frequently underused learning environments (Azevedo, 2005; Azevedo & Jacobson, 2008). This research is particularly important as there have been numerous calls for more implementation of technology in education (e.g., National Council of Teachers of Mathematics (NCTM), 2000; Program of International Students Assessment (PISA), 2003).

Several researchers have suggested that one potential mediator between the potential of ICT and academic performance is the quality of students' self-regulatory learning (SRL) processes (e.g., Azevedo, 2005; Kramarski & Dudai, 2009; Kramarski & Mizrachi, 2006). SRL refers to a cyclical and recursive process that utilizes feedback mechanisms (e.g., Butler & Winne, 1995; Zimmerman, 2000). Students are considered self-regulated learners to the degree that they are cognitively, metacognitively, motivationally and behaviorally active participants in controlling their own learning process (e.g., Pintrich, 2000; Zimmerman, 2000). In terms of cognitive and metacognitive processes, self-regulated students are good strategy users. They plan, set goals, select strategies, organize, monitor, and evaluate at various points during the acquisition process (Pintrich, 2000; Zimmerman, 2000). In terms of motivational processes, self regulation refers to students' willingness to learn and to attain academic self-efficacy.

Researchers have also begun to direct more and more attention to self regulation on the social level, where knowledge is distributed among the group members, each of whom uses their knowledge and skills to contribute to the group endeavor. Learning on the social level is known as a "community of practice" and as "situated learning" (Wenger, 1998). Wenger (1998) maintains that in order for practice to generate coherence within a community, the essential factors of *mutual engagement, joint enterprise and shared repertoire* must be present. Mutual engagement means that members of a community of practice are engaged in a common negotiated activity. Joint enterprise allows a community to extend the boundaries and interpretation of practice beyond those that were created. Shared repertoire means that members negotiate their communal resources (routines, sensibilities, artifacts, vocabulary, styles).

A survey of current research on online communities of practice (e.g., Johnson, 2001) raises the question as to what exactly constitutes a community of practice in ICT education. An online community is a virtual community that can easily be set up across cultures via the World Wide Web (WWW), a group whose members are separated in space and time (i.e., geographic location and time zone). The other key concept behind online communities is the use of networked technologies so that the members may collaborate and communicate with each other (Johnson, 2001).

Online Mathematical Problem Solving Discussion Forums

Online mathematical problem solving discussion forums are an example of virtual communities in practice. A discussion is a group situation in which many people share their knowledge and opinions with the others in the group, and argue in favor of their opinion. Online discussions provide students with a wide variety of ways to interact with each other (Han & Park, 2008). They allow asynchronous exchange and enable one-on-one

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