



"In Math Class, I am Confident in Solving Word Problems": Creating a Strengths-Based Mathematics Survey



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Introduction

- Children's beliefs about their math competence and interests are related to their later mathematical achievement.¹
- Prior measures of beliefs about math competence often have focused on math learning and skills more generally.²
- However, the strengths children believe they bring to math class can vary across dimensions beyond just math skills.
- Understanding children's beliefs about the various strengths they bring to the classroom could provide insight into how teachers and researchers can build on these strengths to promote mathematical achievement.⁴

Current Study

- We have developed a strengths-based mathematics questionnaire to understand fourth and fifth-grade children's beliefs about their strengths in the math classroom.
- This survey was created with input from focus groups with teachers.
- In **study one** we piloted a 21-item questionnaire examining underlying components and create hypothesized subscales of strengths children might hold.
- In **study two** we examined how a shortened questionnaire (16-items) related to various math skills and beliefs.

Study 1: Survey Creation

Sample

- The sample contains 107 fourth (N = 63) and fifth graders (N = 45). These children were recruited from 5 different classrooms in the same school district in Massachusetts.
 - Girls = 40, Boys = 51, Prefer Not to Say = 16
 - Data was collected Spring 2021 as part of a larger study

Procedure

- Children completed a 21-item questionnaire where they indicated how confident they are in various aspects of math class.

When I am in math class I am confident in...



Analysis

- Scale reliability was good ($\alpha = .88$).
- Data was transformed to account for nested variables.
- Velicer's MAP test indicated that two components could be extracted.
- An exploratory principal component analysis (PCA) with Promax rotation was conducted identifying two components, "problem solving skills" ($\alpha = .87$) and "peer help seeking skills" ($\alpha = .73$).

Study 1: Results

Problem Solving Skills

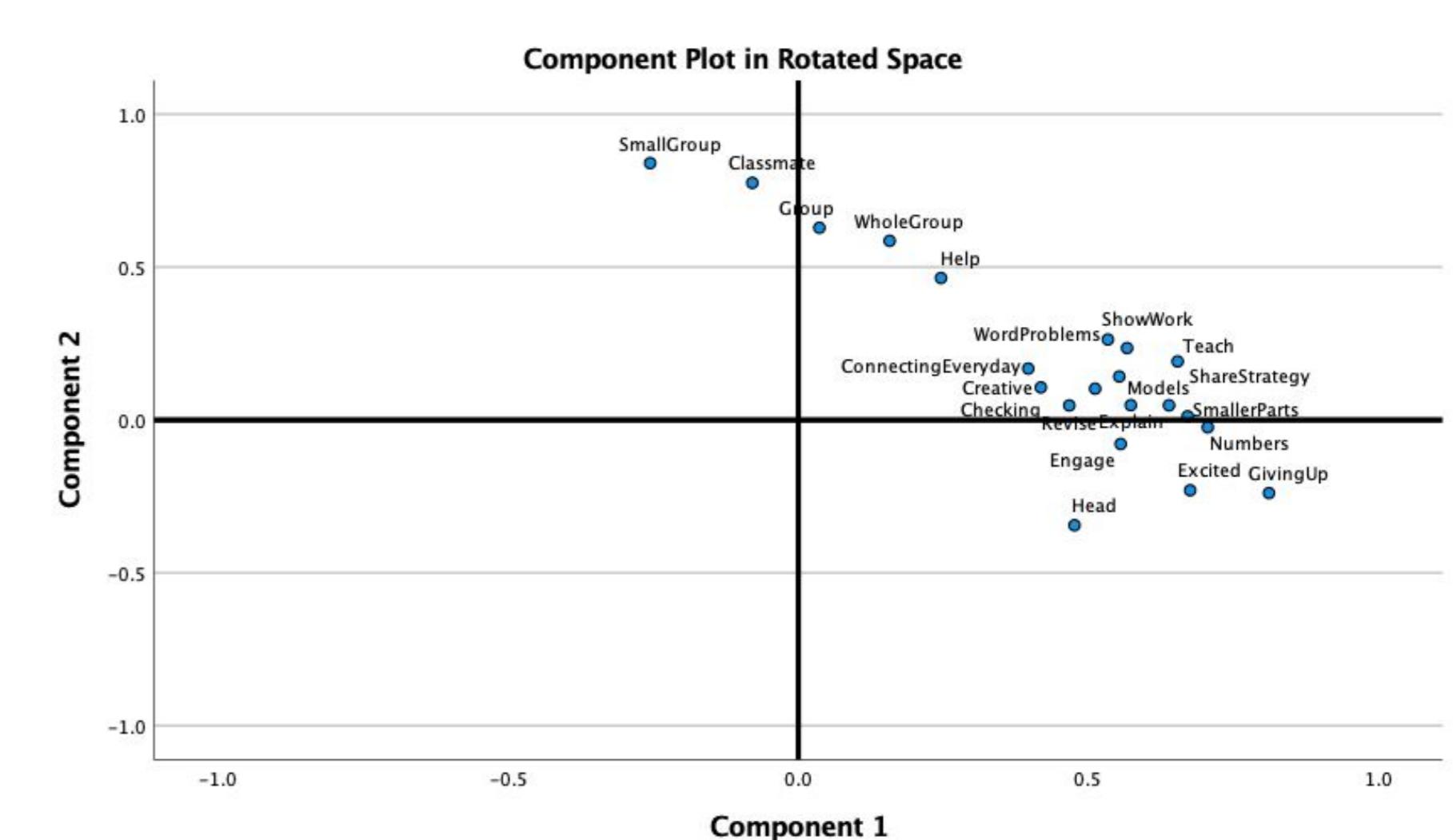
Question

- Explaining how I solved a problem
- Connecting math to things I do and see everyday
- Thinking of creative ways to solve tricky problems
- Changing my thinking when my strategy does not work
- Working on problems and not giving up even when they are hard
- Being excited to learn new topics in math
- Participating in the activity my teacher presents
- Going back through and checking my work
- Breaking down big problems into smaller problems
- Solving problems with pictures/models
- Solving problems with numbers and equations
- Solving word problems
- Solving math problems only in my head
- Showing my work
- Teaching my classmates how to understand a problem
- Sharing different math strategies I use with my classmates

Peer Help Seeking Skills

Question

- Asking for help when I am working in small groups
- Asking my classmates for help
- Asking questions in whole group discussions
- Knowing when to ask for help in math class
- Working with a group on a math problem



21 questions administered organized by component.

Highlighted question indicate lower loadings (less than .5). These questions were removed for study two.

Study 2: Survey Correlates

- The sample contains 212 fourth graders (Girls = 94, Boys = 82, Other = 6, Prefer Not to Say = 30)
 - These children were recruited from 7 different classrooms in two school districts in Southern California.
- Data was collected in Spring 2023 as part of a larger study.
- Children completed a 16 item strengths-based survey.
- They also completed a growth mindset survey and assessments of math knowledge: fractions knowledge, fact fluency, magnitude comparison, number line estimation.

Discussion

- A strength-based survey could provide insight into children's beliefs about their math skills.
- The survey also highlights additional components of individual differences such as the malleability of math skills and social aspects of mathematical learning.

Study 2: Results

Both Peer Help Seeking and Problem Solving skills were correlated with growth mindset scores. Problem Solving Skills was correlated with math scores on fact fluency and magnitude comparison.

Table 1: Correlations of measures with strength survey sub-scale

	Problem Solving Skills	Peer Help Seeking Skills
Peer Help Seeking Skills	0.47***	1
Growth Mindset	0.49***	0.3***
Fractions	0.11	-0.08
Fact Fluency	0.24***	-0.08
Number Line	0.25***	-0.09
Magnitude Comparison	0.1	-0.12

References

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