This document provides a summary of Recommendation 4 from the WWC practice guide *Teaching Math to Young Children.* Full reference at the bottom of last page.

CONTENT: **Mathematics**
GRADE LEVEL(S): **preK–K**
LEVEL OF EVIDENCE: **Minimal**

Recommendation

Teach children to view and describe their world mathematically.

Teachers can start by having children describe math they see and experience in the real world informally, using their own language. Once children are comfortable with informal representations and talking about math, they can move to more formal representations and vocabulary, with teacher support. Applying math to real-world situations while children play and work at school will help them develop a better understanding of the math concepts they are learning.

How to carry out the recommendation

1. Encourage children to use informal methods to represent math concepts, processes, and solutions.

Instructional strategies from the examples

- Introduce new math concepts using terms and connections familiar to children.
- Focus on having children explain their mathematical thinking and reasoning in a way that makes sense to them, rather than initially focusing on correct mathematical language.

South Carolina standards alignment

MATHEMATICS: K.G.4, 1.MDA.2
TEACHERS: INST.MS.2

Teachers should begin math instruction by informally representing math concepts through connections to experiences, using recognizable terms and comparisons. For example, teachers should think about the vocabulary that children already know when teaching them addition. Children are likely familiar with the terms “take away” and “left.” Instead of using math terms for subtraction, teachers might say, “Suzy

had four candy bars, and her mom took away one candy bar. How many candy bars does Suzy have left?"

Using information representations of math concepts

Concept	Informal Representation	Teaching the Concept
Whole number	"three"	Collections of blocks, dots, tally marks, fingers, or other countable objects can represent numerals. For example, when playing a game, use blocks to represent children's scores so that everyone can track each player's score.
Equal	"same number as" or "same as"	Provide opportunities for children to begin to recognize that collections that have the same number when counted are equal. For example, a collection of four plates is the same number as a collection of four cups.
Unequal	"more than" or "fewer than"	Point out that a collection is more (or fewer) than another if it requires a longer (or shorter) count. For example, seven is more than six because it requires counting beyond six.
Addition	"and" or "more"	Start with a collection and add more items to make it larger. For example, start with three crayons and add one more. Then ask, "How many?"
Subtraction	"take away" or "fewer"	Start with a collection and take away some items to make it smaller. For example, start with three crayons and take away one. Then ask, "How many?"

Note. Adapted from Table 6 on page 43 of the practice guide.

2. Help children link formal math vocabulary, symbols, and procedures to their informal knowledge or experiences.

Instructional strategies from the examples

- Help children connect their informal language to formal mathematical language through modeling.
- Use formal mathematical terms throughout the school day.
- Connect children's mathematical language to mathematical symbols.

South Carolina standards alignment

MATHEMATICS: PS.1a, PS.4
TEACHERS: PLAN.SW.3

Once children are comfortable with talking about and representing math concepts informally, teachers can begin introducing formal math concepts. Teachers can do so by connecting informal representations with formal math terms (for example, "more" with "addition"). To help children learn formal terms, teachers should be sure to use each term multiple times throughout the school day and also provide opportunities for children to repeatedly use the term. For example, when teachers read a book with the class, they can make connections to math terms by talking about the characters in the book, such as one character being younger or older than another.

Children must also learn to connect their informal math knowledge with formal math symbols (for example, "more" connects with +). An example activity might involve having children solve addition or subtraction problems with objects in the classroom. For more ways to connect informal knowledge to formal math symbols, see Table 7 on page 44 of the practice guide referenced on the last page of this document.

3. Use open-ended questions to prompt children to apply their math knowledge.

Instructional strategies from the examples

- Use open-ended questions to help children build their ability to reason mathematically and use math vocabulary.

South Carolina standards alignment

MATHEMATICS: PS.1, PS.2, PS.3
TEACHERS: INST.MS.2

Teachers can use open-ended questions ("what," "why," "how," and so on) to prompt children to think about math concepts and vocabulary. These questions allow children to apply what they know in answering a question. Open-ended questions should encourage children to use concepts and terms they are familiar with. For example, teachers might show a picture of two trees and ask, "What makes these two trees different?" This question invites multiple answers. One child might say, "The first tree is taller than the second tree." Another child might say, "They are different kinds of trees." Allowing for multiple responses lets children discuss concrete objects using math terms. Sample open-ended questions that teachers might use to encourage children to discuss math concepts are provided below. See the practice guide referenced on the last page of this document for more examples.

Examples of open-ended questions

- What makes these the same/different?
- How can you tell how ___ (tall, short, long, wide) that is?
- How did you figure out how many ___ (blocks, buttons, shapes) there are?
- Why do you think this is ___ (taller, shorter, longer, wider) than that?

Note. Adapted from Table 8 on page 45 of the practice guide.

4. Encourage children to recognize and talk about math in everyday situations.

Instructional strategies from the examples

- Provide opportunities for children to discuss connections between math concepts and the world around them.
- Have children explain their solution strategies out loud.
- Encourage children to think about other ways they might be able to solve a problem.

South Carolina standards alignment

MATHEMATICS: PS.2a
TEACHERS: INST.MS.2

Teachers can strengthen children's math knowledge by providing opportunities for them to connect math concepts to the real world. For example, teachers might ask children for help in deciding the number of pencils needed for the classroom: "How should we figure out how many pencils we need for the classroom?" Teachers could then encourage the children to think about the solution path for the problem by discussing it out loud: "How did you think of that answer? What steps did you take?" Once the children have explained how they solved the problem, teachers can repeat the explanation out loud and then ask, "Are there different steps we could have taken to solve this problem?" If children are struggling to discuss their mathematical process, teachers can provide examples. This activity allows children to connect their math knowledge to problem-solving in everyday situations.

Potential roadblocks and how to address them

Roadblock	Suggested Approach
I'm not sure what types of open-ended questions are most effective for getting young children to think mathematically.	Use the strategies described in this recommendation to think about open-ended questions you might use. Start a math conversation by asking, "How can we figure this out?" Once children have answered, prompt them to think about how they arrived at their answers by asking, "How did you think of that answer?" and "What steps did you take?" If there is more than one correct strategy, ask children, "Are there other steps we could have taken to solve the problem?"

Reference: Frye, D., Baroody, A. J., Burchinal, M., Carver, S. M., Jordan, N. C., & McDowell, J. (2013). *Teaching math to young children* (NCEE 2014-4005). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance. https://ies.ed.gov/ncee/wwc/PracticeGuide/18