What is a Number Talk?

from "Number Talks Build Numerical Reasoning" (Sherry Parrish, 2011)

How can educators make shifts in their instructional practices that foster sense making in mathematics and move forward in developing mathematical dispositions as outlined in each of these documents? Classroom number talks, five- to fifteen-minute conversations around purposefully crafted computation problems, are a productive tool that can be incorporated into classroom instruction to combine the essential processes and habits of mind of doing math. During number talks, students are asked to communicate their thinking when presenting and justifying solutions to problems they solve mentally. These exchanges lead to the development of more accurate, efficient, and flexible strategies. What does it mean to compute accurately, efficiently, and flexibly? Accuracy denotes the ability to produce an accurate answer; efficiency denotes the ability to choose an appropriate, expedient strategy for a specific computation problem; and flexibility refers to the ability to use number relationships with ease in computation (Russell 2000).

> "The heart of number talks is **classroom conversations** focused on making sense of mathematics."

A NUMBER TALK'S KEY COMPONENTS

1. Classroom environment and community

Building a cohesive classroom community is essential for creating a safe, risk-free environment for effective number talks. Students should be comfortable in offering responses for discussion, questioning themselves and their peers, and investigating new strategies. The culture of the classroom should be one of acceptance based on a common quest for learning and understanding. It takes time to establish a community of learners built on mutual respect, but if you consistently set this expectation from the beginning, students will respond. A first step toward establishing a respectful classroom learning community is acceptance of all ideas and answers - regardless of any obvious errors. Rich mathematical discussions cannot occur if this expectation is not in place. We must remember that wrong answers are often rooted in misconceptions, and unless these ideas are allowed to be brought to the forefront, we cannot help students confront their thinking. Students who are in a safe learning environment are willing to risk sharing an incorrect answer with their peers to grow mathematically. Expecting acceptance of all ideas without evaluative comments is important. Educators can model this trait by recording all answers to be considered without giving any verbal or physical expressions that indicate agreement or disagreement with any answer. Teachers may need to practice having a "blank face." Students look to teachers as the source of correct answers. Part of building a safe learning community is to shift this source of knowledge to the students by equipping them to defend the thinking behind their solutions.

2. Classroom discussions

A successful number talk is rooted in communication. During a number talk, the teacher writes a problem on the board and gives students time to mentally solve it. Students start with their fists held to their chests and indicate when they are ready with a solution by quietly raising a thumb. Once students have found an answer, they are encouraged to continue finding efficient strategies while others are thinking. They indicate that they have found other approaches by raising another finger for each solution. This quiet form of acknowledgment allows time for students to think, while the process continues to challenge those who already have an answer. When most of the students have indicated they have a solution and a strategy, the teacher calls for answers. All answers - correct and incorrect - are recorded on the board for students to consider. The benefits of sharing and discussing computation strategies are highlighted below. Students have the opportunity to do the following:

- Clarify thinking
- Investigate and apply mathematical relationships
- Build a repertoire of efficient strategies
- Make decisions about choosing efficient strategies for specific problems
- Consider and test other strategies to see if they are mathematically logical

3. The teacher's role

As educators, we are accustomed to assuming the roles of telling and explaining. Teaching by telling is the method many of us experienced as students, and we may have a tendency to emulate this model in our own practice. Because a primary goal of number talks is to help students make sense of mathematics by building on mathematical relationships, our role must shift from being the sole authority in imparting information and confirming correct answers to assuming the interrelated roles of facilitator, questioner, listener, and learner. Since the heart of number talks is classroom

conversations focused on making sense of mathematics, it is appropriate for the teacher to move into the role of facilitator.

Keeping the discussion focused on the important mathematics and helping students learn to structure their comments and wonderings during a number talk is essential to ensuring that the conversation flows in a natural, meaningful manner. As a facilitator, you must guide students to ponder and discuss examples that build on your purposes. By posing such questions as: "How does Joey's strategy connect to the ideas in Renee's strategy?" you lead conversations to build on meaningful mathematics. As we move toward listening to our students' thinking instead of concentrating on only a final, correct answer and one procedure, we will begin to ask open-ended questions. By changing our question from, "What answer did you get?" to "How did you solve this problem?" we will be able to understand how students are making sense of the mathematics.

4. Role of mental math

If students' math experiences have primarily focused on learning and practicing the standard U.S. algorithms for each operation, they may be resistant to looking at problems from other perspectives. Some students may try to visualize the problems vertically and will even write the problem with their fingers on the floor or in the air to remain consistent with the paper-and-pencil algorithms they may have learned. Mental computation is a key component of number talks because it encourages students to build on number relationships to solve problems instead of relying on memorized procedures. One purpose of a number talk is for students to focus on number relationships and use these relationships to develop efficient, flexible strategies with accuracy.

When students approach problems without paper and pencil, they are encouraged to rely on what they know and understand about the numbers and how they are interrelated. Mental computation encourages them to be efficient with the numbers to avoid holding numerous quantities in their heads. Mental computation also helps strengthen students' understanding of place value. By looking at numbers as whole quantities instead of discrete columns of digits, students must use their knowledge and understanding of place value. During initial number talks, problems are often written in horizontal format to encourage student's thinking in this realm. A problem such as 199 + 199 helps illustrate this reasoning. By writing this problem horizontally, you encourage a student to think about and use the value of the entire number. A student with a strong sense of number and place value should be able to consider that 199 is close to 200; therefore, 200 + 200 is 400 minus the two extra units for a final answer of 398. Recording this same problem in a vertical format can encourage students to ignore the magnitude of each digit and its place value. A student who sees each column as a column of units would not be using real place values in the numbers if they are thinking about 9 + 9, 9 + 9, and 1 + 1.

> "Simply defined, number talks are five- to fifteen-minute classroom conversations around **purposefully crafted computation** problems that are solved mentally."

5. Purposeful computation problems

Crafting problems that guide students to focus on mathematical relationships is an essential part of number talks that is used to build mathematical understanding and knowledge. The teacher's goals and purposes for the number talk should determine the numbers and operations that are chosen. Carefully planning before the number talk is necessary to design "just right" problems for students.

TAKING THE FIRST STEPS

Making the shift toward teaching for understanding by encouraging students to develop mental math strategies can often be overwhelming. Many of us are comfortable with telling students how to solve a problem but avoid focusing on student-invented strategies because doing so may feel foreign and intimidating. As you begin implementing number talks, consider starting first with smaller numbers, such as basic facts. Using basic facts as a starting place is an excellent way to establish that many ways exist to view and approach a problem. With the fact 6 + 7, we see multiple ways for students to think about this problem:

- USE DOUBLES
  (6 + 6 = 12 plus one more;
  7 + 7 = 14 minus one)
- MAKE A QUICK TEN
  (6 can be split into 3 + 3 and
  3 + 7 = 10 plus three more)
- COUNT ON OR COUNT ALL
  (7, 8, 9, 10, 11, 12, 13)

Give yourself the license to be a learner along with your students and to question, "Does it make sense?" When students become accurate, efficient, and flexible with their mental math strategies, you can then transition to their regular paper-and-pencil computation practice. Encourage them to incorporate their mental math strategies from number talks with other algorithms by solving each problem in two different ways. This will not only help serve as a system of checks and balances for accuracy but also help students develop and maintain flexibility in thinking about numbers.