

Assessing & Developing Math Concepts



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Kathy Richardson is the author and developer of the Assessing Math Concepts (AMC) series of assessments and the Developing Number Concepts (DNC) series for Kindergarten through Second Grade Mathematics. Kathy, Program Director for Math Perspectives, is one of the most respected early childhood mathematics educators. Kathy answers questions from teachers across the country who are using AMC and DNC.

If you have questions for Kathy, please send them to Math Perspectives at info@mathperspectives.com.

CRITICAL LEARNING PHASES and Number Talks Instructional Ranges

Q Hello, Kathy! I attended one of your leadership trainings in Hutto, TX a couple years ago and have been studying the Critical Learning Phases with our math intervention team. We are now doing a summer book study with your Number Talks in the Primary Classroom book.

I am writing because I may have interpreted the learning phases wrong, and am looking for clarification. I had thought the Critical Learning Phases were generally chronological, with Understanding Counting being followed by Understanding Number Relationships, and then Addition/Subtraction: Parts of Numbers, and so on. When reading the number talk book, it looks like the second phase, Number Relationships, is actually pulled out and runs throughout all the other phases, rather than being like a "second step." Am I reading this correctly? Thanks for clarifying! - Rochester, MN

A It is exciting to me that you are using the Number Talk book for a book study. Stay in touch with any questions or insights that come up. I will be glad to answer questions or comment if it will be helpful.

There are different ways to think about the Critical Learning Phases. There is a chronological order for when children begin to develop these concepts, but there are other complexities that show up when looking more closely to see more detail or when looking at the bigger picture to see their development over time. What we emphasized at the Leadership Institute was the order in which children are "ready" to learn these concepts. So, in general, they begin with Counting which they

understand early on as one and another one and another one with each number separate from other numbers. Then they begin to develop the idea that a smaller number is part of a larger number and that numbers are related to each other. So if they have been asked to show a group of 4 and then the teacher says, "Show me 5", instead of pushing the 3 away so they can make a pile of 5, they will count, "1,2,3.. and then add on to make 4 and then 5. One of the questions that is most interesting to me in the assessments when given to very young children is when we ask them to change 5 to 4. A child, who has started over every time they were asked to build a number, may see that they can just take one off to get to 4. Those who start over and count from 1 to make a new pile don't see that yet. When they do, it is like the first little hint they are beginning to notice relationships. What makes the Critical Learning Phases so important is they identify levels of thinking that must be in place for children to work with particular concepts. So a child who "changes" 5 to 4 by pushing the pile of 5 out of the way and building a new pile of 4 is not ready to learn $5-1 = 4$ with understanding. What we do with young children is so important for their future understanding of the math they will be learning. It really is foundational in ways most people who work with older children don't realize.

What we wanted to do in the Number Talk book was to present the idea that children will be learning more than one concept at a time. I think of it like a song that begins with one note, but then another note is added and another and another until we end up with chords. We don't want teachers to focus on just one concept at a time when doing Number Talks, and to think of Number Talks as moving from one thing to another. Instead we wanted to present the idea that once an idea is introduced, it needs to keep developing and to be integrated with other ideas.

Hope this is helpful. Be sure and let me know if you have any other questions. ~ Kathy

DEVELOPING NUMBER CONCEPTS: Linking Assessment to Instruction

Q Hello, I am a 1st grade teacher who has all your materials. I read the book *How Children Learn Number Concepts* and I realize that my kids need to learn how to see that numbers are or can be parts of other numbers. But I don't know how to find activities within Kathy's book (Book 1-2-3) to develop this particular skill. Please help. - River Forest, IL

A I think the most helpful guide is the information we direct teachers to after giving the Assessing Math Concepts assessment. You can find the list of activities online at AssessingMathConcepts.com. Select Resources and then select Expand AMC Documents and you will see a list of the Linking

documents for each assessment. There are two assessments that can give you information on whether or not your students are seeing that numbers are made up of parts. One is Changing Numbers and the other is Number Arrangements. We look at the idea from different angles with each assessment. Changing Numbers shows whether the child can build on a given number to make a new number. Number Arrangements give us information about whether children see parts within a whole number. You need to give the children a variety of experiences where they focus on parts. Mary Baratta-Lorton called this "surrounding the child with the concept". Here are a couple activities that are suggested for each assessment.

Grow and Shrink p. 35 in Developing Number Concepts Book One
Number Arrangements beginning on p. 77 in Developing Number Concepts Book Two

Children need to understand that smaller numbers are part of larger numbers. Grow and Shrink is an effective activity that will help them see that. It can be done over and over again because you can change the range of numbers you work with and the size of the differences between the numbers depending on what the children do. This is a task where you can easily see where children's thinking is.

Working with Number Arrangements using toothpicks and tiles and pattern blocks gives children the opportunity to look for parts. Even if you haven't assessed all the children, if you know what you are looking for, you will be able to observe how your students are thinking about numbers and parts of numbers. There is another way that you can help children become aware of parts. You do this by asking questions that will give them a chance to think about parts and you a chance to see what they do. For example, if children were measuring Line Puzzles and they measured part of it, you could ask "How many paper clips have you used so far? How many more paper clips do you think it will take?" My point in this example, is that you can focus the kids on thinking about parts even when the task is not designated for that purpose.

I hope this is helpful. Let me know if you have any further questions. ~ Kathy

ASSESSING MATH CONCEPTS

Q Some of the teachers in our school division noticed that if a student does not move the counters when counting, the student will not earn an "A." Is this true? If so, what explanation can I provide them as to why? Thank you for your time. We love the assessments! - *Mineral, VA*

A Thank you for your question. The children don't have to move the counters. If they can do it accurately, they could point or "count with their eyes" if they have a systematic way of doing this. What we don't want the child to do is line up the counters first before counting. The issue is if they organize the counters before they count, they are making the task "simpler", so counting this way is not considered 'Ready to Apply'. This method is usually used because the student has been shown this way to keep track. Lining up the objects before counting may help them get the right answer, but it also limits their flexibility and interferes with the development of more efficient strategies." If a child starts to line the counters up, you can say, "Would you like to try counting them without lining them up first?" This can serve as a hint for any children who think they are supposed to line them up first.

Let me know if you or the other teachers you work with have any additional questions. ~ Kathy

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