MATH: NUMBER RECOGNITION AND SUBITIZING - AIAN
Every Individual is Rooted in Culture
Two-Eyed Seeing

“Two-Eyed Seeing asks us to see our strengths, the best in our ways of knowing, while also asking us to respect and celebrate our differences. Two-Eyed Seeing acknowledges the necessity of formal structure yet that it must be preamble to and receptive of new understandings and opportunities, i.e., understandings associated with ‘Spirit of the East’ which brings the ‘gift of newness, of transformation.’”
Math Stretches Across the ELOF Domains

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NATIONAL CENTER ON
Early Childhood Development, Teaching and Learning
Math Stretches Across the ELOF Domains

- Cognition (Infant/Toddler)
  - Reasoning and Problem-Solving
  - Emergent Mathematical Thinking
- Cognition/Mathematics Development (Preschooler)
  - Counting and Cardinality
- Approaches to Learning
  - Cognitive Self-Regulation
- Language and Communication
  - Communicating and Speaking
Making It Work

We were always trying to integrate culture into the curriculum—the science domain, the math domain, etc. Then we realized that culture should be at the base, serving as the foundation, the building block for curriculum development. It was an amazing paradigm shift! We are now making huge gains in integrating language and culture into our early childhood programming.

—The Red Cliff Early Childhood Center
Language and Culture Matter

Without language, the canoe, paddle, water, seat, the birds you hear are different than what our ancestors experienced. If you know the language, then you know what our ancestors heard, saw, felt, and experienced.

—Zalmai “Zeke” Zahir, University of Oregon
Highly individualized teaching and learning

Implementing research-based curriculum and teaching practices

Parent/family engagement

Screening and ongoing child assessment

Nurturing, responsive, and effective interactions and engaging environments
Parent, Family, and Community Engagement

Culturally and linguistically responsive environments can only be created by engaging and partnering with families, Elders, and the community. Establishing a partnership with families and the community is crucial for children’s learning and later success in life.
Culturally and Linguistic Responsive Practices

Sources of Developmentally Appropriate Practices

- Daily Program Operations/Service Delivery
  - Child Development Research
  - Individual Child Assessment
  - Cultural & Linguistic Contexts of the Child, Family, & Community
Session Objectives

• Explain *number recognition* and *subitizing* for young children (the goal)
• Identify the *developmental progression* for number recognition and subitizing
• List ways to incorporate subitizing into in everyday *educational activities*, routines, and instruction
• Use the *Steps and Introduction to Making It Work Guide* to integrate culture and language in lesson plans for math skills
“Subitizing is a fundamental skill in the development of [children’s] understanding of number.”

(Baroody, 1987)
Some Examples of Subitizing in the Classroom

• Simple but continuous teaching strategy
  • Use small numbers in everyday talk and cultural storytelling

• You can make a huge difference
  - planned curricular experiences
  - spontaneous experiences
Learning Trajectory

Three Parts:

1. Goal
2. Developmental Progression
3. Educational Activities
1. Goal

2. Developmental Progression

3. Educational Activities
Children recognize and then subitize (recognize quickly) the number in a group without counting.

“Look! I have three blocks!”
Not this!

5
Number Recognition

• Early number recognition is not (yet!) subitizing.

• Subitizing is the rapid recognition of numbers without needing to count.

• Children can first recognize the number in small groups, then they get better and faster and can subitize.
Why Is this Goal Important?

• Number recognition builds upon the *earliest developing* number sense
  • Infants begin to notice the number of objects in a small group

• Supports learning how to count
  • Cardinality (knowing how many you counted)

• Supports learning arithmetic
  • Even after accounting for IQ and language
Part 2 of the Learning Trajectory

1. Goal
2. Developmental Progression
3. Educational Activities
Young Children and Number

- Infant competencies
- “Habituation” research
Child getting “bored”
Perceptual Subitizing

• What is it?
  • The ability to “just see” how many objects in a small collection.

• Let’s actually do some perceptual subitizing.
  • Ready?
What did you see?
Conceptual Subitizing

• What is it?
  • The ability to see the parts of multiple small sets and putting together the whole.

• Now, let’s try some conceptual subitizing.
  • Ready?
What did you see?
What Did You See?

• How did you know?
• Think-pair-share!
• Within the first year, sensitive (dehabituates) to number, but does not have explicit knowledge of number. For infants, this begins with very small numbers (1 or 2).
LT Level: Small Collection Namer

- Names groups of 1 to 2, sometimes 3.

“Two fish!”
LT Level: Maker of Small Collections

- Makes a small collection (no more than 4, usually 1–3) with the same number as another collection or from the number word.
LT Level: Perceptual Subitizer to 4

- Quickly recognizes collections up to 4 briefly shown and names the number.
LT Level: Perceptual Subitizer to 5

- Quickly recognizes collections up to 5 briefly shown and names the number.
Names the total in all arrangements to about 5, when shown only briefly.
LT Level: Conceptual Subitizer to 10

- Extends to 10.
  For the advanced!
Part 3 of the Learning Trajectory

1. Goal
2. Developmental Progression
3. Educational Activities
Math Language

• When children make a math utterance, teachers:
  • 60% of the time ignore it
  • only 10% of the time respond mathematically

This has important implications for children, particularly children speaking or learning their tribal language.
Support Subitizing for AIAN Children

1. Choose culturally meaningful and familiar materials
2. Connect math terms to child’s tribal language
   • Learn if the child can subitize in their tribal language?
   • Embed language of child in activity
   • Use one or two words and phrases
3. Multiple representations
4. Emerging competence versus struggles with expressive vocabulary
5. Tiered levels of questions
What To Do?

Quick Images or Snapshots
• Show a set for 2 seconds or less, then hide it
• Ask children to say how many they saw

How would you need to alter these cards to play this game?
Rhythmic Subitizing

Subitizing can also be rhythmic
Supporting Children with Suspected Delays or Identified Disabilities

- Subitizing is especially important for the mathematical development of children with special needs.
- Use number names *all day*, naturally but intentionally.
- Play a lot of dice and domino games.
- *Follow the learning trajectory with patience!*
Children with Disabilities

- Work toward use of fives and tens frames, a powerful representation (Flexer, 1989)

- For those with perceptual issues, such as visual impairment:
  - use manipulatives that can be held
  - include lots of *rhythmic* subitizing
Review