

10-2011

Exploring the Effects of Curricula on Fifth-Grade Students' Problem Solving

Jonathan Bostic

Bowling Green State University, bosticj@bgsu.edu

Follow this and additional works at: https://scholarworks.bgsu.edu/teach_learn_pub



Part of the [Education Commons](#)

Repository Citation

Bostic, Jonathan, "Exploring the Effects of Curricula on Fifth-Grade Students' Problem Solving" (2011).
Teaching and Learning Faculty Publications. 24.
https://scholarworks.bgsu.edu/teach_learn_pub/24

This Presentation is brought to you for free and open access by the Teaching and Learning at ScholarWorks@BGSU. It has been accepted for inclusion in Teaching and Learning Faculty Publications by an authorized administrator of ScholarWorks@BGSU.

Exploring the Effects of Curricula on Fifth-Grade Students' Problem Solving

Introduction

Effective problem solvers (1) read and understand the problem, (2) create a situation model, (3) develop a mathematical model, (4) implement a strategy and arrive at a result, (5) interpret the result, and (6) communicate the solution (Verschaffel, Greer, & De Corte, 2000). Reform-oriented materials (e.g., Everyday Mathematics (Bell et al., 2004)) encourage students to become familiar with multiple representations to facilitate problem solving. Secondary students using reform-oriented materials employed more representationally-diverse approaches during problem solving than peers using traditional textbooks (Senk & Thompson, 2006).

Research Question

How does textbook use (i.e., reform-oriented and traditional textbooks) influence fifth-grade students' problem solving?

Method

Students were selected from a larger sample based on textbook use and self-reported prior achievement. Kristy has been using Everyday Mathematics (Bell et al., 2004) since Kindergarten whereas Gavin has used only traditional texts during that time. Both participants were 11 years old. They self-identified themselves as African American and having average ability in mathematics.

Participants were interviewed in an empty classroom for approximately 30 minutes. Interviews were audio recorded. They practiced thinking aloud while problem solving and then completed four open, complex, and realistic tasks adapted from prior research (Bostic & Jacobbe, 2010; Verschaffel et al., 1999). Students were asked to solve the problem and then provide alternative approaches, if known.

Thematic analysis (Hatch, 2002; Braun & Clarke, 2006) was used to help identify patterns of problem-solving behaviors. Interviews were transcribed and strategies were coded using Lesh and Doerr's (2003) then transcripts and students' written responses were explored for themes. Data sources were examined for evidence and conflicting evidence. Problem-solving performance was also examined and responses were coded as either correct or incorrect.

Results

Similarities

- Employed symbolic-oriented representations during initial problem-solving approach.
- Used the problem's context to varying degrees to interpret the result.
- Correctly solved the same problems (i.e., problems two and three).

Differences

Table 1

A Comparison of Participants' Problem-solving Behaviors

Problem-solving Behavior	Kristy (Reform-oriented)	Gavin (Traditional)
Read and understand the text	Read the text, reflected on it, and reread the text.	Read the text once.
Situation and Mathematical Modeling	Conjectured a solution, described the situation embedded within the text, developed a symbolic-oriented or pictorial mathematical model.	Created a symbolic-oriented mathematical model.
Interpreting and Reporting results	Explored appropriateness of result and reported contextually-relevant result for multiple solutions.	Reexamined text briefly and reported contextually-relevant result.
Metacognitive Behaviors	Reread text frequently and self-evaluated during problem solving.	No observed metacognitive behaviors.
Multiple Representations	Provided a symbolic-oriented and pictorial representation.	Provided a symbolic representation.

Conclusions and Implications

There were differences in participants' problem solving. Kristy read and reread the text, developed an appropriate mathematical model, implemented mathematical analysis procedures, and reported her contextually-relevant solution. She demonstrated metacognitive behaviors and used multiple representations during problem solving. Gavin read the text, developed an appropriate mathematical model, implemented mathematical analysis procedures, and reported the result. He did not reevaluate his work and provided one symbolic-oriented problem-solving approach for each task. Textbooks may influence the ways that elementary students solve problems and more investigations are necessary to explore this phenomenon.

References

- Bostic, J., & Jacobbe, T. (2010). Promote problem-solving discourse. *Teaching Children Mathematics, 17*, 32-37.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77-101.
- Bell, M., Bell, J., Bretzlauf, J., Dillard, A., Hartfield, R., Isaacs, A., . . . Saecker, P. (2004). *Everyday Mathematics*. Chicago: SRA/McGraw-Hill.
- Hatch, A. (2002). *Doing qualitative research in education settings*. Albany, NY: State University of New York Press.
- Senk, S., & Thompson, D. (2006). Strategies used by second-year algebra students to solve problem. *Journal of Research in Mathematics Education, 37*, 116-128.
- Verschaffel, L., De Corte, E., Lasure, S., Van Vaerenbergh, G., Bogaerts, H., & Ratinckx, E. (1999). Learning to solve mathematical application problems: A design experiment with fifth graders. *Mathematical Thinking and Learning, 1*, 195-229.
- Verschaffel, L., Greer, B., & De Corte, E. (2000). *Making sense of word problems*. Lisse, Netherlands: Swets & Zeitlinger.

Jonathan Bostic
Bowling Green State University
bosticj@bgsu.edu

This work was conducted while Jonathan was a graduate student at the University of Florida. He would like to thank his advisors, Dr. Stephen Pape and Dr. Tim Jacobbe for their support.