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Math Vocabulary and Achievement

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Math Vocabulary and Achievement

Abstract

Establishing a sufficient understanding of mathematics vocabulary is an important aspect of achievement and advancement in mathematical skills in children. Powell et al. (2017) found a significant correlation between a student's math-vocabulary knowledge and performance on a mathematical computation assessment. The researchers highlighted the importance of vocabulary in helping students to read textbooks, answer questions, and engage in communication that improves mathematical skills. To further investigate this relationship, we are conducting a pilot study on the interaction between math vocabulary and math achievement. This study involves 15 children from a suburban school in the midwest, referred by teachers as having a math difficulty (performance below the 25th percentile) on a computer adaptive winter screening measure. To measure math vocabulary students were given a first grade math vocabulary test. Two assessments were administered to measure math performance: a norm-referenced math achievement test (GMADE) and a norm-referenced early numeracy test (Number Sense Screener). We hypothesize that lower scores on the math vocabulary test will correlate with lower scores in the math achievement test as well as the early numeracy test. This poster will report on the results of our pilot study and discuss implications for students with math difficulty.

Math Vocabulary and Achievement

INTRODUCTION

Establishing a sufficient understanding of math vocabulary is an important aspect of achievement and advancement in mathematical skills in children. Powell and Nelson (2017) found a significant correlation between a student's math-vocabulary knowledge and performance on a mathematical computation assessment. The researchers highlighted the importance of vocabulary in helping students to read textbooks, answer questions, and engage in communication that improves mathematical skills.

METHOD

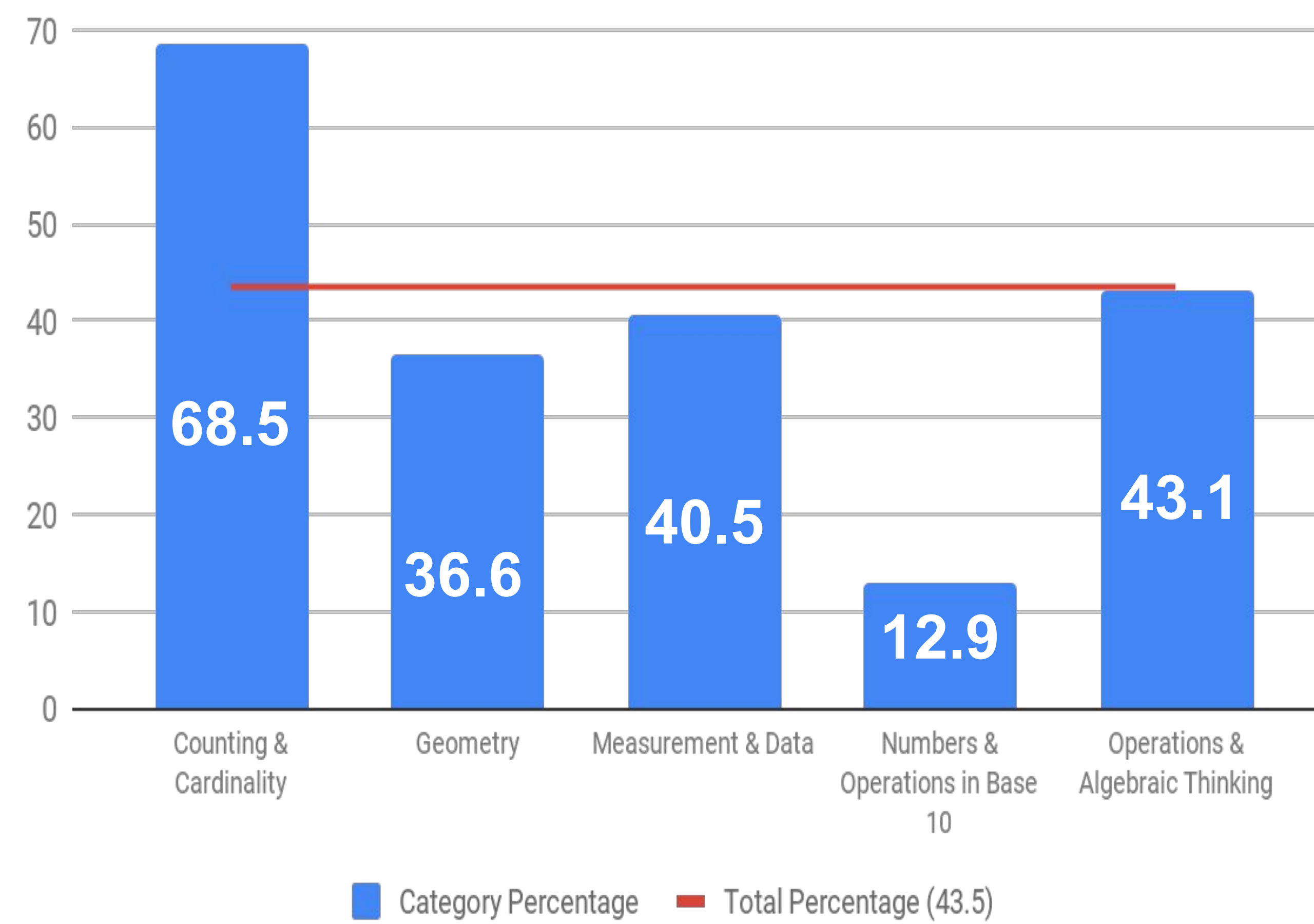
This pilot study involved 15 children from a suburban school in the midwest, referred by teachers as having a math difficulty (performance below the 25th percentile) on a computer adaptive winter screening measure. One student was removed from the study because of scoring higher than the 25th percentile on a subsequent math assessment. To measure math vocabulary students were given a first grade Mathematics Vocabulary assessment. Additionally, an assessment was administered to measure math performance: a norm-referenced math achievement test (GMADE). To analyze the interaction between math vocabulary and achievement, we conducted a descriptive study to observe which areas in math vocabulary that these students had difficulties in. This poster will report on the results of our pilot study and discuss implications for students with math difficulty.

Demographics

Characteristics	<i>n</i>	Percent (%)	GMADE Average	Average Percentile rank	Average Math Vocab Score
Total	14		49.7	7.8	39.6
Sex					
Male	5	35.7	53.4	10.6	38.4
Female	9	64.3	47.4	6.0	40.2
English Language Learner					
Yes	4	28.6	49.3	7.0	40.3
No	10	71.4	49.8	8.0	39.3
Free Lunch (low SES)					
Yes	5	35.7	45.5	4.8	39.0
No	9	64.3	51.6	9.1	39.9

RESULTS

Percent Correct on Mathematics Vocabulary Assessment

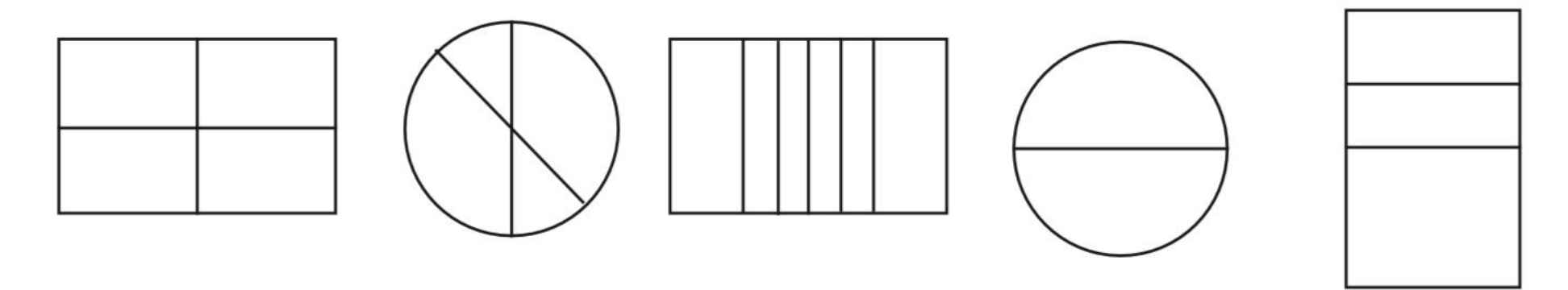


The questions on the Mathematics Vocabulary assessment can be subdivided into 5 domains based on the Common Core State Standards for kindergarten through second grade, which are presented on the table. The Counting and Cardinality category is considered a kindergarten skill, and so it was not surprising that the students scored the highest, on average, in this section of the assessment. The two categories with the lowest scores were Geometry and Numbers and Operations in Base 10. Geometry was especially concerning because of the 33 questions in this category, 6 questions were answered incorrectly by all of the students, which was more than the other categories.

Results (Continued)

Below is an example question from the Geometry category. This question is of interest because it was the only kindergarten level question consistently marked incorrectly. Examining questions such as this one may provide insight into which areas students with math difficulty display consistent weaknesses with understanding math vocabulary.

8. Circle all that show equal shares.



Also of interest, Powell and Nelson (2017) found that 98.1% of students in their study correctly answered a question asking to shade a row, but only 25.0% were able to shade a column. Similarly, we found that when asked the same question, 85.7% of the students in our study were able to shade a row, while 14.3% correctly shaded a column.

IMPLICATIONS

Understanding where students display weaknesses is an important part of ensuring improvement with math understanding. Further analyzing areas of difficulty may help to formulate future interventions for pivotal areas in math, such as mathematics vocabulary. Our study faced some limitations, of course, such as a small sample size and representation from only one school. Future research should examine other areas of difficulty in regards to math fluency and how these areas impact math performance.

References:

Powell, S. R., & Nelson, G. (2017). An investigation of the mathematics-vocabulary knowledge of first-grade students. *The Elementary School Journal*, 117(4), 664-686.