Experimental Effects of a Model of Reading Engagement (MORE) on First and Second Grade Students' Domain Knowledge

James Kim
Harvard University

Jackie Relyea
North Carolina State University

Mary Burkhauser
Harvard University

Ethan Scherer
Harvard University

Background

Although researchers and practitioners have developed and implemented a number of interventions to improve basic literacy skills, it has been more difficult to identify evidence-based interventions to improve students' acquisition of domain knowledge, particularly in content area subjects like science and history. One promising solution is content area literacy instruction, which grounds reading, writing, speaking and listening activities in complex disciplinary texts and content. However, much of the research on content literacy has focused on improving outcomes for students in the upper elementary and middle grades, including intervention programs like In-Depth Expanded Applications of Science (IDEAS; Romance & Vitale, 2001), and Concept-Oriented Reading Instruction (CORI; Guthrie et al., 2004; Guthrie & Klauda, 2014). These interventions have a common goal of helping students integrate newly learned concepts with prior domain knowledge to build coherent text representations (Cromley & Azevedo, 2007; Kintsch, 1998; Kintsch, 2009). In this study, we aim to develop and experimentally test the effectiveness of a Model of Reading Engagement (MORE), an early elementary content literacy intervention.

Purpose

The purpose of this study is to test the early impact of MORE in Grade 1 and Grade 2. MORE lessons include thematic units in science and history that enable students to connect new learning in content area subjects and to pursue mastery goals for acquiring domain knowledge. We designed a 20-day lesson sequence in which teachers used three practices to support domain knowledge acquisition (i.e., the use of conceptually-related science texts, concept mapping, argumentative writing) with two practices to support reading engagement (interactive read alouds and discussion of science and history texts, and peer-mediated collaborative research).

This randomized controlled trial reports preliminary findings of a 2-year implementation of MORE, focusing on early impacts on domain knowledge. The main hypothesis guiding this study is that a 1-year implementation of MORE would have positive effects on proximal measures of domain knowledge (i.e., vocabulary knowledge depth) and foster near transfer to words that were not directly taught in the MORE lessons.

Setting/Population/Participants

As shown in Table 1, this study was implemented in a large urban district with mostly low-SES and medium-SES students and non-White students (38% African-American, 8% Asian American, 32% Hispanic). The study sample included 5,052 students in Grade 1 and Grade 2 during the spring of 2019. In addition, Table 2 displays balance checks on pre-treatment measures and reveals no statistically significant differences between the MORE and control condition.

Intervention/Program/Practice

MORE lesson units included 10 days of life science instruction and 10 days of history instruction. In particular, the Grade 1 MORE lessons consisted of one unit on the life science topic of Arctic animal survival and one unit on the topic of inventors. The Grade 2 MORE lessons consisted of one unit on the topic of dinosaur extinction and one unit on the topic of explorers.

The unit standards were anchored to both state standards in science and history, as well as national Next Generation Science Standards and C3 social science standards.

Methods/Research Design

We recruited 30 K-5 elementary schools from a large southeastern urban school district to participate in this study. We created 7 randomization blocks based on school size, prior achievement, and prior experience with the curriculum. Schools were randomly assigned to implement MORE in Grade 1 or in Grade 2. If schools were randomly assigned to implement MORE in Grade 1, then Grade 2 served as the control group. If schools were randomly assigned to implement MORE in Grade 2, then Grade 1 served as the control group. This design has the advantage of increasing buy-in for the experimental design and facilitating recruiting of sites since principals recognize that at least one full grade of teachers and students will receive MORE lessons.

Data Collection and Analysis

The primary aim of this study was to examine preliminary experimental effects of MORE on students' vocabulary depth—that is, students' ability to make semantic connections among related domain vocabulary. We developed a 24-item semantic association task that assesses students' vocabulary knowledge depth of taught words in science and history and their ability to identify relations between the target word and other known words. For each target word, there were four-word options in which one to three words were semantically linked to the target word. Students were prompted to "circle all of the words that go with" the target word. Each item was scored 0 to 4.

To evaluate the effect of MORE lessons on student outcomes, we used a three-level hierarchical linear model to account for the nested nature of the data with students (Level 1) nested in classrooms (Level 2), and classrooms nested within schools (Level 3). Our model estimates the main effect of school-grades being assigned to MORE, but also includes block fixed-effects, standardized reading pretests, and student demographics to improve the precisions of our estimate.

Preliminary Results

Overall, the results showed positive effects on proximal measures of vocabulary depth in science (ES = .51) and history (ES = .54). These results replicate an earlier intervention study involving only Grade 1 students. In the SREE presentation, we will present results on near transfer measures of vocabulary depth on words that were not directly taught in the MORE curriculum.

Conclusions

Consistent with the SREE 2020 theme of identifying interventions with meaningful educational effects, this cluster randomized trial suggests the effectiveness of MORE on proximal measures of domain knowledge (Kintsch, 1998), as measured by a vocabulary depth outcome, which are

sensitive to changes in classroom practice. Given the strong relationship between domain knowledge and reading comprehension, this practically important finding will lay the foundation for additional analyses that probe whether there are near transfer effects (on untaught vocabulary) and far transfer effects (standardized measures of reading).

References

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Tables

Table 1. Summary Statistics - Means and Standard Deviations

	Analytic Sample
White	0.19
African-American	0.38
Asian	0.08
Hispanic	0.32
Other	0.03
Gifted	0.05
Male	0.50
Limited English Proficiency	0.23
Individual Education Plan	0.08
Low SES	0.41
Med SES	0.38
High SES	0.21
DIBELS Score (raw)	209.17
	(17.92)
MAP RIT	176.16
	(17.92)
N	5,052

Notes: Numbers in parentheses are standard deviations for continuous variables. There were no statistical difference between the different outcome samples.

Table 2

Table 2: Randomization Check - The effect of MORE on Pre-Treatment Covariates

	Analytic Sample
White	-.01
	(.008)
Black	.02
	(.014)
Asian	-.01
	(.007)
Hispanic	0
	(.011)
Other	0
	(.006)
Gifted	.01
	(.027)
Male	.01
	(.015)
Limited English Proficiency	-.01
	(.014)
Individual Education Plan	-.01 +
	(.006)
Low SES	0
	(.007)
Med SES	-.01
	(.01)
High SES	.01
	(.008)
DIBELS Score	-8.47
	(13.269)
MAP RIT	-1.79
N	5,052

Notes: Each row represents a separate regression model (only the coefficient of the treatment status is reported). All regressions include block fixed effects. Models were estimated using a hierarchical linear model with teacher and school-grade random effects to account for the nesting of students within classrooms within school-grade (the unit of randomization). Statistical significance levels: +p<0.10, *p<0.05, **p<0.01, ***p<0.001