Preschoolers’ Knowledge of Repeating Patterns Over Time
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Patterns & Math
- Patterning is a spontaneous, recurrent activity of young children that is central to early mathematics education (NCTM, 2000).
- Working with repeating patterns (e.g., ABBABBB) helps children learn to make generalizations important for algebra (Papic et al., 2011).
- Evidence is currently limited on the growth of different repeating pattern skills (Clements & Sarama, 2009; Rittle-Johnson et al., in press).

Goals
- Examine the relative difficulty of different repeating pattern skills for preschoolers.
- Develop and test a construct map (Wilson, 2005) that represents the continuum of repeating pattern knowledge that preschoolers are thought to progress through.
- Investigate changes in preschoolers’ repeating pattern knowledge over time.

Method
Participants: 64 preschoolers (4.0 to 5.3 years in Fall). Design: Given brief pattern practice, and then assessed in Fall and Spring of school year. Assessment: 10 items, each targeted at 1 of 4 levels of the construct map (dropped one Level 4 item).

Sample Tasks:
- Level 1: Duplicate_AABB
- Level 2: Extend_ABB
- Level 3: AbstractColor_AABB
- Level 4: SmallestTower_AABB

Construct Map
- Level 4: Pattern unit recognition
- Identifies the pattern unit
- Level 3: Pattern abstraction
- Translates patterns into new patterns with same structural rule
- Level 2: Pattern extension
- Extends patterns at least one pattern unit
- Level 1: Pattern duplication
- Duplicates patterns

Improvements Over Time
- Large improvements in proportion correct on Level 1, 2, & 3 items.

Error Analysis
- Pattern Knowledge by Level
- Error type
- Example for ABB pattern
- % Used across trials
- % Children who used Fall Spring Fall Spring
- Correct
- Partial Correct
- Wrong Pattern AB
- Wrong Pattern Other
- Sort
- Random Order
- Off Task
- Made a tower

Wright Map – Fall
- SmallestTower_AABB
- Memory_AABB

Wright Map – Spring
- AbstractShape_AABB
- AbstractColor_AABB
- SmallestTower_AAB

Conclusions
- 4-year-olds gain more accurate knowledge of repeating patterns over the preschool year.
- Many advance beyond duplication and extension.
- Learning to abstract patterns – although not being instructed in school! - May provide a foundation for early algebraic thinking.
- Frequency of less sophisticated errors decreased over time.
- Construct map and assessment captured shifts in pattern knowledge over the preschool year.
- Future research should identify sources of change in pattern knowledge.
- Better understand relevant cognitive mechanisms underlying preschoolers’ patterning skills.
- Further investigate links between patterns and mathematics learning.

References