

The Relationship Between Reading Ability and Standards-Based Mathematics Achievement

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Abstract

A sequential mixed methods study examined the relationship between reading ability and standards-based mathematics achievement. Hypotheses were tested using archived SRI and GCRCT data taken from 279 sixth grade students and four teacher interviews. Results indicated that reading ability had a statistically significant relationship with standards-based mathematics achievement.

Problem

The problematic conditions that led to this study are the questions surrounding whether student reading levels are a major factor that contributes to the stagnation of standards-based mathematics test scores and unsatisfactory student performance, as standards-based mathematics requires students to apply more reading skills than traditional mathematics. Although literature suggests that a relationship exist between reading ability and some traditional forms of mathematics, the relationship between reading ability using student Lexiles and standards-based mathematics achievement data had not been investigated.

Purpose

Test the relationship between reading ability and standards based mathematics achievement.

Explore teachers' perspectives of the relationship between reading level and mathematics achievement from their experiences.

Relevant Literature

Themes that emerged from the literature and the results of the study and their contributing authors are:

- information processing theory** (Simon, 1978).
- cognitive load theory** (Merriënboer & Sweller, 2005).
- mathematics as a language** (Vukovic, & Lesaux, 2013).
- mathematics and working memory** (Welsh, Nix, Blair, Bierman & Nelson ,2010; Kyttälä 2008).
- mathematics and reading instruction** (Burns, 2006; Fuentes, 1998; Meaney & Flett, 2006; Kester Phillips et al., 2009).
- reasoning and mathematics** (Kribs & Ruebel 2008).
- phonological processing** (Geary, 1993; Geary et al., 2007, Reikas, 2006).
- teacher perceptions** ((Brophy & Good, 1974; Skinner & Belmont, 1993; Hardré & Sullivan, 2008; Ben-Peretz, 2011).

Research Questions

- RQ1:** Is there a relationship between 6th grade GCRCT mathematics scores and SRI Lexile measures?
- RQ2:** Is there a relationship between 6th grade GCRCT mathematics Algebra scores and SRI Lexile measures?
- RQ3:** What are the perceptions of 6th grade mathematics teachers regarding how reading ability impacts students' acquisition of Georgia Performance Standards of Mathematics?

Procedures

The data collection was done in two stages:

- Collection of archived sixth grade scores (N=279).
- Conducted four semi-structured teacher interviews.

Data Analysis

Instrumentation

- Scholastic Reading Inventory (SRI)
- Georgia Criterion Referenced Competency Test (GCRCT)

Quantitative Analysis

Pearson Product-Moment Correlation (r) tests were run between the variables of reading ability and standards-based mathematics achievement.

Qualitative Analysis

Data taken from qualitative interviews were coded by myself and a qualified coder then inter-rater reliability was calculated.

Integration of Methods

Further quantitative analysis were conducted as a result of the qualitative findings.

Findings

A moderate positive correlation was found between reading ability and standards-based mathematics achievement $R = .682 (n = 279, p < .01)$.

Teacher interview responses identified specific sub-domains that require extensive amounts of reading comprehension which caused for additional correlation test to be run and assessed. The results are in the table below.

	Algebra	Number and Operation	Measurement	Geometry	Data Analysis & Probability	Math Total
Lexile	.616**	.554**	.526**	.597**	.617**	.682**

Limitations

The results of this research study were limited to the sampling frame of students and teachers described.

Moderate positive correlation does not establish a cause and effect relationship between reading ability and standards-based mathematics achievement.

My presence may have caused a bias in participant responses because I am an employee of the school where the study was conducted.

Conclusions

Results of the study could be useful to school administrators and educational practitioners in making decisions on ways to improve standards-based mathematics achievement.

Educational leaders may want to place an emphasis on developing educational programs that infuse reading strategies within mathematics curriculum.

Further research exploring factors such as working memory, general intelligence, computational fluency, and reading ability is necessary to extend this study.

Social Change Implications

Consistently integrating reading in mathematics instruction should occur at an early grade, which could positively affect students' mathematics performance from grade level to grade level.

Improved mathematics abilities should help American students compete globally for (STEM) based jobs on behalf of America.