


Supporting Early Math Knowledge Through Patterning

in preschool and kindergarten

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Slides available at:
vu.edu/patterns-and-math-publications

TACEE 2018

Thanks to Participants and Funders!


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- Holly Street Daycare
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- West End Church of Christ
- Temple Preschool
- McNeilly Center for Children
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- Shayne Elementary School
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- Gardner School
- Gordon Jewish Community Center Preschool
- St. Mary Villa
- West End United Methodist Church

And Thanks to Our Funders




Image from: <https://www.teacherspayteachers.com/Product/14-preschool-PATTERNING-activities>

14 preschool PATTERNING activities





Finding the pattern allows us to know what comes next (and next after that ...)

Pattern: a predictable sequence (i.e., follows a rule)
E.g., alternating sequence of shapes or sounds
E.g., counting by twos (2, 4, 6, 8 ...)



Early Patterning: Repeating Patterns

- **Repeating Patterns** follow a rule that one part repeats over and over. The *core unit* is the part that repeats.

Patterning is Important

- Patterning is included as a central early algebraic topic in consensus documents in mathematics education (NCTM, 2000; NAEYC, 2014).

- Patterning is a core way to engage young children in the Common Core Mathematical Practice of “Look for and make use of structure”

Patterning is Important: Evidence Summary

- Patterning is a topic of major importance for early math learning and instruction
 1. Early patterning skill predicts middle-grades math achievement, including TCAP scores (Fyfe, Rittle-Johnson & Farran, 2018; Rittle-Johnson, Fyfe, Hofer & Farran, 2016).
 2. Early patterning skill predicts end of pre-K numeracy knowledge (Rittle-Johnson, Zippert & Boice, 2018).
 3. Improving students’ patterning skills can improve their math knowledge (Papic et al., 2011; Kidd et al., 2013; Kidd et al., 2014).

Patterning is Common

- Young children spontaneously engage in **patterning activities** (Ginsburg, Inoue, & Seo, 1999; Ginsburg, Lin, Ness, & Seo, 2003).
- Some parents and preschool teachers reported engaging children in patterning activities many times a week (Rittle-Johnson, Fyfe, Loehr & Miller, 2014).
 - However, the mathematical nature of patterns are often not highlighted (Economopoulos, 1998).

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PATTERNING TIPS FOR TEACHERS

Preschool - Kindergarten




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Tips for Teachers

1. Increase complexity of core unit
2. Increase demands of patterning task
3. Use language to deepen understanding
4. Find patterns in numbers too

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1. Increase Complexity of Core Unit

1. *Easiest*: AB 
2. *Intermediate*: AAB, ABB, AAB 
3. *Harder*: ABC (and beyond) 

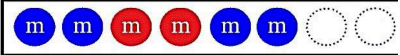
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*To differentiate instruction, some children can progress quickly to more complex core units while others work to master easier core units.

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1. Complexity of Core Unit Caution!



- *To establish a pattern, need 2 full core units*
 - *Otherwise, multiple correct answers*
 - E.g., Below, core unit could be AAB or AABBA, so 2 red (if AAB) or 2 blue (if AABBA) are both correct answers



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2. Increase Demands of Patterning Task

EASY TASKS

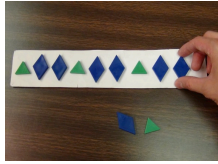
- Copy pattern: “Please make the same pattern” 
- Find the missing item: 

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2. Increase Demands of Patterning Task INTERMEDIATE TASK

- **Extend pattern**
 - “What comes next?” or “Keep the pattern going”

ABB pattern:



AAB pattern






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2. Increase Demands of Patterning Task ADVANCED TASKS


Esp. useful second semester of Pre-K and in Kindergarten

- **Abstract pattern:** Recreating a model pattern using different materials
 - E.g., “Please make the same kind of pattern down here, using these shapes.”
 - Keep space between 2 patterns.
- **Identify the rule:**
 - e.g., “What part repeats over and over?” and “What is the rule for this pattern?”
 - e.g., “What is the smallest tower you could make and still keep the same pattern as this?”

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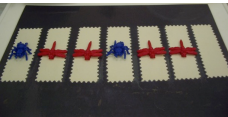

3. Use Language to Deepen Understanding USE ABSTRACT LABELS



- Use generic, abstract labels, even with 4-year-olds
 - Label using letters. e.g., “The pattern goes A-B-B-A-B-B. It’s an ABB pattern.”
 - Label using numbers. e.g., “This is a 1-2 pattern because it has 1 orange and 2 green, and then it repeats.”
 - Label multiple patterns using same labels (e.g., “They are both ABB patterns!”)
- Ask children to label too
 - “What can we call it?” or “What kind of pattern is it?”

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3. Use Language to Deepen Understanding PROMPT CHILDREN TO EXPLAIN





- “Explain how to figure out that the blue tarantula comes next.”
- Especially helpful when children provide an incorrect answer and have been shown the expected answer.
- Explaining to an adult (e.g., mom) improves learning.

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3. Use Language to Deepen Understanding DISTINGUISH PATTERNS FROM NON-PATTERNS

- “Is this a pattern? Does it follow a rule?” (No)



- “Can you find a pattern (in the room)? How do you know it follows a pattern?”
 - Young children often identify things that don’t follow a pattern, so need feedback and support

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EXAMPLE REPEATING PATTERNING ACTIVITIES

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Introductory Activity

Core unit: AB pattern
Tasks: Copy, then Extend, with lacing beads
Language: Prompt to explain & label part that repeats

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Introduce & Expand Activity

Core unit: Varied core units
Task: Copy pattern with words and actions
Language: Add abstract labels and prompt to explain

- Patterning in Song
 - *Banana, Banana, Meatball* song by Go Noodle
<https://www.youtube.com/watch?v=BQ9q4U2P3ig>
- Use language to deepen understanding:
 - Describe: “We made a pattern because it has a part that repeats. Can you describe the pattern?”
 - Use abstract labels and prompt to explain:
 - **How many bananas do we start with?** <put 2 fingers up on one hand> **And then how many meatballs?** <put 1 finger up on other hand>. **So we can call it a 2-1 pattern!**
 - **Why can we call it a 2-1 pattern?**

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Advanced Activity

Core unit: Start with AB, expand to more complex units
Task: Abstract pattern to new materials
Language: Label core unit if struggling

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Advanced Activity

Core unit: AAB
Task: Use core units to create pattern
Language: Use abstract labels and prompt to explain

From *Building Blocks Pre-K Math Curriculum*

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Tip 4

Find Patterns in Numbers Too

Big Idea: Numbers follow rules just like (repeating) patterns follow rules. When we find a pattern, we know what comes next.

Repeating Patterns in Number System

- One’s digits repeat in each decade:
 - Number words above twenty
 - Written numerals above 10

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4. Find Patterns in Numbers Too

Growing patterns: Items increase or decrease following a rule, such as add 1 or add 2.

2, 3, 4, 5, ? 2, 4, 6, 8, ?

e.g., Count sequence is same as adding one
 e.g., Skip counting by twos is same as adding 2

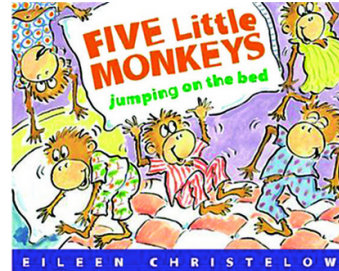
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4. Find Patterns in Numbers Too Example: Making Stairs

From *Building Blocks Pre-K Math Curriculum*

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4. Find Patterns in Numbers Too Example: Stories



Practice predicting how many monkeys are jumping on the bed each time one falls off. Finger play makes this easier.

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Tips for Teachers

1. Increase complexity of core unit
2. Increase demands of patterning task
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Questions?

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Design Patterning Activities for Your Classroom

- Plan patterning activities you will use in your classroom or other setting.
 - Find people with similar interests and needs (e.g., teach same grade level)
- In your small group, plan 3 activities:
 1. **Easier repeating patterning activity** to introduce or re-introduce patterning to students
 2. **Harder repeating patterning activity** to deepen your students' understanding
 3. **Pattern in numbers activity** to broaden your students' use of patterning
 - What language will you use? How will you support children to learn deeply?

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Patterning Material Ideas



- Lacing beads
- Pattern strips with blocks, tangrams, objects
- Pattern trains with linking cubes (e.g., Unifix)
- Pattern worksheets
- Movements and Songs
 - *Banana, Banana, Meatball* song by Go Noodle
<https://www.youtube.com/watch?v=BQ9g4U2P3ig>
 - Walk and dance in patterns: e.g., clip-clop like a horse; flick-flick-swoosh your tail.
- Patterning apps
- *Building Blocks Pre-K Math Curriculum* provided several of these suggestions. Available from McGraw Hill.

