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NUMBER TALKS: HERE'S WHAT WE'VE LEARNED AND WHAT TEACHERS ARE SAYING

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INTRODUCTION

In this issue of the *Abacus*, by popular demand, we are revisiting Number Talks. Many teachers have started, or are thinking about starting, to use Number Talks in their classrooms. Here we discuss the nuts and bolts and provide concrete tips about what not to do and what to do when doing Number Talks. We draw on our experiences as math coaches and teachers of future teachers. We share some reflections from some teachers, who share their own learning about teaching Number Talks. Basically, they talk about what they learned from fellow teachers about leading Number Talks.

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BACKGROUND (WHAT RESEARCH SAYS ABOUT NUMBER TALKS)

What is a Number Talk?

A Number Talk is often described as a "five- to fifteen-minute classroom conversation around purposefully crafted problems that are solved mentally" (Parrish & Dominick, 2016, p. 13; as cited in Matney et al., 2020). Students are given a mental-math problem, like 32×5, to solve individually. They think through possible solutions and use hand signals to discreetly indicate the number of strategies they've found. The teacher then gathers possible answers and displays them for the class. Students share their solution strategies and discuss the approaches of their peers, and the teacher draws students' attention toward connections that promote the mathematical goal (Matney et al., 2020).

Some of the Benefits of Number Talks

Number Talks are advocated as a powerful tool to enhance two key areas of math learning: number sense and procedural fluency. By creating learning environments that help students understand and organize number relationships, Number Talks support the development of computational fluency. They provide a space for students to explore multiple-solution methods and demonstrate flexibility in their approaches.

According to Humphreys and Parker (2015), encouraging students to mentally solve math problems and discuss their strategies can transform how they learn math. When students realize they can make sense of math in their own way, they build confidence, learn to make strong arguments, and engage with their peers' ideas. Although arithmetic algorithms are useful, they often hide the deeper meaning behind the steps, leading to gaps in understanding that persist into middle school and algebra (Humphreys & Parker, 2015). Hence, Number Talks have the potential to build up students' confidence, improve their attitude toward mathematics, and develop their mental-math skills—and all it takes is about 7 minutes at the beginning of class!

Four Important Components of Number Talks (Matney et al., 2020)

1. ***Classroom Environment and Community***
   Fostering a classroom environment and community that emphasizes mental math, and discourse, and reinforces mathematical reasoning, helps students build knowledge independently, rather than relying solely on the teacher's expertise.
2. ***Classroom Discourse***
   Classroom discourse is a critical element of Number Talks, as it fosters a collaborative environment, where students share and discuss different solution strategies. Studies, such as those by Imm and Stylianou (2012), highlight how teacher language and interactions can influence students' mathematical reasoning and justification. Through verbal reasoning and sharing in Number Talks, students are encouraged to develop their own mathematical understanding, rather than relying solely on the teacher's authority.
3. ***Teacher's Role in Questioning and Supporting Student Reasoning***
   Research on teacher questioning and support for student reasoning shows that while questioning is common, many teachers use closed-ended questions that guide students to predetermined answers, rather than promoting sense making. This highlights the need for more open-ended questioning to improve student reasoning in practices like Number Talks.
4. ***Role of Mental Math***
   Dyson et al. (2015) found that targeted instruction and meaningful practice significantly improved Number Talks and arithmetic fluency in low-achieving Kindergarten students, suggesting the potential of mental-math tasks, like those in Number Talks, to enhance similar skills, though direct evidence for Number Talks' effectiveness is still lacking.
5. ***Purposeful Computation Problems***
   Webel and DeLeeuw (2016) found that the language teachers use when discussing fraction multiplication significantly impacts student understanding, highlighting the importance of carefully chosen computation problems in Number Talks, though research specifically on Number Talks remains limited.

11 "DON'TS" OF A NUMBER TALK

1. **Don't let students have paper to write on.**

***Why?* Number Talks are about mental math.**
If you pose the problem using manipulatives on the board, students are likely to build similar images in their minds, and it will be easier to discuss the math strategies.

2. **Don't pose the problem by using symbols.**

Why? **Posing the problem verbally with and without manipulatives will help students focus on the math strategies** because students will not be confused with symbols.

3. **Don't select numbers that are overwhelming, start simple!**

Why? **Explaining what you see in your mind is hard. Don't add another degree of complexity before common language and strategies are established.**
Engaging in questions you think students already know is a good thing!

4. **Don't take up more than two ideas.**

Why? **Discussing too many solutions may leave students lost and confused.** Only considering two different solution strategies lets you place them side by side and discuss similarities and differences.

5. **Don't let a Number Talk go on too long (aim for 7 minutes).**

Why? **It takes a lot to really listen to someone else's strategy.**
Students tend to agree to put forth full effort, if it is agreed that listening/engaging will be at most seven minutes.

6. **Don't always ask the same students to share their ideas.**

Why? **It is important to consider a range of ideas and have all students practise sharing what they are seeing in their minds.**
If the same students are always volunteering, you can try a think/pair/share to increase confidence of sharing with the whole group.

7 **Don't use any fancy manipulatives (e.g., cut-out cupcakes, pictures of candies); simple round dots are best.**

Why? **There is lots of research in Psychology about subitizing.** Students can easily flash their eyes at round dots, spatially arranged as five on a dice, and know there are five dice. Having different shapes and sizes of manipulatives can affect this recognition and distract students from the math in the Number Talk.

8 **Don't forget that students in your class will have lots of different strategies.**

Why? **Students will surprise you with the different ways they see things in their minds.** Students have different preferences for numbers and strategies. Before the Number Talk, try to anticipate as many different solution strategies as possible.

9 **Don't just show them your way of solving the problem; actually listen to what students are saying.**

Why? **After solving the problem yourself, you will have uncovered your preferences for numbers and strategies and will likely be excited to share with students.** It's important to set your preferences aside so that you can listen to students and make the strategy they share verbally visible for all students to discuss and have a mismatch of what they said to your preferred solution strategy.

10 **Don't let students touch the manipulatives.**

Why? **It's hard to highlight the crux of the solution strategy.** Efficient and precise movements help highlight and make it clearer to students. It is the students' job to share verbally, and the teacher's job to make their ideas visible. It's a partnership.

11 **Number Talks don't have to be boring and don't have to be done solely in math class!**

Why? **When Number Talks are about students' ideas, they are not boring.** Everyone likes to talk about their own stuff/ideas. Students enjoy Number Talks, which can be used to "fill in" the few minutes before recess or the end of the day.

Have fun with it!!

What Teachers Are Saying

Number Talks take time to incorporate into your practice. Like any other skill, the process is not smooth or linear. We asked teachers to share their reflections on developing their Number Talk skills, and this is what they said:



I have made my Number Talks quicker and simpler for my students. Keeping the problem simple and keeping the Talks between 7-10 minutes has helped to explore student strategies and not lose interest in the Talk's goal.
—Belinda

I have decided that incorporating Number Talks is an excellent way to engage students... I have decided that Number Talks do not always have to be about "solving a problem." They can focus on knowing the answer already to a problem, and developing various strategies with students to get to that answer. I also liked that we talked about different ways of presenting the question to students, and how this can impact student answers and also student engagement.
—Marina





I love the idea of having kids put their heads down and thinking with heads on desk, rather than everyone looking at them while they think. Another strategy that I love and have started using is asking students if they have a similar strategy on the board. I am going to get kids to put a heart on their favourite strategy. The kids love doing this, and when I don't give them a sticky note, they always ask for it.
—Gregory

I now try to have Number Talks as often as possible. At times, it may not even be in our math block. If I know I have 10-15 minutes to fill before lunch or recess, I will try to squeeze one in. This means that not all of our Number Talks are introductions to our lessons; rather, a 10-minute math workout. I've also focused more on my representation of their thinking.
—ShoShawna





When I was first introduced to the concept of Number Talks, it was very daunting... Luckily I had access to people who helped me... who came into my classroom and modelled Number Talks. Through this observation and subsequent discussions, I felt confident about how to annotate student thinking... When I moved to a middle school, I felt lost all over again... I didn't know how to "scale it up" to a more advanced curriculum... I let a full year pass by before engaging with Number Talks at the middle school level, and only resumed them when I was placed on a team, where I had the opportunity to collaborate with a colleague who was very knowledgeable on the subject, and again, made it manageable by modelling and debriefing with me as needed.
—Andrea

I learned that the introduction is the most important phase of a large-group lesson. This goal is to make sure that everyone understands what seven plus five is and how these dots combined will equal a greater number. In addition, I also found that having the students work through the problem on their own and then share their strategies heightened their growth and understanding. This invited collaboration to learn different methods of calculation through the use of finger gestures and splitting equations... Moreover, asking the class which method they used helps us as educators gain a collective understanding of the students' learning strategies. This guides a greater focus into the methods and strategies that should be focused on going forward.
—Sara



Dialogue: Teacher says, Student says

Teacher: I have a picture up here and it is 5 by 12. So I'm just going to check 1, 2, 3, 4, 5 by 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. What we're wondering is how many blocks are here. You may already know it, but you know the most interesting thing is finding out how we would do this.

I'm going to get you to *close your eyes*. I'm wondering if there is a way we can cut this to make it easier to figure out.

Is there a way that we can rearrange these to make it easier to figure out how many there are?

Let's open our eyes and tell the person beside you what you would do. So, what do you do?

Student: We thought we could just split it in half because if we split it in the right spot, it would actually be like having two equal numbers maybe. And then you could take those numbers and use them in an equation, and then you could….

Teacher: Okay, I'm going to split right there, right? Which is… how would you describe these two pieces now?

Teacher: Are they the same?

Student: Yeah.

Teacher: They're the same! So where did he cut?

Student: The half point.

Teacher: The half point, right? He cut the half! Ah, that's a nice idea. Yeah, how many other people thought: "I'll just split it in half?" *Why is cutting in half easier?*

Student: …So I mean I would just like count one side, and then that side would usually be the same as that side, so you would know.

Teacher: So how many people think, "Oh, I can split it in half, and then go—30 and 30, which is 60, right?"

Teacher: Is there a way now that we could rearrange this?... and it would ask a different question. What happens if I do this… what is this question?

Student: 5 x 12.

Teacher: So that's 5 x 12 (pointing to the 5 by 12). What is this question? (pointing to the double/half). *Turn and talk* to the person beside you.

Teacher: Okay, so what do we see now?

Student: 6 x 10.

Teacher: 6 x 10! Okay, so I want you to vote right now. I have 5 x 12 or 10 x 6. Which question do you like better? Raise your hand for this question, and now for this question. *Why do you like this question more?*

Student: 'Cause it's easier!

Teacher: It's easier. So what happened to the 5?

Student: You turned it into a 10… You doubled it.

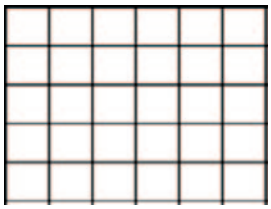
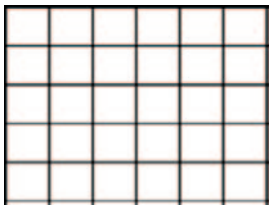
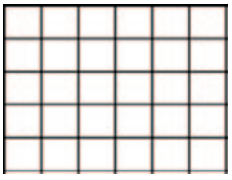
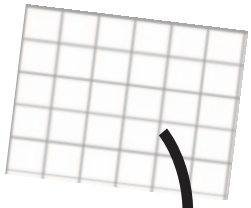
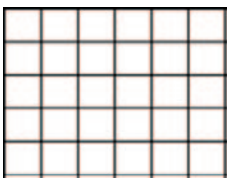
Teacher: Okay, doubled it. What happened here to the 6?

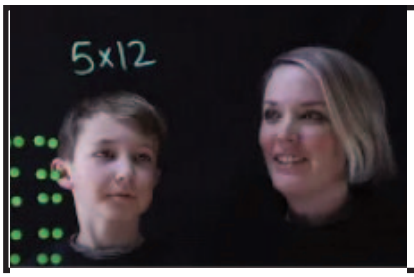
Student: Then you took away 6… you divided it.

Teacher: What do we call that when we divide by 2?

Student: Halving.

Teacher: Sure! Halving. That's a strategy—we could split the number in half and rearrange it to double one side. So, instead of doing 5 x 12, we did 10 x 6.

Imaging on the Board	Purposeful Actions
	**Counting the rows and columns** to make sure students know this is a 5 x 12 **Visualizing** what students already know
 	**Cutting the paper** in half, based on student's idea **Revoicing:** They're the same. **Checking in** with the whole class to find out who also thought like the student who shared **Eliciting reasons** for why halving strategy makes solving mental math easier **Paraphrasing** to make sense of the student's idea for the class
  This piece was moved below to elicit the idea of halving and doubling. 	Because the doubling and halving strategy was not emerging, **the teacher moved the image on the whiteboard and prompted for the question**. **Turn and talk** is a move to get students to notice the dimensions. **Revoicing** what the student sees (6 x 10) Using the word "*we*" to develop a collective understanding **Voting** to emphasize that students can rearrange a question to half and double to solve a mental-math question



To see the Doubling and Halving Strategy, check out the YouTube video: www.youtube.com/watch?v=mhA_REMBpBE

CONCLUSION

It's important to note that Number Talks shift from the traditional "showing and telling." Number Talks are about students' ideas. The teacher's job really points out the partnership: it's their job to listen to how students see things in their minds and make that visible for the entire class to engage with. They are short (we suggest 7 minutes or less) and should be fun for students because it's about how they think.

Number Talks can be tough. It's important to have colleagues to practise with, to watch, and to watch you doing Number Talks.

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