

Experiences of Undergraduate Student Volunteers Delivering a Play-Based Early Numeracy Intervention: An Exploratory Study



WESLEYAN PRESCHOOL MATH GAMES

Introduction

Wesleyan Preschool Math Games (WMPG)

Wesleyan Preschool Math Games is a *research-based*¹, *play-based*² early numeracy³ initiative

- We are currently exploring the most effective scaffolding approaches for these games
 - ➔ Should we allow the students to have more control over game play (Low Guidance) or should we directly scaffold their learning (High Guidance)
 - ➔ Can we ask teachers to implement the math games or should we offer another adult to play the games with the students?

Undergraduate Student Volunteers

- Enthusiastic, eager to learn, accessible, abundant
- Should be able to dedicate sustained time and attention
- May be more susceptible to new teaching philosophies⁴
- May be susceptible to Math Anxiety⁵

Undergraduate Training and Experiential Learning

- Training undergraduate students to become teachers has shown to improve their conceptual understanding of play-based numeracy learning⁶
- Some trainings have been able to reduce math anxiety⁷
- Experiential learning with undergraduate teaching students has increased pedagogical understanding and teaching confidence⁸

Research question: What are the experiences of undergraduate students who deliver research-based numeracy resources in early childhood classrooms?

Present Study

The present study aims to explore the learning implications of employing undergraduate volunteers to assume a novice teaching role for play-based early numeracy support.

Study 1. How can we characterize undergraduate students who volunteer to assume a novice teaching role in an early numeracy intervention? What are the impacts of the training and the experiential learning component on undergraduate volunteers?

Study 2. How accurately do the undergraduate students implement the math scaffolding according to their assigned condition?

References

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Study 1

Methods

- **Participants:** Undergraduate students (N=35) were recruited from Universities in Connecticut. A subset of undergraduate students (N=14) completed sufficient classroom visits and their data is used to look at the undergraduate evolution.
- **Procedure:** Undergraduate students were given surveys at 3 distinct time points (1) At Baseline (2) After their Training (3) After Classroom Visits & Reflections
- **Measures:**
 - Math Anxiety
 - Knowledge of Mathematical Development
 - Self Efficacy
 - Math Teaching Anxiety
 - Guided Play Beliefs and Math Development Beliefs

Results

Undergraduate and Teacher Baseline Comparison:

- Single Item Math Teaching Anxiety: $t(35) = 3.77, p < .00625$
- Knowledge of Mathematical Development: $t(35) = -3.37, p < .0062$
- Confidence in Mathematics Instruction: $t(35) = 4.14, p < .00625$
- Locus of Instruction Beliefs $t(35) = 7.871, p < .00625$

Undergraduate Evolution:

- Knowledge of Mathematical Development
 - Significant effect of Time*Condition $F(2,11) = 4.64, p < .05$
 - Larger increase in scores after training than classroom visits
- Teaching Math Anxiety
 - Nearing a significant effect of Time by Condition $F(2,11) = 2.89, p = .075$ (would likely have a more significant effect with a larger sample population)
 - Significant decrease in teaching anxiety for undergraduates in the experimental group after their training, $t(9) = 1.96, p = 0.04$, but not after experiential learning, $t(9) = 0.56, p = 0.29$.

Discussion

1. Undergraduates represent a distinct teaching population in comparison to teachers
2. Math games training and experiential learning opportunities yielded an increase in Knowledge of Mathematical Development and a decrease in Math Teaching Anxiety
3. Training and experiential learning did not significantly shift beliefs about Guided Play or Math Development

Key Takeaways

- Undergraduate students differ from teachers at baseline
- Training and classroom visits afforded opportunities for improvement of math teaching anxiety and knowledge of mathematical development
- Undergraduate students were able to implement the play-based numeracy intervention with high fidelity

Study 2

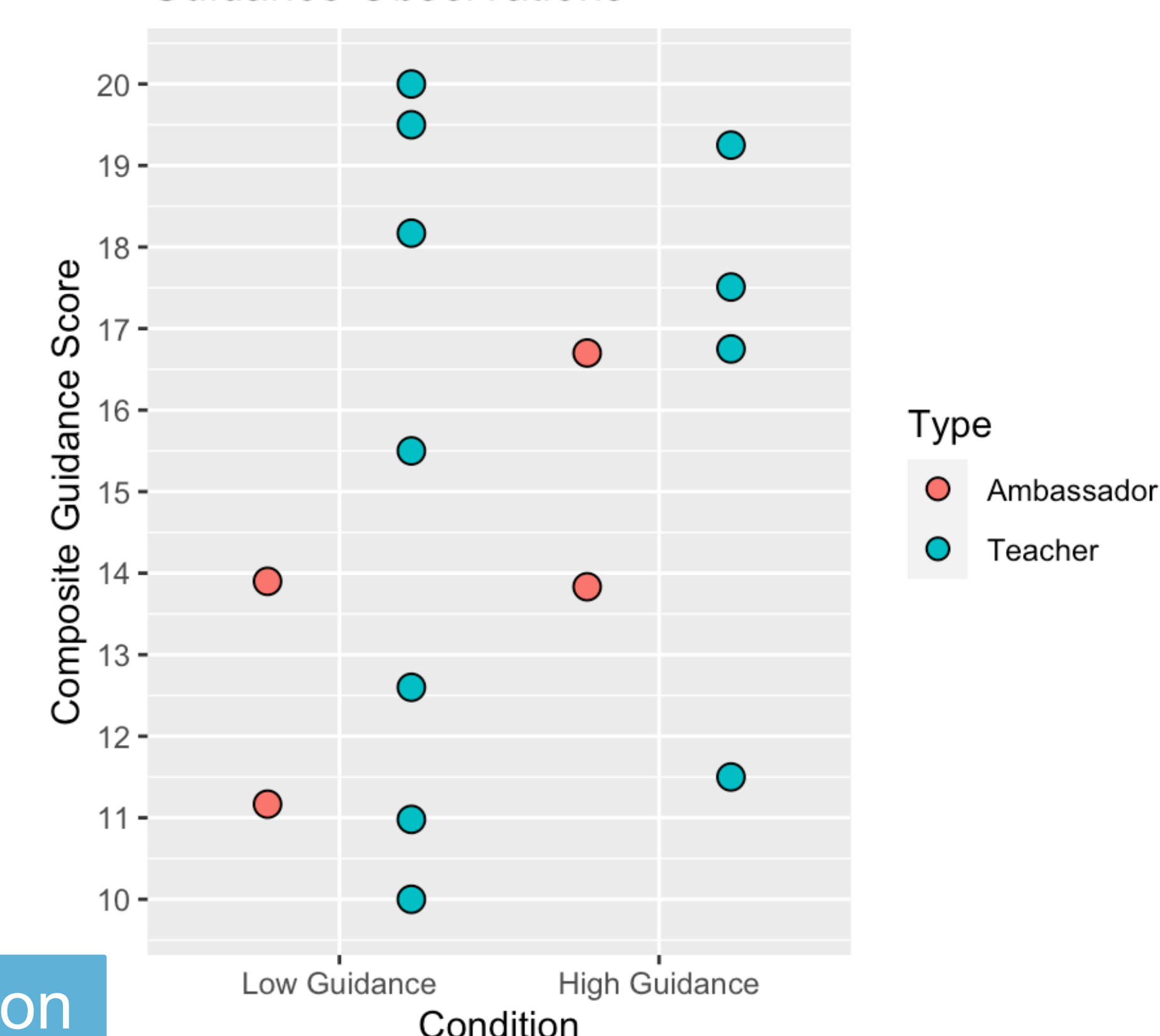
Methods

- **Participants:** Four math ambassadors were selected for observations (N= 4), all female identifying students at Wesleyan
 - Both guidance conditions and math anxiety levels were represented in the sample
- **Procedure:** Pairs of observers went into classrooms (2x each, 4 weeks apart for 1 hour)
- **Measures:** Locus of Control, Physical Interactions with Materials, Physical Proximity, Direct Language

Results

ID	Condition (Math Anxiety)	Average Locus of Instruction	Average Physical Interaction	Average Physical Proximity	Average Direct Language	Composite Guidance Score
A02	High (High Anxiety)	3.8	4.3	5.0	3.6	16.7
A10	High (Low Anxiety)	3.0	3.3	5.0	2.5	13.8
A08	Low (Low Anxiety)	2.9	2.9	4.9	3.2	13.9
A12	Low (High Anxiety)	1.8	2.6	4.6	2.1	11.1

Guidance Observations



Discussion

- Excellent condition differentiation with Locus of Instruction and Physical Interactions with game materials
- Undergraduates can give attention and engagement
- Undergrads were more likely to move in accordance with their assigned condition, whereas teachers had greater variability and inconsistency in their implementation

Limitations

1. Small sample size
2. Limited time
3. Training differences inhibit even comparison

Future

1. Increase sample sizes
2. Look at numeracy results in preschoolers after undergrad intervention