Professional Learning Community Guide

Grades K-5

West Virginia DEPARTMENT OF EDUCATION

#math4lifeWV

Why do Number Talks?

Session 1

Number Talks are short, daily routines or exercises that help students build number sense.

Number Talks provide students a platform to explain their mathematical understanding in a safe, risk-friendly environment. Teachers are able to gain insight into student thinking which could include non-traditional approaches, connections to previous understanding, and misconceptions. Number Talks, when implemented consistently, develops flexibility with numbers through the use of number relationships and the structure of numbers, and provides opportunities to use mathematics in a manner that is meaningful to students. Number Talks remove the focus on speed and redirect students to deeply think about mathematics while emphasizing the mathematical process and communication.

Dr. Jo Boaler, author of the book “Mathematical Mindsets” and founder of YouCubed, discusses the importance of using Number Talks in your classroom. Watch the following video: *https://www.youtube.com/watch?v=YKegyzRj8-k*.

Discussion Prompts

1. After viewing the Jo Boaler video, what resonated with you about the importance of number talks? Discuss with your colleagues some key points which stood out to you.
2. What idea in the video has the power to influence your teaching or change the way you think about how students learn? Share the idea and its impact.

Reflection

1. How important is it to you that people listen to what you have to say? Why?
2. How comfortable are you with stepping back and letting your students offer their thinking and strategies in mathematics, even if their understanding is contradictory to your way of thinking?
3. What is your comfort level with mental computation?

Next Steps

Read the following article to discuss for next session: *"Promoting Mathematical Discourse in the Classroom"* by Catherine C. Stein.

Additional Resources

- "Number Talks: Whole Number Computation" by Sherry Parrish
- "Number Talks: Fractions, Decimals, and Percentages" by Sherry Parrish
- "Making Number Talks Matter" by Cathy Humphreys and Ruth Parker
- "Making Number Talks Matter Even More" by Cathy Humphreys and Ruth Parker
- "Principles to Action" from the National Council of Teachers of Mathematics

> *"It is clear that the chief end of mathematical study must be to make the students think."*
>
> *John Wesley Young*

The Importance of Mathematical Discourse

Session 2

In Session 1, you were asked to read the article "Promoting Mathematical Discourse in the Classroom."

Discussion Prompts

1. In the article, “Let’s Talk, Promoting Mathematical Discourse in the Classroom,” this statement was posed: *Teachers send messages about what is important to them by the way they establish their classroom community. Of course, accuracy is essential in mathematics, but to encourage discourse, teachers must show students that they value understanding concepts rather than just getting the right answer.*
    a. In what ways do you agree with the statement?
    b. In what ways do you disagree with the statement?

2. In the Skeleton Tower Problem (“Let’s Talk, Promoting Mathematical Discourse in the Classroom,” p.287, figure 2), the scenarios from two inquiry-based classrooms reflect low-press and high-press discourse with the students.
    a. In the low-press classroom what questions are posed?
    b. How does the nature of the question limit the student in response?
    c. In the high-press classroom, what does the teacher do to encourage the student to expand upon their thinking?

3. Read this statement from page 287: *Mistakes are an opportunity for learning, and the learning is a collaborative process in which all students are expected to participate. Conversely, non-supportive motivational discourse occurs when teachers emphasize getting the right answers without mistakes, compare or highlight individual successes or failures, or use sarcasm or humiliation (Turner et al. 2003).*
    a. Watch the following video: *https://www.youcubed.org/resources/mistakes-powerful-video/*
    b. Discuss your views about mistakes and encouraging thinking through mistakes.

Next Steps

In the previous two sessions, there has been an emphasis on the value of mathematical discourse. Catherine Stein, author of “Let’s Talk, Promoting Mathematical Discourse in the Classroom,” makes the statement: *“The use of discourse in the mathematics classroom, however, can be difficult to implement and manage. The same students participate in every discussion while others contribute only when called on, and even then their contributions are sparse. Some students make comments that relate to procedure but never reach the deeper-level mathematical concepts.”*

How can you ensure your students have equal opportunity to contribute and reach the deeper-level mathematical concepts? The next session is designed to promote how a routine of mathematical discourse can be encouraged.

Prepare for the next session: Read Chapters 1 and 2 of "Number Talks, Whole Number Computation" by Sherry Parrish.

Additional Resources

The West Virginia Department of Education has a webinar on “Facilitating Meaningful Mathematical Discourse” among other topics at the following link: *https://wvde.us/math4life/educators/professional-learning/.*

> *“The only way to learn mathematics is to do mathematics.”*
>
> **Paul Halmos**

Establishing the Routine of Number Talks

Session 3

Watch the video: *www.mathsolutions.com/NTWNCA1*

After reading Chapters 1 and 2 of "Number Talks, Whole Number Computation" by Sherry Parrish, read the following paragraph and list. Answer the discussion questions with your colleagues.

Five Major Reasons That Talk is Critical to Teaching and Learning

1. Talk can reveal understanding and misunderstanding.
2. Talk supports robust learning by boosting memory.
3. Talk supports deeper reasoning.
4. Talk supports language development.
5. Talk supports the development of social skills.

Understanding the development of mathematical thinking in elementary-aged students allows teachers to anticipate procedures that students are apt to invent, and find ways to support students as they progress in their understanding. When teachers encourage students to invent alternative problem-solving strategies, the learning objectives are different from those that result from instruction using standard memorization procedures. The emphasis is on making sense and finding meaning in the methods that students create and successfully use (Scharton, 2004). Students should be given opportunities to solve computational problems, create their own procedures for solving them, and explain their methods to others. Research found this approach improves the students' accuracy, as well as their understanding of the methods, their understanding of their own procedures deepened as a result of this elaborative rehearsal. Listening to the methods that others use prompts some students to experiment with other students' methods of computing (Sousa, 2015).

Establishing the routine of Number Talks in your classroom is a best practice and a way to encourage mathematical discourse. It also builds student understanding and strengthens numeracy.

Discussion Prompts

1. In the paragraph and list above, emphasis is placed on improving student numeracy and other challenging issues that are faced in the elementary classroom. What are two areas you would like to focus your efforts as you conduct Number Talks in your classroom?
2. Watch the video at *www.mathsolutions.com/NTWNC34*. What did you notice the teacher doing? How was the classroom arranged? Notice proximity. Why is this important?
3. What are some ways you can frame questions to elicit student thinking?
4. What are routines you can immediately establish for your classroom Number Talks?

Next Steps

Plan to implement Number Talks in your classroom before the next session by following steps 1-4 on pages 17-19 in “Number Talks, Whole Number Computation” by Sherry Parrish.

Additional Resources

- "Talk Moves: A Teacher’s Guide for Using Classroom Discussions in Math" by Suzanne H. Chapman, Catherine O’Connor, and Nancy Canavan Anderson. Math Solutions, Sausalito, 2013.

- "How the Brain Learns Mathematics, Second Edition" by David A. Sousa. Corwin, Thousand Oaks, 2015.

- Minds In Bloom Blog: *https://minds-in-bloom.com/getting-started-with-number-talks/.*

> ***“Mathematics is the most beautiful and most powerful creation of the human spirit.”***
>
> ***Stefan Banach***

The Math Standards in Number Talks

Session 4

In this session, participants will need a way to access the internet.

Reflect on the implementation of Number Talks in your classroom with the PLC group.

1. What went well?
2. What needs refining?
3. How did you feel about your questioning techniques?

In education, as well as most things in life, intentionality is crucial for success. Intentionally teaching rules and establishing guidelines are crucial for behavior and environment. In the same manner, intentionally addressing your content standards is important when doing a Number Talk.

When implementing a Number Talk, ensure that the West Virginia College-and Career-Readiness Standards (WVCCRS) are being intentionally addressed, as well as the Mathematical Habits of Mind.

Follow the link provided to see your grade level's content standards:
https://wvde.us/math4life/educators/grade-specific-resources/.

- Click on the grade level that you are currently teaching. The first bullet point is the College- and Career-Readiness Standards for a particular level. Click the blue circle to the right. Read through the grade-level standards and note which standard focuses primarily on computation.
- Go back to the main page for grade-level resources. Scroll down to the heading, West Virginia's Educators' Guide for Mathematics. Click on the grade-level Educators' Guide on the left. Pair the computation standard to the standard found in the Educators' Guide. For example, the fourth-grade standard M.4.9 is to fluently add and subtract multi-digit whole numbers using the standard algorithm. On page 14 in the Educators' Guide, this standard is addressed:
    - » *At grade four, students become fluent with addition and subtraction with multi-digit whole numbers to 1,000,000 using standard algorithms* ***(M.4.9)****. A central theme in multi-digit arithmetic is to encourage students to develop methods they understand and can explain rather than merely following a sequence of directions, rules, or procedures they do not understand. In previous grades, students built a conceptual understanding of addition and subtraction with whole numbers as they applied multiple methods to compute and solve problems. The emphasis in grade four is on the power of the regular one-for-ten trades between adjacent places that let students extend a method width which they are familiar. Since students in grades two and three have been using at least one method that will generalize to 1,000,000, this extension in grade four should transpire quickly.*

When utilizing the Educators' Guides note that there will be provided multiple strategies for solving problems. This resource can help you to anticipate strategies students might utilize when participating in a Number Talk. Prior to addressing a certain skill, check the standard it covers and prepare yourself for student thinking.

Next Steps

- The College- and Career-Readiness Standards for Mathematics (WVCCRM) at the beginning of each grade level provides an overview of what teachers need to know as they address the content standards. The Mathematical Habits of Mind (MHM), the skills and dispositions for students to successfully engage in mathematics, are highlighted and emphasized on the following pages. Read the Overview of the WVCCRM and MHM.
- In the Educators' Guide for your grade level, the MHM are addressed. The description of the Mathematical Habits of Mind is the same at all grade levels. However, the way these are utilized as students engage with and master new and more advanced mathematical ideas does change. Review the chart provided in your grade-level Educators' Guide for the MHM and how you can formatively assess your students' proficiency with a particular MHM. There are also questioning techniques provided for you to utilize to deepen the conversations you begin with your students during a number talk.

"Millions saw the apple fall, but Newton asked why."

Bernard Baruch

The Mathematical Habits of Mind in Number Talks

Session 5

When doing Number Talks, many Mathematical Habits of Mind (MHM) are being activated and engaged. The Mathematical Habits of Mind are a crucial part of the WVCCRM. In the last session, you were asked to review the standards and then explore the Educators' Guides for your grade level.

Discussion Prompts

1. What information does the Educators' Guides provide for a teacher as they plan for Number Talks?
2. How are the Educators' Guides connected with the WVCCRM?
3. How will you utilize these tools?
4. What did you notice about the Educators' Guides that may serve your professional learning needs?
5. The Mathematical Habits of Mind are highlighted in both the WVCCRM and the Educators' Guides. Why is that information useful as you begin Number Talks in your classroom?

Activity

Watch a Number Talks video and look for the Mathematical Habits of Mind addressed in the video.
K-2 Video: *www.mathsolutions.com/NTWNCK1*
3-5 Video: *www.mathsolutions.com/NTWNC52*

Reflection

1. What are the students doing in both videos?
2. What is the teacher doing in both videos?
3. How can you implement new strategies in your classroom that will make your Number Talks even more successful?

Next Steps

Do a Number Talks problem and identify which CCRS the Number Talk addressed as well as the Mathematical Habits of Mind it addressed. Be prepared to discuss how the MHM were addressed in you Number Talk. Reflect on what went well and what did not go so well.

Number Talks in Your Classroom

Session 6

With your PLC group, discuss what went well and what did not go as expected in your Number Talks. As with any new concept, implementation may face a host of challenges. The difficulties that present themselves during Number Talks offer important learning opportunities for you and your students. You may need to fiddle around with Number Talks until you find what works best for you and your students.

Tips That Will Help

Ask clarifying questions:

- What I think I heard you saying was _____.
- I think I heard you say _____.
- I want to make sure I understand what you mean. Could you please repeat that last part?
- Who can explain what _____ said in your own words?

Resist putting words into a student's mouth or assuming you know what a student is trying to say.[1]

ENCOURAGE CREATIVE THINKING. While we may have grown up knowing only one way to solve problems, we want students to develop numeracy. They need to flexibly work with numbers to understand how they really work. Just like you need time to perfect a dance move, a recipe, a favorite knitting pattern, or a basketball shot, students need time to fiddle around with computation to find out what works best for them. Assuming that a student understands why a procedure works or assuming that the traditional algorithm is the best way to do a problem defeats the purpose of making sense of the mathematics. Remember, math is a learning subject, not a performance subject.

OOPS! WHAT HAPPENS IF I MAKE A MISTAKE? When mathematical ideas are being explored we may go down the wrong path. That's okay! Mistakes are learning treasure troves, so we must use the opportunity to model for our students a spirit of wondering, curiosity, and of being willing to embrace and examine our mistakes in a search for meaning (Humphreys, 2015).

WRITE THE STUDENT'S NAME AND SCRIBE THE STRATEGY AS CLOSELY AS POSSIBLE ON A SURFACE VISIBLE TO ALL STUDENTS. Writing a student's name is a wonderful way to give ownership and a reference of pride for a student. Recording what they say and asking clarifying questions give students time to reflect on their strategies and see what they are saying. It is unbelievably helpful in improving students' speaking skills.

[1]*Adapted from "Making Number Talks Matter" by Ruth Parker and Cathy Humphreys*

CAN I EVENTUALLY TURN THE RECORDING OVER TO STUDENTS? Teachers should be facilitating Number Talks for three reasons: Clear communication, accurate representation, and precise notation (Parker, 2015). Having the teacher as facilitator also sends the message that an adult is listening, and finds what you have to say not only interesting, but important.

WHAT HAPPENS WHEN STUDENTS DON'T VOLUNTEER TO OFFER A SOLUTION, OR ONLY A FEW STUDENTS PARTICIPATE WHILE OTHER OBSERVE? In the beginning, you may have students who are insecure in their problem-solving strategies, or who don't want to share their thinking. Give them a few Number Talks sessions to engage, and then pull out the popsicle sticks with their names on it, and ask them if they have a strategy. Sometimes, students just need to be given a little persuasion to engage.

KEEP THE NUMBER TALKS SHORT. It is important to consistently do Number Talks throughout the week. Keeping the time limited to 15 minutes ensures you will be more likely to continue on a consistent basis. Set a timer to make sure you don't go over the time. You won't get to every student, even if they are excited to solve a problem. Strategies can last over many days, so each child will have an opportunity to participate. You may want to keep track of who you called on so you can call on others the next day.

Reflection

- What are some ways you can help your colleagues consistently implement Number Talks?
- What tips do you have for a successful Number Talk?

> *"There should be no such thing as boring mathematics."*
>
> *Edsger Dijkstra*

Online Resources

Session 7

The best Number Talks often happen organically. The more Number Talks occur in your classroom, the more students will engage in the mathematics. Facilitating good mathematical discourse often happens around great questions. Here is a list of great online elementary discourse resources:

Pre-K through Grade Two:

- The Teaching Channel has an abundant set of resources that will help you with honing your Number Talks skills: *https://www.teachingchannel.org/blog/2017/08/18/dig-into-number-talks*

- Pre-K/Kindergarten: Learning to Think Mathematically with the Rekenrek: *https://www.mathlearningcenter.org/sites/default/files/pdfs/LTM_Rekenrek.pdf*

- First Grade Video featuring Math Routines: *https://www.teachingchannel.org/video/number-talk-math-lesson-1st-grade*

- Second Grade Number Talk: *http://bpsassets.weebly.com/uploads/9/9/3/2/9932784/number_talks_second_grade_resource.pdf*

- Number Talk Questions: *https://schoolwires.henry.k12.ga.us/cms/lib/GA01000549/Centricity/Domain/3791/math_talk_poster.pdf*

- Phrases that can help children when they are explaining their thinking. These can be cut out and glued on index cards and placed on a ring so students can use them during a Number Talk. *https://schoolwires.henry.k12.ga.us/cms/lib/GA01000549/Centricity/Domain/3791/math_talk_sentence_starters.pdf*

- Number Frames for iPad, Web and More: *https://www.mathlearningcenter.org/resources/apps/number-frames*

- Number Rack for iPad, Web, and More: *https://www.mathlearningcenter.org/resources/apps/number-rack*

Grades Three through Five:

- The Teaching Channel has an abundant set of resources that will help you with honing your Number Talks skills: *https://www.teachingchannel.org/blog/2017/08/18/dig-into-number-talks*

- Number Talks for Grades 3-5: *http://bps.solutions/MATH/Grade3-5_Number_Talks.pdf*

- Tackling Misconceptions: Small-Group Number Talks: *https://www.teachingchannel.org/blog/2016/05/27/small-group-number-talks-gbt/*

- Number Talks Professional Development: *https://bstockus.wordpress.com/2015/12/05/twelve-hours-of-number-talks/*

- Number Talks: Grade Five: *https://hcpss.instructure.com/courses/108/pages/number-talks*

Works Cited

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