

Strategies for Supporting Fluency in Early Numeracy

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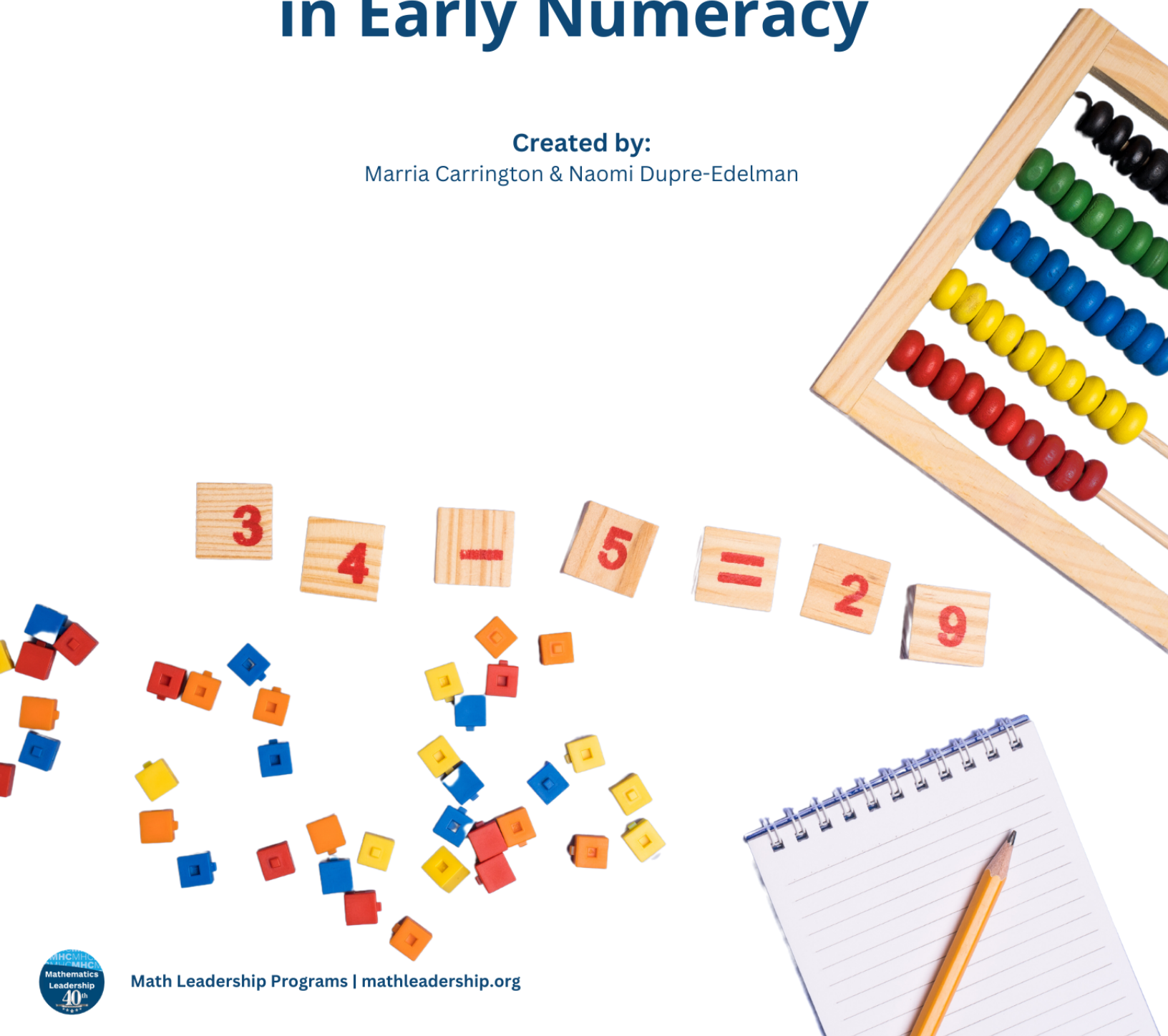


Table of Contents

Table of Contents	2
Introduction to Early Numeracy Fluency	3
Verbal Sequences	4
Recognizing and Identifying Numerals	5
Early Structuring	6
Early Counting Strategies	7
Resources to Support Early Numeracy Fluency	8
References	9

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Introduction to Early Numeracy Fluency

Before students can begin to master their basic math facts in addition, subtraction, multiplication and division, we need to support students with **early numeracy fluency**.

Early numeracy fluency consists of four pieces:

1. Verbal Sequences
2. Recognizing and Naming Numerals
3. Early Structuring
4. Counting Strategies

Supporting students in early numeracy supports building later conceptual and procedural understandings in place value, operations, fractions and integers. Research has also shown that strong early numeracy skills is an indicator of later positive success and opportunity for students (Duncan, 2007). Early numeracy develops from pre-kindergarten through first grade, but they continue to utilize these early skills throughout their learning to make sense of mathematics.

Each of these topics should be introduced systematically, and there is overlap amongst the four pieces during instruction. Below you'll find short descriptions of each of the four pieces of early numeracy along with some strategies to try in your classroom and other resources to explore.

Verbal Sequences

Verbal Sequences refers to a child's ability to orally say the forward and backward sequences. We call this counting to children, but counting technically includes coordinating words and objects. When children learn names for numerals 1-100 and the order, they are learning 28 different vocabulary words including:

- Numerals 1-20
- Decade Numerals (30, 40, 50, 60, 70, 80, 90, 100)

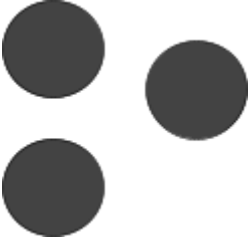
While children should be able to recite numbers words in sequential order going forward and backwards, they should also be able to, when prompted, name the number word that comes before and after a given number. For example, when asked what comes before and after 82, they should be able to say 81 and 83.

Activities that Support Verbal Sequences

Choral Counting	This is a whole group or small group activity where all students count together. Start with numbers that you know are successful for students (e.g.. Start at one and let's count forward and don't forget backwards too,until I say stop).
Count by 10s	Start by getting the <i>by 10s</i> sequence down. In first grade, students work on the <i>by 10s</i> sequence on non-decade numbers. 3, 13, 23, etc.
Number word after...	Give students a number, for example 29, and ask them what comes next. Continue to do this with numbers both that they are confident in and those that will scaffold them forward to new learning. Crossing forward across decades and the teen numbers are the most challenging spots. Also landing on 33, 44, 55, 66, etc. can be tricky too because the student already hears the number when they say it; a common mistake will be for the student to skip this number. For example, 65 ... 67.
Number word before...	Give students a number, for example 31, and ask them what comes before it. Continue to do this with numbers both that they are confident in and those that will scaffold them forward to new learning. Crossing backwards across decades and the teen numbers are the most challenging spots. Also, the number word before 21, 31, 41, etc. are challenging for students..

Recognizing and Identifying Numerals

Students throughout PK - Grade 1 benefit from multiple and varied opportunities to practice recognizing and identifying numerals. This skill requires students to recognize the symbol and attach the word to it. As much as possible in instruction, link the quantity to the numeral, especially within 5, 10 and 20 for early learners.

Quantitative Representation	Verbal Form	Numeric Representation
	<p style="text-align: center; font-size: 2em;">“three”</p>	<p style="text-align: center; font-size: 3em;">3</p>

Giving students ample practice opportunities to see the symbol, hear the word and attach it to quantity will develop their skill in recognizing and naming numerals. It is also important to note that practice of these skills should *follow* the beginning work with verbal sequences. Just like young students say the alphabet before they can recognize and identify the letters, students’ verbal sequences in math proceed their symbolic knowledge.

Resources for Recognizing and Naming Numbers in Numerical Form:

Memory	Create decks with numerals and images of quantities - for example, finger patterns, dot patterns, 5 and/or ten frames and bead racks. Start small, 1-5, and consider how many cards are appropriate for your students. Basic game: Deal the cards face down and students work to make matches.
Go Fish	Use the same decks you make for memory. Each student has cards and is trying to make a pair or trio of matches.
Treasure Hunt	This is a sequencing game that you can differentiate very easily. Check out videos from the US Math Recovery Council to learn how to play. Treasure Hunt Link

Early Structuring

As students begin to make sense of number sequences and recognize different ways numbers are represented, they can begin to make sense of how numbers are structured.

Early structuring supports:

- **Number Conservation:** the ability to hold on to a number in their head
- **Number Imaging:** the ability to visualize and recognize numbers in images
- **Subitizing:** the ability to recognize small quantities without counting
- **Tracking a Count:** the ability to track a count

Four components of early structuring are:

1. **Finger Patterns:** creating quantities on fingers
2. **Spatial Patterns:** recognizing regular and irregular patterns, for example domino and dice patterns
3. **Temporal Sequences:** hearing a sequence of sounds and quantifying it
4. **Temporal Patterns:** hearing a pattern of sounds and quantifying it

Students will need opportunities to practice each of these parts individually as well as together. Below you'll find some activities that support early structuring with ***finger patterns***.

Activities that Support Early Structuring with Finger Patterns

Finger Patterns (on both hands)	Have students create numbers 1-5 on the dominant hand. Once they have the pattern, ask them to make it on their other hand. At first they will count, once they know the pattern then move onto Bunny Ears (see below). The goal is to get to the point where they are able to create the patterns without counting.
Doubles	Prompt: put up 3 fingers on each hand, and ask, "how many fingers?" Repeat with numbers 1-5. Verbally, have students also say 3 and 3 makes 6. After a lot of experience, the prompt shows me the double for ___ and we are wanting students to not have to count! Later in the year, connect symbolic notation to $3 + 3 = 6$ or $6 = 3 + 3$.
Bunny Ears	Instead of having students create the finger patterns in front of them, ask them to make bunny ears. This is another layer of difficulty because their fingers are not in their range of vision. Check out Teaching Number in the Classroom with 4-8 Year Olds .

Early Counting Strategies

Strategies for counting are important, especially as students begin to learn how to add and subtract in early elementary school. Each student will progress at their own speed in their ability to count over periods of time.

Each stage has activities that can be used to support them. More important is to be sure that you are allowing students to move between them as they learn to use each type of counting. Supporting students where they are in counting and providing them tactile, multi-sensory experiences can help support them in moving to the next stage. Below you'll find descriptions and strategies for two of the five Counting Strategies Stages from Steffe, (1988).

Counting Strategies Stages (Steffe, 1988)

Stage	Description	Activity to support Students
1. Emergent	Emergent counters can or may be able to verbally sequence numbers. Students who are emergent counters need support in coordinating their verbal counting with items and may not have 1:1 correspondence.	Activities to support the knowledge of the verbal sequence is critical. <i>See ideas above.</i> Provide opportunities to count items and move items to develop a counting strategy that encourages 1:1 correspondence. Model the verbal sequence and how to count by touching items and saying one word with each. Have students match quantities to visuals. For example: show the 5-dot pattern and have them put 5 counters over the dots. Do this in various patterns on 5 and 10 frames.
2. Perceptual	Perceptual counters are proficient at counting objects and collections they can see. They have 1:1 correspondence and cardinality. Their verbal sequence is solid. From here students will move to figurative counting, which takes time and lots of experiences. Figurative counters can count items they cannot see.	Finger patterns and subitizing dot patterns to 6 should be in place. Create opportunities for students to count what they cannot see by using covers to hide objects. Put out 4 counters and then 3, but cover the 3 and watch. Create hide and seek games: "There are 3 under here and I have 5. How many do I have?" Once students are successful with 1 cover, move to 2. Also if they are successful within the range of 10, challenge them to go outside of finger range.

Resources to Support Early Numeracy Fluency

If you'd like to further your knowledge of Supporting Early Numeracy Fluency check out the following resources (all are hyperlinked when you click):

Website Resources:

- ❖ Math Recovery:
 - [Blog](#)
 - [Number House](#)
 - [Number Sequence with Cups: Find the Chips](#)
- ❖ [Kentucky Center for Mathematics](#)
- ❖ [Build Math Minds by Christina Tondevold](#)
- ❖ [Learning and Teaching with Learning Trajectories](#)
 - [Counting Activities to Support](#)
- ❖ [Math for Teachers by Mount Holyoke College](#)

Books:

- [Developing Number Knowledge](#) by Robert J. Wright, David Ellemor-Collins, Pamela D. Tabor
- [Teaching Number in the Classroom with 4-8 Year Olds](#) by Robert J. Wright, Garry Stanger, Ann K. Stafford and James Martland

Tools to Invest in or Make:

- ❖ [Number Paths](#)
 - [How to Use a Number Path \(Blog post\)](#)
- ❖ [Numeral Rolls](#)
 - [Make Your Own](#)
- ❖ [Numeral Tracks](#)
- ❖ [Finger & Dot Pattern Images](#)
- ❖ [Treasure Hunt Card Decks](#)
- ❖ [Bead Rack](#) (virtual resource)

Our course **X.MATH-415 Early Assessment and Instruction I**, is a great opportunity to learn more about early numeracy fluency strategies and assessments. Reach out to Naomi Dupre-Edelman, Assistant Director of Math Leadership Programs, ndupre@mtholyoke.edu, for more information on registering.

If you have any questions, please reach out to Marria Carrington, Director of Math Leadership Programs at mcarrington@mtholyoke.edu or Naomi Dupre-Edelman at ndupre@mtholyoke.edu.

References

- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428–1446. <https://doi.org/10.1037/0012-1649.43.6.1428.supp> (Supplemental)
- Huntley, R. (2007). Teaching Number in the Classroom with 4-8 Year Olds Robert J. Wright Garry Stanger Ann K. Stafford James Martland. *Mathematics in School*, 36(1), 35.
- Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., Susperreguy, M. I., & Chen, M. (2012). Early Predictors of High School Mathematics Achievement. *Psychological Science*, 23(7), 691–697. <https://doi.org/10.1177/0956797612440101>
- Steffe, L. P. (1988). Construction of Arithmetical Meanings and Strategies. [electronic resource] (P. Cobb (Ed.)). Springer New York.