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2018

Characteristics and Achievement Patterns of 3-Year-Old Preschoolers' Evolving Mathematical Knowledge to Inform Preschool Instructional Practices

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Characteristics and Achievement Patterns of 3-Year-Old Preschoolers' Evolving Mathematical Knowledge to Inform Preschool Instructional Practices

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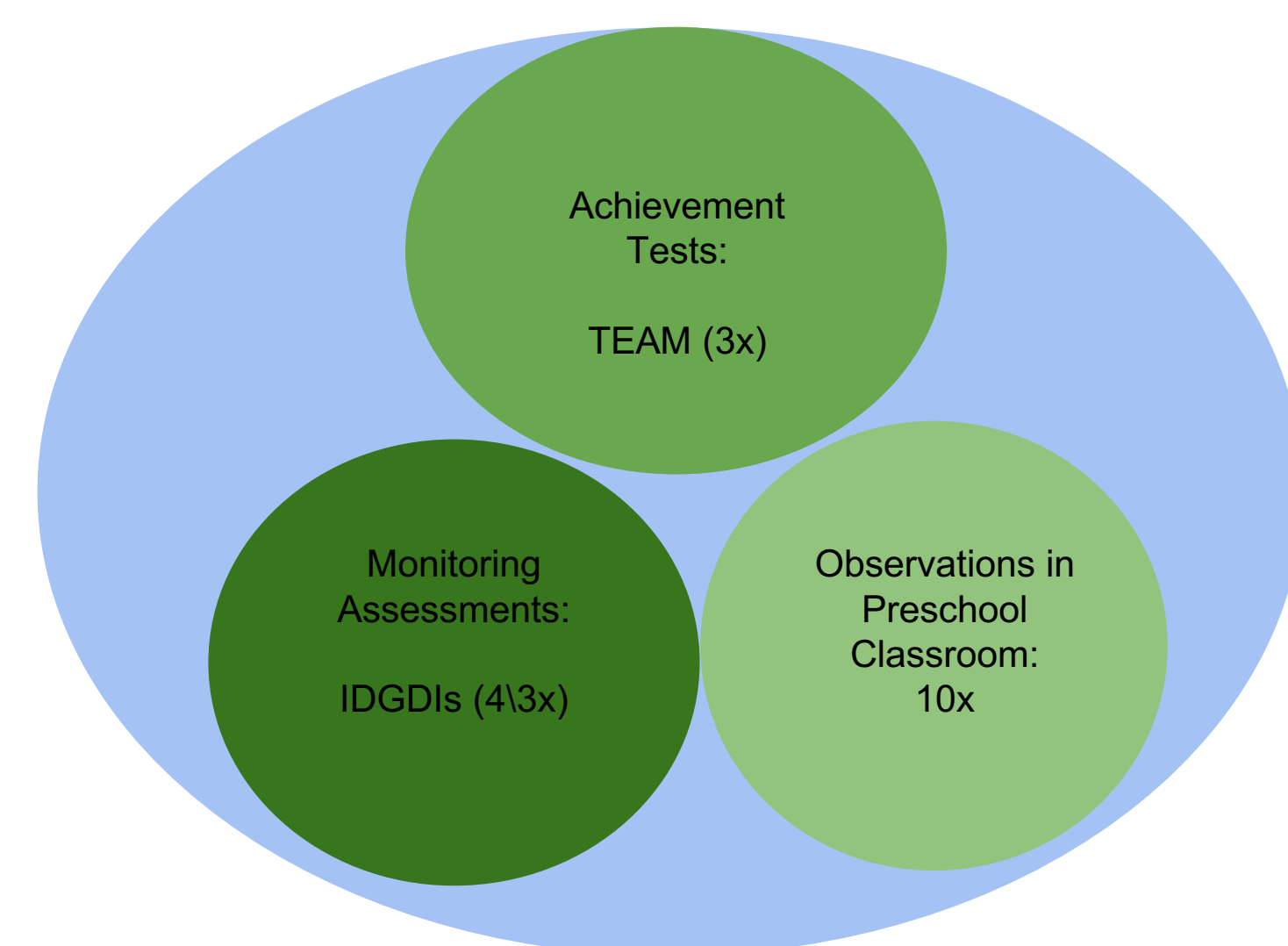*Utah State University*

Introduction

The NAEYC recommends that early childhood mathematics education be research-based and developmentally appropriate. Currently, research indicates that early number sense predicts later mathematics achievement. Because of this, teachers see the importance of ensuring young students meet specific mathematics benchmarks. An in-depth look at actual students' development in the context of their classrooms is warranted. Specifically, we studied five cases of 3-year-olds' mathematical understanding.

Research Question: What are the characteristics and achievement patterns of 3-year-old preschoolers mathematical knowledge over a year?

Methods

We used multiple sources of data in our cross-case study:

Achievement Tests: TEAM (3x)

Monitoring Assessments: IDGDIs (4\3x)

Observations in Preschool Classroom: 10x

The data were analyzed in terms of assessment scores, learning trajectory codes, and other open coding methods.

Results

- Sam, Jane, and Hannah showed cardinal knowledge by 3yr 6mo.
- Hannah's cardinal knowledge (3yr 6mo) developed alongside counting and 1-to-1.
- Emily had the lowest scores, but consistently accessed the verbal counting task. Emily continues to develop verbal counting, subitizing, and 1-to- 1.
- Ava made a cognitive leap (3yr 5mo) as she moved from reciter to counting items with number words in order.

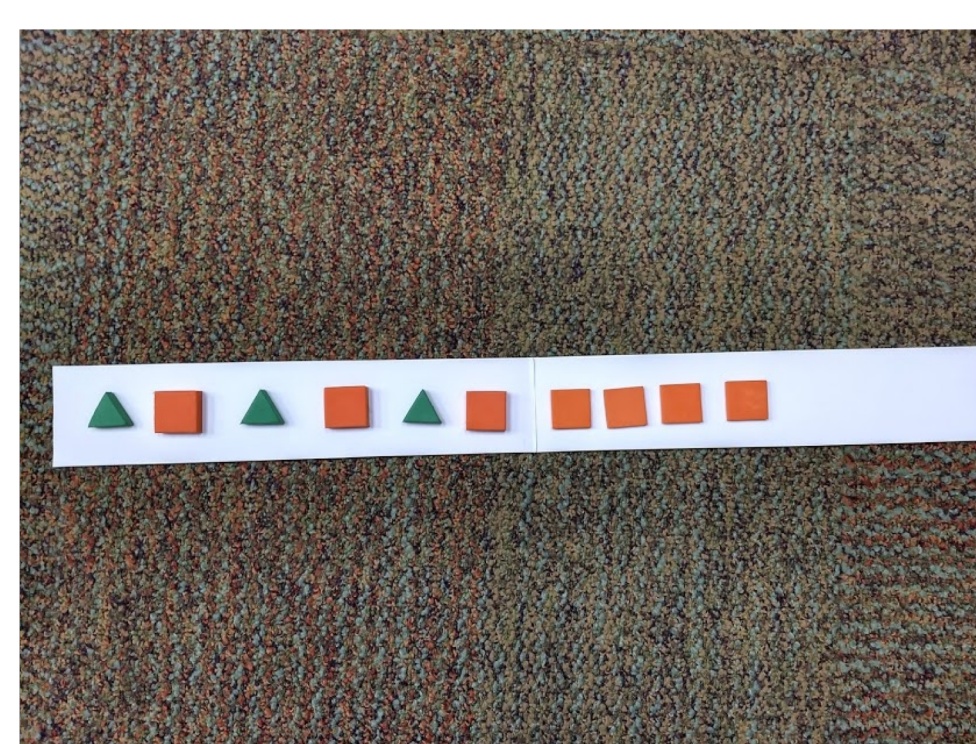## Figure 1 – TEAM Tasks

Sam (3yr 11mo)
Count a given amount

Sam (3yr 11mo)
Count a given amount

Sam (3yr 11mo)
Cardinality

Ava (3y 10mo)

Jane (3yr 8mo)

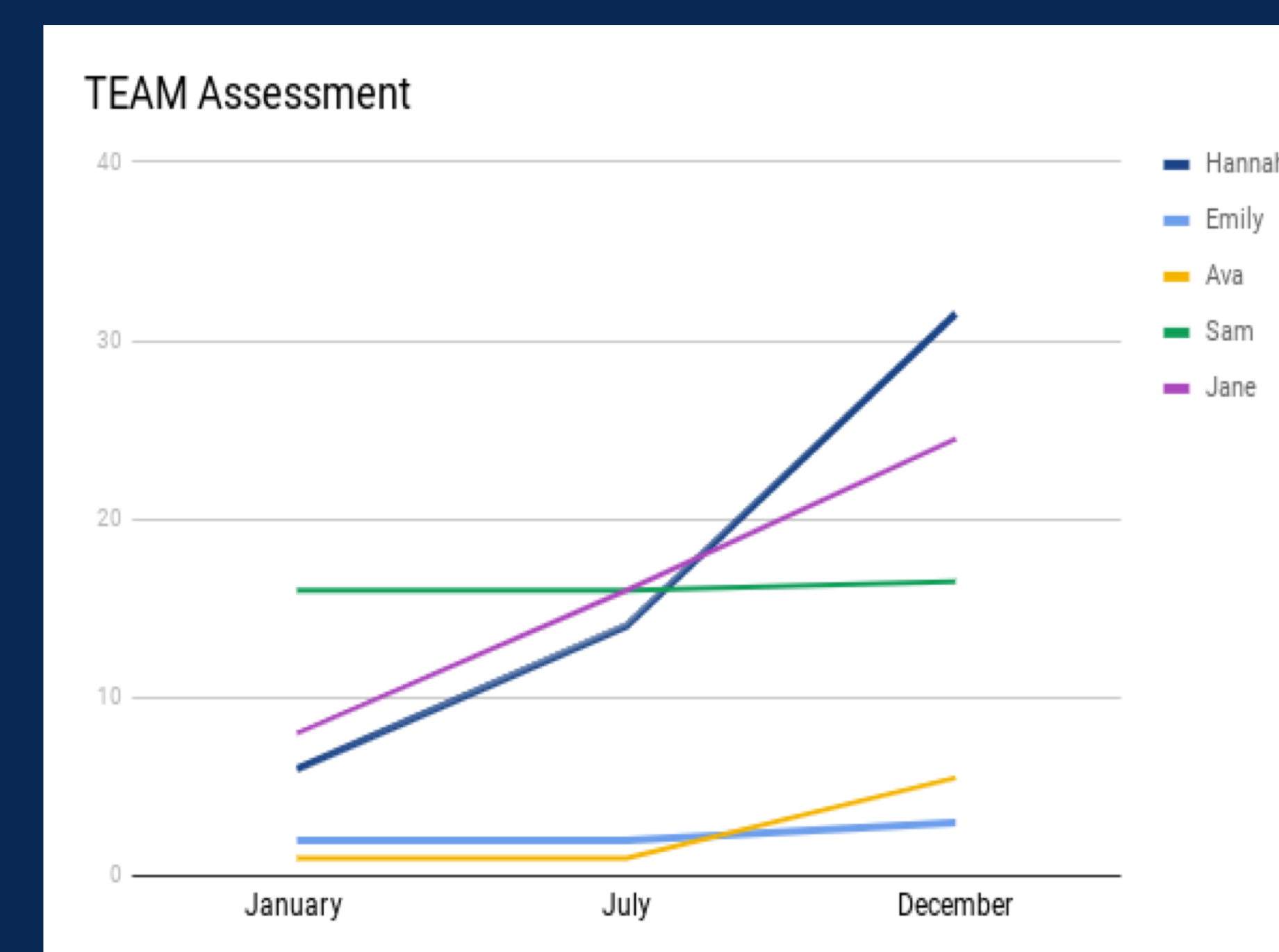Counting and cardinality are key skills for three year olds.

Key growth in geometric and numerical knowledge teachers for three year olds need to provide opportunities to develop these skills.

Figure 2 – TEAM Assessment Results

TEAM Assessment

The five cases had differing achievement score patterns

Conclusions

Learning trajectories are a framework for understanding typical mathematical development, though every child's learning path is different. Key leaps in numerical understanding include: knowing the sequence of number words (counting); cardinality; and linking counting, 1-to-1, and cardinality. Key leaps in geometric understanding include: composing shapes, comparing shapes, and beginning to copy or repeat pattern sequences.

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Study conducted with The School of Teacher Education and Leadership at Utah State University

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