

Peer-Mediated Modified Schema Based Instruction Targeting Mathematical Problem Solving for Students with Extensive Support Needs



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Purpose

- Peer-mediated instruction has positive impacts across a range of academics (i.e., language arts, mathematics, science, and social studies) for students with disabilities, regardless of their disability (Okilwa and Shelby, 2010).
- Peer-mediated instruction supports growth and development of both the mentee and the mentor.
- Alegre-Ansuategui et al. (2017) later supported this finding within their meta-analysis of peer mediating instruction and academic achievement in mathematics.
- Modified schema-based instruction has been shown to be effective within the literature as an intervention package to increase mathematical skills among students with ESN across a range of math contents and contexts.
- Ley Davis (2016) used peer-mediated MSBI with middle-school aged students targeting additive math problems. Results indicated a functional relation.

Research Questions

RQ 1: Did MSBI work?

What is the effect of peer-delivered modified-schema based instruction on the frequency of correct, independent steps of the task analysis for solving multiplication word problems completed by high school students with ESN?

RQ 2: Can they use mathematical reasoning?

How do high school students with ESN justify their mathematical reasoning do during turn and talk when provided with a system of least prompts after peer-mediated modified-schema based instruction?

RQ 3: How is MSBI perceived?

What are the perceptions of key stakeholders (e.g., tutors and tutees) on peer-delivered math instruction?

Method

Design: Mixed methods single case research (MMSCR)

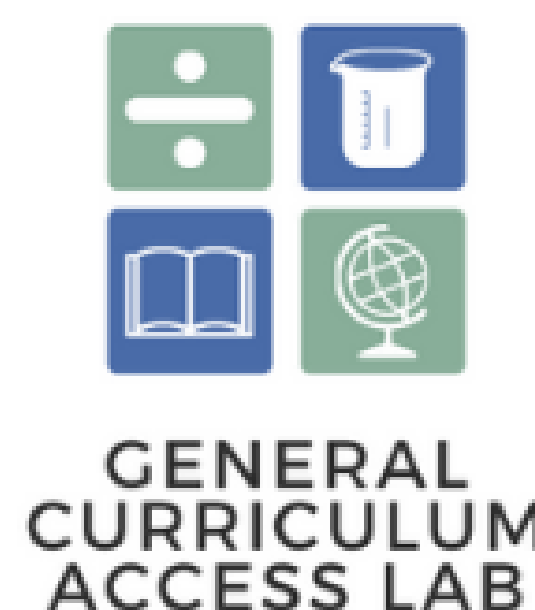
Conditions:

- Baseline
- Intervention
- Generalization (approximately every 3 probes)
- Maintenance (goal of at least 3)

Independent Variable: Peer-Mediated Modified Schema Based Instruction (MSBI)

Dependent Variables:

- Number of critical steps completed independently correct
- Number of word problems correct
- Ability to use mathematical reasoning



Participants & Setting

Setting: separate classroom, one-on-one

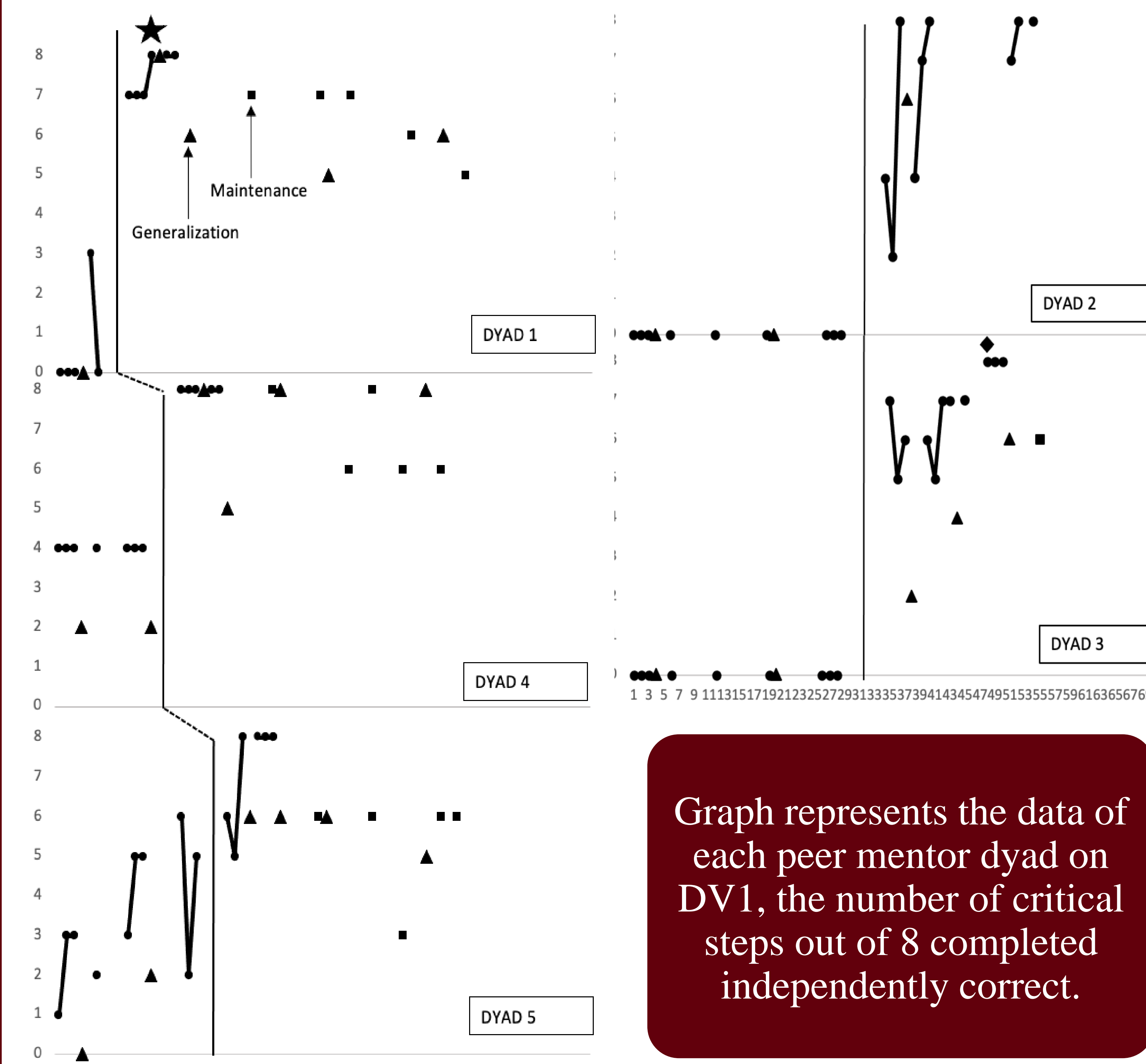
| Peer Mentees | | | | |
|--------------|----------|--------|----------------|------------------------------------------------------|
| | Grade | Gender | Race | Disability |
| Eve | Senior | Female | Asian American | Intellectual Disability |
| Parker | Senior | Male | White | Autism Spectrum Disorder |
| Janelle | Freshman | Female | Black | Intellectual Disability |
| Patrick | Freshman | Male | White | Intellectual Disability and Autism Spectrum Disorder |
| Ezra | Freshman | Male | Multiracial | Intellectual Disability |

| Peer Mentors | | | | |
|--------------|--------|--------|-------|-------------------|
| | Grade | Gender | Race | Experience |
| Abby | Senior | Female | White | Multi-Year Mentor |
| Ashley | Junior | Female | White | Multi-Year Mentor |
| Nick | Senior | Male | White | Multi-Year Mentor |
| Evan | Senior | Male | White | Multi-Year Mentor |

Procedures

| | |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline | <ul style="list-style-type: none"> Given word problem, task analysis, schema, virtual manipulatives No system of least prompts, error correction, or peer support |
| Lesson 1 | <ul style="list-style-type: none"> Vocabulary (e.g., equal, factors, multiply, multiplication) Conceptual overview of multiplication |
| Lesson 2 | <ul style="list-style-type: none"> Review vocabulary Practice multiplication with manipulatives (i.e., cubes and virtual) |
| Lesson 3 | <ul style="list-style-type: none"> Review vocabulary, concepts Guided practice solving problems with virtual worksheet Introduce self-monitoring and self-graphing |
| Intervention | <ul style="list-style-type: none"> Began with reviewing goal Prompting hierarchy: verbal, specific verbal, model |
| Maintenance | <ul style="list-style-type: none"> Given word problem, task analysis, schema, virtual manipulatives No system of least prompts, error correction, or peer support |
| Generalization | <ul style="list-style-type: none"> Given word problem, task analysis, virtual manipulatives Fade schema No system of least prompts, error correction, or peer support |

Results



Limitations / Future Research

**COVID-19
Related
Attendance**

**Narrow
Generalization**

**Structured
Turn and Talk**

**Teacher
Implemented**

References

- Alegre Ansuategui, F. J., Moliner Miravet, L., Lorenzo Valentín, G., & Maroto, A. (2018). Peer tutoring and academic achievement in mathematics: a meta-analysis. *EURASIA: Journal of Mathematics, Science and Technology Education, 14*(1), 337-354. DOI: 10.12973/ejmste/79805.
- Davis, L. L. (2016). *Effects of peer-mediated instruction on mathematical problem solving for students with moderate/severe intellectual disability* (Doctoral dissertation, The University of North Carolina at Charlotte).
- Okilwa, N. S., & Shelby, L. (2010). The effects of peer tutoring on academic performance of students with disabilities in grades 6 through 12: A synthesis of the literature. *Remedial and Special Education, 31*, 450-463.