

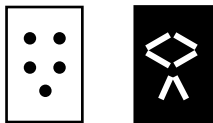
LEARNING MATHEMATICS THROUGH NUMBER TALKS

Why Number Talks?

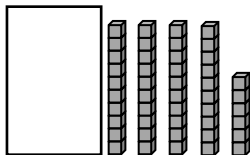
Take a moment to reflect on what math was like for you as a child in your first few years of school. If your experience was typical, you remember doing workbook pages, memorizing basic addition and subtraction facts, and learning the steps for borrowing and carrying. This way of studying math is based on the almost universally accepted assumption that basic math facts and computational procedures are acquired through memorization. However, there is another way to learn mathematics; one that is more effective and builds a stronger foundation than learning by memorization. This method is based on children seeing how numbers work, analyzing the composition of numbers, and recognizing the recurring patterns that appear whether one is breaking up 1 ten, 1 hundred or 1 thousand. When children solve problems by thinking about the meaning of the numbers and relationships between them, they might look at a problem such as $4 + 5$ and say, “I know that 5 and 5 is 10, so if you take 1 off, that makes 9.” Or, when presented with the problem $102 - 55$, they might think 100 minus 50 is 50. If they take 5 more away, there’s 45. Put the 2 back on, they have 47.

When children work with numbers using the mathematics that makes sense to them from the very beginning of instruction, we see not only how much easier this is for them than trying to follow our way of doing it, but also how much more mathematics they are able to understand and use. Children who understand the underlying mathematics inherent in the structure of numbers know that numbers make sense. They develop a deep understanding of number and number relationships and will solve problems with accuracy and efficiency. When children are asked to make sense of numbers rather than to simply learn procedures for working with them, they go on to higher-level mathematics with the necessary foundation for success.

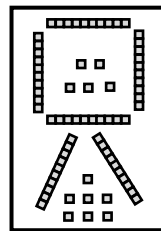
Children can get the experiences they need thinking with numbers through a short, daily routine called Number Talks. Number Talks are a powerful tool for helping children learn to understand numbers and to develop computational fluency. During Number Talks, children are asked to think and reason to solve problems using the mathematics they know and understand rather than following the rules and procedures set down by others. The teacher presents intentionally selected problems and asks the children to share the processes they used to figure out “how many.” Teachers present problems within an appropriate range of numbers using models to highlight particular concepts the children need to learn, as shown in the following examples.



See if you can use the first card to tell how many are in the new card.



*You said there are 46 showing.
There are 66 cubes altogether.
How many are hiding?*



What's the most tens you can make?

The teacher asks questions that have the potential of helping children focus on what they may not otherwise notice. However, the children are not pressured to recognize what they don't yet see, nor are they expected to use language they don't yet understand. Their focus is on figuring out "how many" in the best way they can, rather than trying to determine what the teacher wants them to see or think or say.

The Number Talk Routine

All Number Talks follow a basic format. The 5- to 15-minute routine is the same for each Number Talk, but the problems and models used will differ. Number Talks are usually held with the whole class but sometimes in small groups. When children are working within the entire class, they will have opportunities to experience a wide range of problems and many different ways to solve them. While in small groups, the problems that children work with can be more tailored to their particular needs.

1. Present the problem using models or symbols.
2. Say: *Thumbs up when you know how many.*
3. Collect answers from 3 to 5 children.
4. Ask: *How did you find out?*
5. Notice the mathematics the children use.
6. Sometimes write down the math they did using symbols.
7. Repeat the cycle.

Number Talks allow children to hear how other children approach the problems they are working on. Listening to others shows the children there are many ways to solve a problem and gives them opportunities to consider different methods. Sometimes they find another approach meaningful and want to try it out for the next problem. For example, a child might listen to how a classmate added 98 to a number and think, "That's a good idea. That's easier than the way I did it." Another child might not have understood what was being described and so continues to think

about the problem in the way that makes sense to them. The decision to try out someone's way of solving a problem is entirely up to the child. Children are never asked to give up their own thinking and try out a method that does not yet have any meaning for them. Their own sense-making process and search for ways to solve problems is more important to their growth in understanding than any attempt to copy what other children are doing.

Number Talks are an ongoing daily experience, giving children time to search for better and better ways to find out "how many." Troy helps make that point. We met Troy when he was a first-grader in a first- and second-grade combination class. He had just heard the ways the others in his class solved $28 + 14$ and he shared what he did with great confidence. "I started with 28 and then I counted on my fingers." He was thinking for himself, and his way worked so he was happy with what he could do. When children do not yet know the mathematics needed to solve a problem using sophisticated or efficient methods, they can still work on the problem using whatever mathematics they know up to that point. Everyone can do the problem in some way, so every child can be expected to think about the numbers and engage in solving the problem.

Troy didn't continue counting on his fingers. He was engaged in a search for relationships and understanding how numbers work. His experiences took him to the place in second grade where he was asked to solve $24 + 37$.

Troy: 30 plus 24 equals 54, plus 6 is 60, plus 1 more equals 61.

Teacher: Where did you get the 6?

Troy: I broke the 7 into 6 and 1.

At this point, Troy saw numbers as made up of tens and ones. He kept 24 intact and easily added the 30 to get to 54. He knew he needed 6 more to add to 4 to make another ten so he broke up the 7. He can do this all with ease because he understands the structure of numbers as tens and ones and knows the parts and sums of numbers without counting.

This level of thinking by a second-grader does not come from learning skills his teacher taught him. Rather, what he knows comes from noticing how numbers work, by seeing what happens when numbers are broken apart and put back together again. It comes from feeling empowered to examine problems in his own way—without worrying about what others are doing or saying. He can think, "I know this because I see it. It is there—in the numbers." Troy understands so much more than if he had been required to follow a procedure. He understands the mathematics and is able to get answers easily using the math he knows.

Children often experience school as a place where they have to do exactly what the teacher tells them to do with little opportunity to think for themselves. A Number Talk is a setting where children learn that what they think matters and that they can figure things out for themselves in the ways that makes sense to them. The power of Number Talks is they capitalize on the natural quest children have to "get better and better" and to "see more and more." The Number Talk builds on the child's curiosity and need to make sense, allowing each child to be fully engaged in trying to figure things out. It enables the teacher to listen to each child and support them at whatever point they are in their developing understanding as they share what they noticed, what confused them and what they figured out.