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Facilitating Students' Mathematical Understanding Through Number Talks

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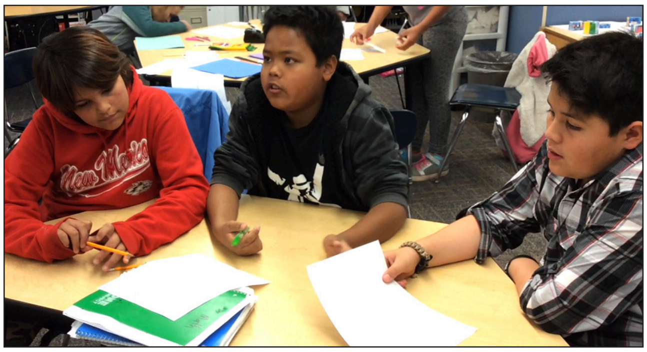
Mathematics is much more than a list of solutions or algorithms students need to know to pass a test or complete an activity. My goal for students is that they leave my third-grade classroom knowing that mathematics is about understanding, flexibility, and application. I want to see my students tackle problems by analyzing information, choosing the most efficient strategy, explaining their process, and evaluating its efficacy. To do this, students must learn to mentally construct strategies with fluency and precision. Given these goals, I knew I needed to refine the way I approached teaching mathematics. I wanted to start facilitating learning to help my students construct and build on their knowledge effectively and purposefully. Number Talks seemed to be the perfect avenue to begin that exploration for my students and myself.



A Number Talk was used to prepare students to solve a problem in teams that they then presented for critique to other groups.

I first encountered Number Talks in August 2015 at Janet Kahn School of Integrated Arts (JKSIA), a Title I school in Albuquerque. It was my first year teaching third-grade general education, and my class was struggling with mathematics. Many students were relying on procedures of mathematical concepts without fully understanding why they worked and what to do when presented with novel or complex problems. This left the students frustrated and confused as we moved to more complex concepts and applications, such as the relationship between addition and multiplication. Number Talks continued to come up through discussions with colleagues, participation in an Achievement Inspired Mathematics for Scaffolding Student Success (AIM4S³™) training, and use of the Georgia State Standards Mathematics Units. I was eager to learn and to improve the way I approached teaching mathematics.

Number Talks is a 5- to 15-minute strategy created by Sherry Parrish (2010) to facilitate mathematical understanding and help students learn to "...reason, make sense and construct strategies built upon numerical relationships" (p. xxiii). The teacher selects a string of related problems ranging from ten frames to multiplication and division to negative numbers. The first problem is then displayed and students are instructed to mentally solve it. Students are asked to hold up one finger for each strategy they used to solve the problem. While students are mentally computing, the class is quiet and the teacher observes. In my class, I noticed some students ticking off numbers on their fingers, counting on by ones. When most students have at least one finger up, the teacher asks for and records all volunteered student answers without reaction. Next, students share their mental strategies as the teacher records them verbatim. The teacher then summarizes what the student said.

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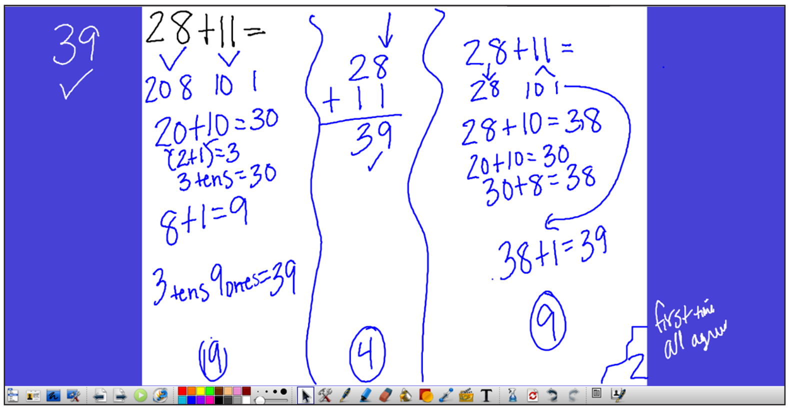
At an AIM4S$^{3™}$ training, I discovered how Number Talks could support my goal of facilitating student understanding. In the AIM4S$^{3™}$ framework, one of the five Key Instructional Principles is Teacher Mechanics and Delivery. I planned my first unit utilizing the Key Instructional Principles, and I prepared my compendium including the Common Core State Standards for Mathematics (CCSSM) *and* the Standards for Mathematical Practice (SMP). As I worked, I realized the SMPs were integral to my goals and directly connected to Number Talks. By verbally sharing their strategies, students must be able to construct a valid argument of their process and solution and to attend to precision in not only their computation, but also their explanation—two of the SMPs.



Sample End-of-Year Number Talk Solutions

The following semester, I sat in on a demonstration in Erin Mayer's classroom at JKSIA. I was encouraged to see her students making sense of the presented problems, constructing strategies, explaining their thinking, and collaboratively building and critiquing each other's thinking. In March 2016, Lisa Meyer of DLeNM came to our school to work with us on Number Talks. As a grade-level team, we talked with Lisa about what had been successful and the questions we had. I continued to refine my practice and welcomed Lisa to my room to watch my delivery and give me feedback.

When I started Number Talks with my class, I chose to start with second-grade problems, as most of my students were not proficient. When I presented the question 14 + 15 = ?, 23 students relied on the standard algorithm of "stacking" the numbers and adding from the right to left to get their answer—some inaccurately. However, most of my students were unable to explain why their strategy worked and if their answers were accurate. I realized that we needed to work on building understanding, flexibility, number relationships, and patterns.

The first few weeks were a great learning experience for us all. We worked through talks dealing with making tens and finding friendly numbers, doubles and near doubles, among others. My students quickly learned to correct me when I mis-recorded one of their strategies and laughed along with me when I accidentally said the answer before they did. As we practiced, some students became confident and eager to share their strategies, challenging themselves to find many different strategies. While other students were more reluctant to share publicly, they listened and watched attentively as their peers talked, repeated, fixed, and reworked their strategies. Soon, even the most reluctant students were shyly holding up at least one finger to show that they had solved the problem.

Due to the need for continued intervention, I worked on differentiated number talks during Response to Intervention (RtI) time. In the small groups, we used dot cards and ten frames to work on subitizing, addition strategies, and number relationships. The students were more open to sharing their strategies and began to see patterns in the strings of problems that helped to build their understanding.

As our class continued to work, I saw students starting to use numbers as flexible entities they could manipulate rather than a sequence of steps. My students were becoming more fluent with their facts and beginning to see patterns and relationships. After noticing my students' growth and engagement in mathematics, I wanted to know how their understanding and application were changing—if at all. I was excited and pleased to see that they were!

As our school year came to a close, 100% of the students got the same answer to a Number Talk problem the first time. We were working on breaking numbers into their place value in order to find a solution. The first problem in the set was 28 + 11 = ?. Most of the students had one finger up quickly, signaling one solution to the problem. Within minutes, they all had at least one strategy. One student volunteered the sum 39, and I saw every other student signal their agreement. We cheered and began talking through our strategies.

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In the group, 19 students solved the problem by partitioning the numbers in to their tens and ones values (20 and 8; 10 and 1). Next, students took 2 tens plus 1 ten to get 3 tens (30), then took 8 ones plus 1 one to get 9 ones. They then had the number composed of 3 tens and 9 ones equaling 39. Nine of those students had a second strategy, taking 11 and partitioning it into 1 ten and 1 one. They kept 28 and added 1 ten, understanding that they were not affecting the ones value. They added the 2 tens and 1 ten to get 3 tens with the 8 ones remaining. They then took the remaining 1 one and added it to the 38. As 1 more than 8 is 9, students had 3 tens and 9 ones equaling 39. Four students used the standard algorithm to solve the problem. Two of the four were able to verbally explain their understanding of the algorithm to a partner while the other two were not.

We pressed on and continued our work with numbers and mathematical understanding. Feeling proud and exhilarated, I watched as my students became more confident and comfortable discussing and working through problems by reasoning abstractly and looking for patterns and similarities.

My first year teaching third grade was an invaluable learning experience. Number Talks had a huge impact on my teaching, as well as on my students' mathematical understanding and practice. Students benefited from engaging in a purposeful conversation about strategies and understanding, challenging themselves to be efficient, accurate, and articulate—as well as gaining a reserve of strategies. I thoroughly enjoyed the in-depth discussions about numbers with the students, and I was always happy to see that some of the strategies students employed had never occurred to me at all! While all of my students will not be proficient as they enter fourth grade, I know that they will continue to build on their understanding, flexibility, and application to be life-long learners.

Reference

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

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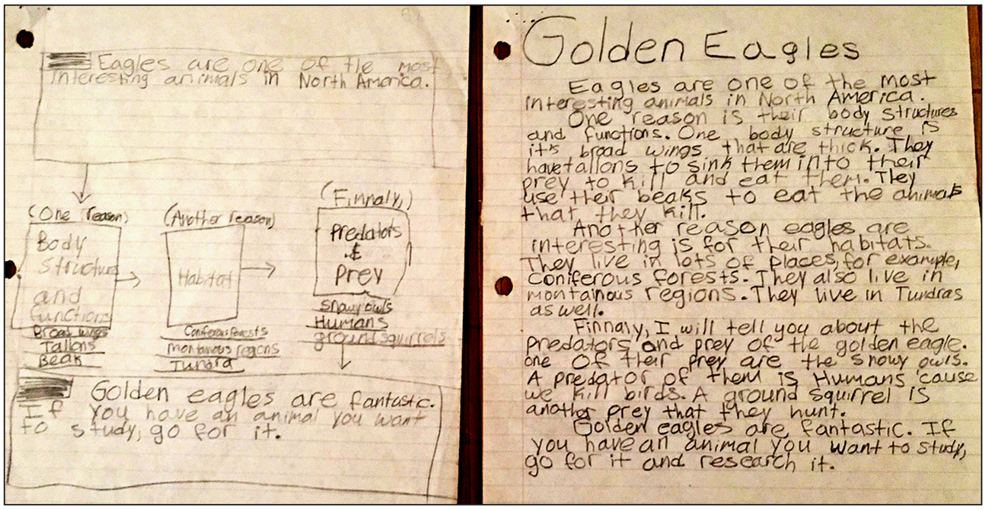
a combination of a Tree Map and Flow Map to organize their writing. Then each student read his or her map to a partner. Partners asked questions and critiqued each other's map to help peers revise their thoughts and structure. Finally, students used the map as a guide to write a draft that could extend to a published piece.



Informational Text—Thinking Map and Written Draft

It has been pure pleasure to see the results of this union—Project GLAD® and Thinking Maps®. As a teacher, my biggest take away has been that students need various forms of strategies and tools to support learning, metacognition, and autonomy. Thinking Maps® pattern the brain to organize and visualize information. Project GLAD® strategies give students access to grade-level content and encourage them to discuss, investigate, and process. While each model is highly beneficial, I find that using them together in an informed and intentional way enhances the tools, support, and opportunities that students need to become successful, independent learners.

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