Contextualizing Algebraic Word Problems through Story Using Technology

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EXECUTIVE SUMMARY

Using stories in mathematics helps students situate mathematics within a context. This chapter presents an activity for the integration of stories and word problems into an algebra course designed for pre-service teachers. The pre-service teachers designed and created stories using technology (digital cameras and PowerPoint) to support algebraic explorations at the elementary and secondary levels based on the Common Core Standards. A balance of technology, language arts, and mathematics content is possible with these stories. The activity can be extended beyond the university classroom by guiding secondary students in creating their own algebraic stories in the classroom.

INTRODUCTION

Word problems are challenging; students often have difficulty decoding and solving word problems throughout their education (Bernardo, 1999; Patkin & Gazit, 2011; Verschaffel, de Corte & Lasure, 1994). Children's ability in literacy tends to be an indicator of success; the stronger a child is in relation to literacy, the more likely the child will be successful in solving word problems in mathematics (Cummins, Kintsch, Reusser, & Weimer, 1988; Lee, Ng, Ng, & Lim, 2004; Vilenius-Tuohimaa, Aunola & Nurmi, 2008). As such, it would make sense to approach word problems not just from a mathematical perspective but also from a language arts perspective as well.

Gerofsky (1996) critically analyzed the linguistic demands of word problems. Gerofsky found that word problems pose many challenges for students and sometimes contexts that are designed to mirror real life are foreign to students. For example, problems may ask students questions that do not necessarily correspond to real life: When will we ever simultaneously fill and drain water tanks? How often will we purchase food for elephants? Will we ever need to measure the angle of a ladder we put against a house? (Gerofsky, 1996). In a study by Lee (2012), 71 undergraduate pre-service elementary and middle school teachers' perceptions on the connectedness of real-life and word problems were investigated. It was found that their meaning of real-life varied. For example, 56% of the participants "strictly defined the reality of the context as existing here and now, excluding any imaginary or non-current time contexts" (p. 445). And while situated contexts for word problems can be strange when taken literally, they still play a prominent role in mathematics education in all grade levels. They provide an opportunity for students to apply mathematical ideas while decomposing the needed language and mathematics that pertain to the question(s) (Bernardo, 1999). There certainly is value in learning mathematics through the language of word problems as they link mathematics and meaning (Boaler, 1993).

Kyttälä and Björn (2014) investigated difficulties with word problems in relation to literacy skills. They researched 99 adolescents in eighth grade. Their study indicated that literacy skills played an important role in determining success in word problems. In fact, literacy skills were the most powerful predictors of success with word problems. If literacy skills play an important role in determining success with word problems, then it makes sense to try and strengthen literacy skills to improve mathematical success in word problems.

Teaching algebraic word problems concurrently with language arts within a context is possible with the creation of stories. Using technology (PowerPoint), pre-service teachers and secondary students created stories that situated algebra within a context; sometimes a real life context, other times a fantasy context. These stories provided a creative outlet allowing for students to visualize a scenario where algebraic ideas are applied using technology.