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NOTES FROM THE FIELD

# Developing Number Sense with Number Talks

Taajah Felder Witherspoon
*University of Alabama at Birmingham*

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When I was a beginning fourth-grade teacher, Dr. Sherry Parrish, my math coach, introduced me to number talks. Number Talks are designed as computation problems for students to mentally solve, place fist on the chest with an extended thumb to show they figured out a solution, and then discuss their strategies for 5 to 15 minutes (Parrish, 2010). During these early years, I realized that I leaned towards being more teacher-centered when facilitating number talks. I primarily focused on students' ability to mentally solve various problems for the sake of solving rather than customizing number talks to address the specific needs of my students.

When I became a Math Coach, I realized the importance of crafting problems to support learning through a more student-centered approach. When classroom teachers used anecdotal notes to create carefully designed problems, I observed a significant improvement in their students' performance, which confirmed the effectiveness of the approach.

As an Assistant Professor, I have numerous opportunities to observe teacher candidates in classrooms across multiple districts. In these settings, I noticed (K-5) students counted every number starting from one with their fingers as their primary default strategy for addition and even multiplication. This motivated me to observe a second grade classroom in an urban setting with the intent to later facilitate number talks to the class for five consecutive days.

In this article, I provide examples of how strategic number talks implemented with purposeful questions can strengthen number sense and problem-solving strategies in an urban second-grade classroom. By using number talks to support students who employ limited and inefficient strategies to solve computation problems, I was able to anchor learning with conceptually based strategies rooted in understanding mathematical concepts, thereby enhancing their number sense.

Although quick images with small numbers as seen on dot cards or ten frames are great ways to introduce number talks, I decided to start with fluency within 10 by developing the strategy for doubles plus one (counting on one more from a doubles combination) because the classroom teacher was working on adding double digits with multiple addends. Over the years, I have successfully used doubles and doubles plus one number talks to help students to become fluent within 10 and then 20. I have also used this strategy to promote flexibility with numbers that can then be applied when adding larger numbers or multiple addends. The following sections provide a detailed explanation of each number talk employed throughout the week, with a summary also presented in Table 1.

Table 1

*Number Talk Strings and Purposeful Questions*

| Day | Number Talk Strings and Purposeful Questions |
|---|---|
| Day I | Purposeful question posed, *"If I am looking for the sum, what type of problem do you think I will write?*"<br>5 + 5; 5 + 6<br>6 + 6; 6 + 7 |
| Day II | 4 + 4; 4 + 5<br>7+7; Purposeful question posed, *"If I continue with my mathematical pattern, what problem might I write next?"* |
| Day III | Purposeful question posed, "*What problem could we use to help us to mentally solve 8+9?"*<br>8+8<br>10+10; 10+11 |
| Day IV | Review without a scaffold: 7+8; 6+7 |
| Day V | Formative Assessment: 15+15; 15+16 |

### Number Talks Goal: Doubles +1

**Day I:** During an initial observation when the second graders attempted to solve an addition problem with 4 addends (24 + 62 +70 + 33), it was noted that every student defaulted to counting on their fingers or drew inefficient models such as flats and lines, which resulted in several unreasonable answers such as 698. To reduce the need for counting while fostering mental strategies, I created a number string (a set of related math problems designed to teach strategies based on relationships between numbers) that I felt students would have access to while solving the problems. For immediate engagement, I posed the question, "If I am looking for the sum, what type of problem do you think I will write on the board?" After the students made several guesses, e.g., "plusses, minus, or times-ing" for addition, subtraction, and multiplication, I immediately wrote 5+5 and then 5+6 on the board. Although I did not explicitly confirm the vocabulary word, I was intentional about using the academic language at the beginning of the number talk, e.g., "What sum did you get for 5+6?" After I received an answer, I responded with the follow up question, "Did anyone get a different sum?" Most of the students knew 5+5 with automaticity and they all used the "counting all or counting on" strategies from 5 to solve the subsequent problem 5+6. For 6+6 and 6+7, the students solved in a similar manner, but one student counted on from the larger addend.

**Day II.** I posed 4+4 to tap into existing knowledge and then 4+5 to build upon previous learning. Again, many of the students knew the double (4+4) with automaticity, but all defaulted to using a version of the counting on strategy to solve the subsequent problem (4+5).

Unlike the responses to the smaller doubles where they knew with automaticity, the students resorted to counting on their fingers to accurately determine the total for 7+7. To promote critical thinking, I posed the question, "If I continue with my mathematical pattern, what problem might I write next?" One student immediately responded with 7+8. I asked them to consider why I might pose this question. In a pensive manner, one student calmly stated, "Well it is one more, so the answer is 15."

**Day III.** To further promote the strategy of "doubles plus 1," I asked the students, "What problem could I use to help us to find the sum of 8+9?" Several students exclaimed in unison "8+8." Even though the students were not asked to solve, many students excitedly shared that the sum of 8+9 is 17. For the next problem, the students solved 10+10 with automaticity. But when presented with 10+11, only a few added 1 more to 20 or knew with automaticity, while most counted on their fingers from 10 or 11. It is important to note that the students had more success in adding one when the teacher prompted them to think about a problem that could help them solve the problem at hand.

**Day IV.** As a review, the teacher posed problems without the doubles scaffold. Fortunately, the goal of doubles plus 1 resonated with most students as evidenced in the strategies they shared for 7+8 and then 6+7. The students who shared used the doubles combination to solve, for example, "7+7 = 14, so 7+8 = 15."

**Day V.** When the students were asked to find the sum for 15+15, most students used the "counting on" strategy to solve. As an indicator of great success, most students displayed their silent thumbs immediately when they were presented with the problem 15+16. Success

was also deemed by students only having one answer (31) to defend for a double-digit addition problem. In addition to properly using the term throughout the week, the second graders were able to correctly indicate the sum as being the answer to an addition problem.

## Reflecting on our Teaching and Learning

As I have shown in the number talk examples, the students were more successful in implementing mental strategies than their previous attempts in solving addition problems with inefficient counting all methods on their fingers or through drawn representations. According to Kamii (1993) "algorithms are harmful because they unteach place value and hinder children's development of number sense." Over the years I have noticed that if students are only presented with one way to solve a problem or traditional algorithms that are designed for memorization, number sense and problem solving can be daunting to students which is evidenced when students provide unreasonable answers. On the other hand, when teachers provide opportunities for students to engage in strategically planned number talks, students will have the opportunity to demonstrate at least two of the Common Core Standards for Mathematical Practice: Construct Viable Arguments and Critique the Reasoning of Others as well as Attend to Precision e.g., introducing, reinforcing, and applying mathematical vocabulary.

After engaging in five days of strategically crafted number talks, the second graders demonstrated flexibility of numbers and became more fluent within 20 and flexible with sums up to 31. The students began to transition from solely counting on their fingers to making use of the mental strategy doubles plus one. I solidified this strategy by inviting the students to predict and think about the problems being posed. To further strengthen number sense and promote procedural fluency, teachers could foster other mental strategies through strategically planned number talks such as making tens or decomposing and solving by place value. The teacher can continue reinforcing the concept of doubles plus one with the number string 25+25 followed by 25+26.

In this article, I have demonstrated the benefits of focusing on an efficient strategy for students to construct throughout the week. I encourage educators to consider using this model for fostering academic language and strategies such as subitizing with quick images that can be used to support students as they transition from counting to reasoning strategies.

## References

Kamii, C. & Dominick, A. (1993). The harmful affects of algorithms in grades 1-4. *Yearbook (National Council of Teachers of Mathematics)*, 130-140.

Parrish, S. (2010). Number talks: *Helping children build mental math and computation strategies, grades K-5.* Sausalito, CA: Math Solutions.