



## DIFFERENTIATING LEARNING OPPORTUNITIES IN EARLY MATH

### OPTIONAL PRESENTER NOTES

### Further Examples of Differentiating



- More of the counting learning trajectory.
- Let's start with more of the developmental progression.



#### OPTIONAL SLIDE 1:

- Say, “Now we can use differentiation effectively with learners at all levels. Let’s learn more about the learning trajectory for counting. We’ll start with more of the developmental progression.”

# Number Sayer

...15-Minute...  
In-Service Suites

- Children begin connecting small quantities to number words to form an initial idea of cardinality, or “how-many-ness.”
- Following their first birthday, the number word “two” is often the first learned.



- Other general terms such as “many” and “less” usually follow. After that, children often learn “one,” and for some children, “three.”
- Only over time do they begin to understand that all groups labeled with the same number word...actually have the same amount.

Number Sayer

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## OPTIONAL SLIDE 2:


- Say, “These are the steps, of levels of a learning trajectory for counting.”
- “First, is Number Sayer:
  - Children begin connecting small quantities to number words to form an initial idea of cardinality, or *how-many-ness*.
  - Following their first birthday, children often learn the number word *two*, first.
  - Other general terms such as many and less usually follow. After that, children often learn *one*, and for some children, *three*.
  - Only over time do they begin to understand that all groups labeled with the same number word... actually have the same amount.”
- Then if you wish and you have access, use LT2 to see an example.

**Chanter**

--15-Minute--  
In-Service Suites

Says in sequence but may run together.



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**OPTIONAL SLIDE 3:**

Read the following:

- Chanter: Says numbers in sequence but may run together.

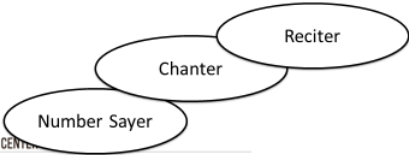

Then if you wish and you have access, use LT2 to see an example.


--15-Minute--  
In-Service Suites

# Reciter

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Verbal counting to 5, then 10.



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OPTIONAL SLIDE 4:

Read the following:

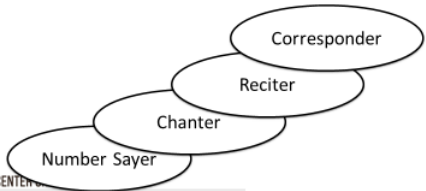

- Reciter: Verbal counting to 5, then 10.


Then if you wish and you have access, use LT2 to see an example.

**Corresponder**

--15-Minute--  
In-Service Suites

Counts correctly using 1-1 correspondence, at least up to 5 objects in a line.



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**OPTIONAL SLIDE 5:**

Read the following:

- Corresponder: Counts correctly using 1-1 correspondence, up to at least 5 objects in a line.


Then if you wish and you have access, use LT2 to see an example.

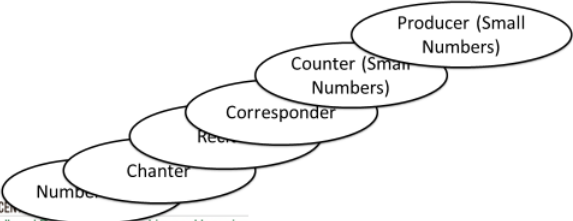
# Counter / Producer




...15-Minute...  
In-Service Suites

Counts out a collection up to 5.







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**OPTIONAL SLIDE 6:**

Read the following:

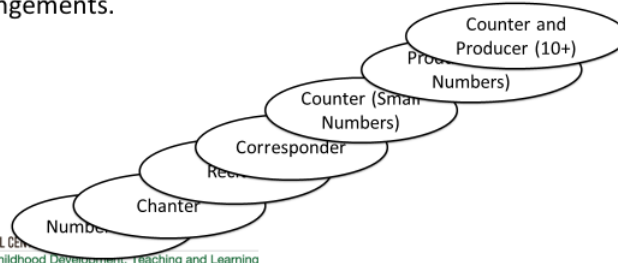
- Counter/Producer: Counts out a collection up to 5.

Then if you wish and you have access, use LT2 to see an example.

# Counter & Producer

...15-Minute...  
In-Service Suites

- Counts and counts out objects accurately beyond 10 (usually to 30 or more). Keeps track of objects that have and have not been counted, even in different arrangements.



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## OPTIONAL SLIDE 7:

Read the following:

- Counter/Producer 10+: Can verbally count accurately beyond 10. Can also count out more than 10 objects (usually to 30 or more). Keeps track of objects that have and have not been counted, even in different arrangements.

Then if you wish and you have access, use LT2 to see an example.

# LT<sup>2</sup>: A Counting Example



- [LearningTrajectories.org](https://learningtrajectories.org)
- Example...click [here](#).



## OPTIONAL SLIDE 8:

Use the link in the 2nd bullet to see a video example (click here). Read and discuss the text about the video.

Ask:

- What competencies do you see?
- What might be the next level of thinking for this child?

*Important note: Do not show the actual URL in the link or share it with anyone. It should not be downloaded or disseminated in any form to maintain privacy agreements.*



## Differentiating *Teaching*



- Notice and encourage children’s natural development through the developmental progression.
- Counting in rhymes, finger plays, stacking blocks, picking up— Emphasizing one or two numbers *past* where children are.
- Don’t underestimate! Higher numbers helps.
  - Mothers use 2 more than 3 and 3 more than 4.
  - From ages 1-9 and 3-9, children used the word two 158 times, three 47 times, four 18 times, and five only 4 times!



### OPTIONAL SLIDE 9:

Read the following:

- Now that we know the developmental progression, we can alter our environments, interactions, and activities for children.
- Simply notice and encourage children’s natural development through the developmental progression. In everyday activities, emphasize verbal and object counting that is just one or two counting numbers beyond where children presently count. But remember—don’t underestimate children! We sometimes stick with small numbers too often and too long. As an example:
  - Mothers use 2 more than 3 and 3 more than 4.
  - From ages 1-9 and 3-9, children used the word two 158 times, three 47 times, four 18 times, and five only 4 times!



## Supporting Teaching and Learning: Examples



- Small Groups
- Naturalistic Observation
  - Templates for differentiation
  - Support from LT2
- The Role of Feedback Cycles

### OPTIONAL SLIDE 10:

Read the following:

- There are many ways to differentiate to support teaching and learning.
- Small groups: Group children by similar levels of thinking. Grouping should be flexible, based on differentiation, and sensitive to children’s emotional and social development.
- Natural observations: Observe children as they engage with materials in the learning environment. In the example below, we’ll see how teachers and family child care providers can observe children during free play or planned learning experiences.
  - Home visitors can support parents as they observe their child playing or during a learning opportunity (ex. counting the laundry as they go in the wash). This helps parents understand their child’s developmental level and offer appropriate activities.
- Feedback cycles: Emphasize accuracy, encourage children to count slowly, give children verbal cue about what they are counting by saying, “Use your finger to point to the objects,” or “Make sure you count each one.”
  - Home visitors can encourage parents to give their child feedback when engaged in learning opportunities at home. For example, home visitors can say, “It was great that you pointed to the cotton balls with your child when you noticed she needed support,” or “Try telling your child to count the Cheerios slowly next time.”
- We’ll take a quick look at each of these.

## Small Groups



- Research suggest small groups as the most effective teaching strategy.
- There are benefits and misuses of grouping by children’s level of thinking.
- Use Small Group work to *differentiate teaching, based on children’s needs and learning trajectories*

### OPTIONAL SLIDE 11:

Read the following:

- Research indicates that doing activities in small groups is the most effective intentional teaching strategy for mathematics (Clements & Sarama, 2014).
- Although grouping children by levels of thinking can be effective, these groupings should be flexible, based on differentiation, and sensitive to children’s emotional and social development. Done badly, it can lead children with lower entry skills into misbehaviors and lower their self-efficacy (e.g., Catsambis & Buttaro, 2012).

Notes for presenters only, in case the issues are raised:

- If using small groups to differentiate instruction seems a bit obvious, note that the Early Childhood Longitudinal Study showed that half of kindergarten teachers report never using this approach (National Research Council, 2007). We don’t use small groups in early childhood education much at all. When we do teach intentionally, whole group instruction dominates.
- Ability grouping is often done badly in schools that serve low SES and high-minority children, in which primary-grade teachers may use four or more groups (reducing instructional time) and spend more time with higher-performing groups (Nomi, 2010). In contrast, in advantaged schools, ability group more often increases achievement for all students.

### REFERENCES:

- Jordan, N. C., & S. C. Levine. 2009. “Socioeconomic Variation, Number Competence, and Mathematics Learning Difficulties in Young Children.” *Developmental Disabilities Research Reviews*, 15: 60–68.
- Levine, S. C., L. W. Suriyakham, M. L. Rowe, J. Huttenlocher, & E. A. Gunderson. 2010. “What Counts in the Development of Young Children’s Number Knowledge?” *Developmental Psychology*, 46(5): 1309–1319. doi: 10.1037/a0019671
- Perry, B., & S. Dockett. 2005. “I Know That You Don’t Have to Work Hard: Mathematics Learning in the First Year of Primary School.” In H. L. Chick & J. L. Vincent (Eds.), *Proceedings of the 29th Conference of the International Group for the Psychology in Mathematics Education* (Vol. 4, pp. 65–72). Melbourne, AU: PME.
- -Catsambis, S., & Buttaro, A. (2012). Revisiting “Kindergarten as academic boot camp”: a nationwide study of ability grouping and psycho-social development. *Social Psychology of Education*, 15(4), 483-515.

- Clements, D. H., & J. Sarama. 2014. *Learning and Teaching Early Math: The Learning Trajectories Approach*. New York, NY: Routledge.
- National Research Council. (2007). *Taking Science to School: Learning and Teaching Science in Grades K-8*. Committee on Science Learning, Kindergarten Through Eighth Grade. Richard A. Duschl, Heidi A. Schweingruber, and Andrew W. Shouse, Editors. Board on Science Education, Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- Nomi, T. (2009). The effects of within-class ability grouping on academic achievement in early elementary years. *Journal of Research on Educational Effectiveness*, 3(1), 56-92.

## Free Explore—With Observation



- 4-year-olds explore manipulatives, interacting with each other and the teacher.
- Example of Teacher's notes:

Child	Numbers Counted/Produced	LT Level
Nita	VC "2 4...3"; C 2 some corr.; P 1	Number Sayer
Ming	None in English	? Check first language
Maria	C 1-5 (card.); P 1, 2, 3	Counter Small Numbers
José	C 3, 4 corr., no cardinality	Corresponder



### OPTIONAL SLIDE 12:

Read the following:

- Let's join one teacher as she uses differentiation with her preschoolers. Notice how she recorded the verbal counting, or VC, and object counting, or C, and then noted their possible level in the counting learning trajectory.

## Making Number Pizzas

1. Verbal counting with guided correspondence to 3 or 4. [Repeat informally throughout week.]
2. Count 1-4, emphasis on cardinality. [Repeat on Friday, increasing numbers.]
3. Produce to 5, explore larger numbers.
4. Explore with interpreter.

Child	Numbers	LT Level
1. Nita		
2. José		
3. Maria		
4. Ming		



### OPTIONAL SLIDE 13:

Read the following:

- Then she used the embedded assessment from her observations to plan a simple small group activity in which she gave each child a number and they put that number on their pretend pizza.
- Notice her plans for four levels of thinking that included all her children. Also notice how this teacher puts Nina's tasks in number 1, José's in number 2, Maria's number 3, and Ming's number 4.

## Assessment from Making Number Pizzas

1. Verbal counting with guided correspondence to 3 or 4. [Repeat informally throughout week.]
2. Count 1-4, emphasis on cardinality. [Repeat on Friday, increasing numbers.]
3. Produce to 5, explore larger numbers.
4. Explore with interpreter.

Child	Numbers	LT Level
1. Nita	VC 1-4; C 2 corr.	Reciter
2. José	C 1-5, some cardinality	Corresponder+
3. Maria	C to 6, P to 5	Producer (Small Numbers)
4. Ming	C to 8, possibly more; P to 6	Producer (Small Numbers)+



### OPTIONAL SLIDE 14:

Read the following:

- The teacher once again recorded how each did. Her plans worked out well, with Ming on his way to the next level. She will watch Nita carefully to give her extra experiences.

## Formative Planning for Board Game

1. Cube with 1-2, then 1-3 dots.
2. Cube with 1-6 dots.
3. Cube with 1-6, then 3-8 dots.
4. Cube with 3-8, maybe numerals.

Child	Numbers	LT Level
1. Nita		
2. José		
3. Maria		
4. Ming		



### OPTIONAL SLIDE 15:

Read the following:

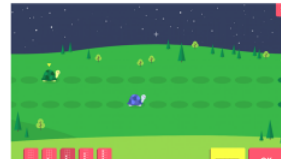
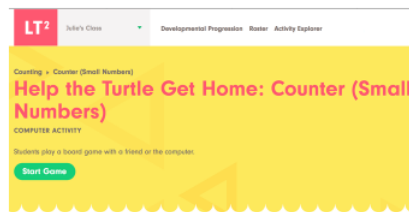
- Weeks later, she returned to her notes from the “Number Pizzas” activity to plan instruction for a board game. She wanted to use different dice or number cubes to meet every child’s needs.



## At the Same Time...



- LT<sup>2</sup> games that adjust dynamically with the children's level.
- Immediate feedback, multiple representations.



### OPTIONAL SLIDE 16:

Read the following:

- There are also games on the LearningTrajectories.org web site that children can play. Teachers can play them too, of course, to get to know them. They have the advantage of providing immediate feedback and having multiple representations of mathematical ideas, such as counting words, numerals (symbols), and sets of objects. The children will also have actions to perform, such as counting while moving on the path.

# LT<sup>2</sup>: An Instructional Example



- [LearningTrajectories.org](https://learningtrajectories.org)
- Example...click [here](#).



## OPTIONAL SLIDE 17:

Read the following:

Use the link in the 2nd bullet to see a video example (or click here). Read and discuss the text about the video.

Ask:

- What is this teacher doing?
- What other activities or teaching practices would you suggest?

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