Number Talks: A Whole-Class Routine for Learning Language for Learning Mathematics

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Number Talks invite students to verbalize mathematical ideas to themselves and to each other. While many mathematical instructional routines invite students to talk with one another, Number Talks uniquely feature a visual representation of mathematical ideas originating with the student and scribed by the teacher.

A typical Number Talk lasts between ten and fifteen minutes and opens with the teacher posing a computational problem. Students then volunteer to share solutions. The teacher collects and records those solutions, negotiating meaning with the students until the students are satisfied that she has understood them. This simultaneous oral and visual experience of numbers and operations make Number Talks an ideal vehicle for learning

language for learning mathematics. Number Talks also support flexibility with numbers and computation, which are the foundation of a powerful number sense and the capacity to learn math to high levels. The Number Talk routine operates alongside and separately from the main curriculum. This helps it serve as a way to invite student-generated strategies to become the subject of a whole-class discussion.

While it can be intimidating for students to share mathematical ideas in a language they are in the process of learning, Number Talks can be facilitated with the needs of language learners in mind. Such facilitation includes providing time for students to rehearse how they are going to share, supporting students to help each other verbalize their ideas, acknowledging and encouraging gestures, asking students to clarify their ideas with the visual representation as a guide, and confirming with students that their thinking has been recorded accurately. The following vignette



Number Talks feature visual representations of mathematical ideas originating with the students and scribed by the teacher.

illustrates what it can look and sound like to facilitate a Number Talk with language acquisition in mind.

Ms. Osada is a bilingual, biliterate teacher with extensive experience with language acquisition. When she facilitated this Number Talk, she had

been doing Number Talks for about a year. This class of third and fourth grade students had about onethird multilingual learners. First, Ms. Osada wrote the problem 5 x 12 on the board and gave her third and fourth grade students time to think about the answer, showing with their thumb on their chest that they had a way to think about it. When

most students had a thumb up, rather than having them share with the whole group right away, she invited them

to choose someone to talk to about their strategy, saying, "so we can practice talking about our ideas."

Michael and Julio, both multilingual third graders, loved to talk through their ideas with each other, and they had shared in interviews that they needed to practice with each other to "really know their ideas." As they leaned toward one another, they described five different ways to think about the problem. They nodded to one another and found connections between one another's ideas and affirmed to each other that their thinking made sense. The rest of the students in the class also shared ideas with one another in pairs and in threes. After a few minutes of a room full of chatter, Ms. Osada pulled the class back together.

Matthew, who hadn't shared so far this year raised his hand to offer the answer "Sixty." As she recorded 60 on the board, Ms. Osada asked if anyone had gotten an answer other than sixty. While this class

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would often offer more than one answer, this time everyone agreed the answer was sixty.

Ms. Osada created the visual representation found on page 4 during the discussion described below:

Matthew raised his hand again to offer his strategy. "I counted by fives, five twelves" he said, and then demonstrated by gesturing with his fingers, "5, 10, 15 . . ." counting up twelve times all the way to sixty, while his friend Eli leaned in to count silently with him. Ms. Osada recorded his multiples of 5, and then asked, "How did you know when to stop?"

Matthew looked at his hands. He held up two fingers. "It's the twelves. I only need twelve fives and them I am done."

Next, Ms. Osada chose to affirm the value of gestures as a way of communicating. "Okay, thank you," she said, "I really appreciate how you used your hands to help me understand your thinking. I also noticed that Eli had a part in your idea by how he was gesturing with you. Can I put your initials and Eli's both next to this strategy?"

At this point Matthew grinned at Eli, and they both nodded and said, "Yes!" and gave each other a fist bump and a high five.

Henry shared next, offering, "I made 12 into 3 times 4. So then I do 20, 40, 60."

As Ms. Osada recorded, she was only able to write 3 x 4 and Henry's skip counting by twenty. "Where did you get the twenty?" she asked.

Henry repeated "20, 40, 60" and pointed but couldn't find the words to say how he'd figured out that he needed to count by twenty three times. Ms. Osada asked if a friend could help. leaves 3. So, we need three twenties."

After recording 3 x (4 x 5) Ms. Osada asked, "Is this your thinking Henry?" He confirmed with a big smile, "Yes, that's it!"

Michael shared next. In keeping with his desire to practice what he wanted to say with a friend first, he repeated what he had rehearsed with Julio, while Annika nodded along. "I started out with ten times five which is fifty. Then two more fives makes sixty."

At this point, Ms. Osada wasn't sure how Michael was thinking of the two additional fives, so she asked him to explain again. He said, "It's two groups of five."

"Oh, so groups of five. That sounds like multiplication."

"Yes," Michael replied, "Two times five."

"And you said that equals ten."

"Yes, 2 times 5 equals 10 and 10 plus 50 equals 60."

When she finished recording, Ms. Osada checked with Michael, "Is that how you saw it?"

"Yes, that's right."

Ms. Osada asked, "Did you come up with this on your own?"

"Well yes, but me and Julio kind of thought the same thing."

Julio offered to share next. He started, "12 is 5 and 5 and 2," showing with a sharp downward gesture than he had broken the number up.

Ms. Osada affirmed his gesture. "Thank you Julio for showing me with your hand that you split up the twelve." Just to be sure that she had it right, she checked in with him, "Is it okay that I wrote 5, 5 and 2 here next to the 12?"

Amy offered, "I see that 4 x 5 is 20 and that

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classes, and summer programs offered unique perspectives that further fueled my interests in Native American rights and Indigenous history. Moreover, my experience in these classes was nothing short of revolutionary and strengthening. For, it was the first time that I was taught in a classroom about the resiliency of our Native peoples and the importance of cultural teachings. Without our Diné Language Teachers, Indigenous community members, organizers, and educators, I truly wouldn't have felt compelled to explore the plethora of beauty that lies within APS and socalled, "Albuquerque."

To our Diné students working towards earning this Bilingual seal or relearning nihízaad– you've got this! You have your ancestors, family members, educators, friends, and me cheering you on all the way. Even if you greet them in Diné, the plants, dirt, air, and stars will cheer you on.

Y4ego shik'4 ! Nih7dzii[h0l= doolee[—T'11 `1hw0j7t'44g0 .

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Julio nodded and continued, "I did five times five and then five times five again. And I put the twenty-fives together and that makes fifty. And we still have two more groups of five left and that's ten so add that to make 60."

Again, Ms. Osada checked with Julio to ensure that she had recorded correctly. He nodded. Ms. Osada closed the Number Talk by asking students to notice similarities and differences in their thinking.

Three students commented on their classmates' ideas. Laura observed that everyone defended the answer of sixty. Geana offered that Michael and Julio had both split the twelve apart. And Angel noticed the similarity between Henry's and Matthew's strategies in that they both skip counted.

Attention to language acquisition during this Number Talk enabled these language-learning students to speak about, hear, and see mathematical ideas in a meaningful way. Rehearsing with a friend first made it easier to share with the class.



Acknowledging, encouraging, and attending to gestures opened the door to nonverbal communication that could be translated into symbols students could read. The prompt to help each other in the process of sharing made the Number Talk a more collective rather than individual experience. Using the visual as a way to confirm with students they have been understood reinforces understanding of symbolic representations and also assures students that they have conveyed their own meaning through their words. Most importantly, Number Talks make student ideas the focus of a whole-class discussion. And when students use language to make meaning of mathematics, they learn more math and more language at the same time.

Resources

- Humphreys, C., & Parker, R. E. (2015). *Making number talks matter: Developing mathematical practices and deepening understanding, Grades 4-10.* Stenhouse Publishers.
- Parker, R. E. (2018). *Digging deeper: Making number talks matter even more, Grades 3-10.* Stenhouse Publishers.
- Mathematics Education Collaborative offers professional development designed to increase teachers mathematical agency, informed by language acquisition expertise. *www.mec-math.org*