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REVISITING THE DON'TS OF NUMBER TALKS

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In our December issue of the *Abacus*, we shared the *11 Don'ts of Number Talks* (republished in this issue). This was an infographic that outlined some common mistakes that can happen when doing Number Talks with students. While Number Talks are widely recognized for fostering mathematical discourse and flexibility in thinking, their success depends on careful implementation.

This issue of the *Abacus* revisits the "Don'ts" of Number Talks, highlighting common missteps and their impact on student learning. Our guest author for this issue, Evan Throop-Robinson, shares a compelling reflection from a group of pre-service teachers at St. Francis Xavier University, who took a unique approach—deliberately leading a bad Number Talk to expose the subtle ways teacher language and actions can either support or discourage student thinking. Their experience underscores the importance of intentional teacher moves in fostering a safe and open math classroom.

Through discussions of what to **avoid** and **explore**, this issue challenges us to reflect on our teaching and consider how we can create more meaningful, student-centred math discussions.

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 manipluatives 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 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 seein 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 atrnost 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 strategy 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. You can prepare for a Number Talk beforehand by trying 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 the 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 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!!

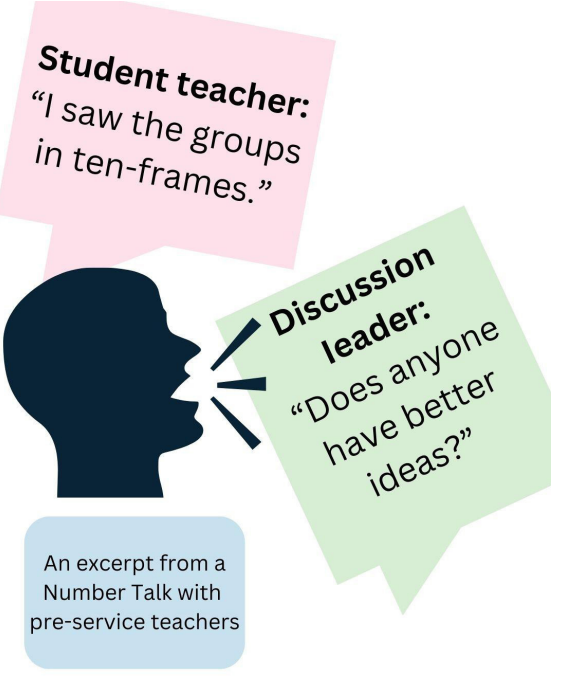
THE ONE WHERE WE DID IT ALL WRONG (ON PURPOSE)

By Evan Throop-Robinson, Joni-Lyn Whitti, Kaia Knockwood, Laura Maillet.
With contributions from Alyssa Goodine, Jenna Hickey, Karly Flecknell

…and with that comment, Kaia's peers in the class of pre-service teachers (PSTs) at St. Francis Xavier University knew the jig was up. This Number Talk felt different, awkward, and strangely off-base.

This is how Evan's students described what they did:

Throughout the winter semester, our class focused on orchestrating Number Talks. Evan, our instructor, randomly organized us into groups of three or four so we could collaboratively plan and lead a Number Talk for our peers. Our group (Laura, Joni-Lyn, Kaia) was scheduled at the tail end of the semester after most groups had already done one, and we noticed that those Number Talks were all very similar. Everyone had read and discussed the *Abacus* article, *Number Talks: Here's what we've learned and what teachers are saying* (Husband, Rapke, DeSimone, 2024) and, in particular, the *11 "Don'ts" of a Number Talk*. So far, everyone in our class demonstrated how to lead a Number Talk, using effective "teacher moves" to encourage and prompt ideas from students. They had all done a good job!



An excerpt from a Number Talk with pre-service teachers

So, our group decided to do something different. **We had the idea to do a "bad" Number Talk,** where we would do all the wrong things, like not giving enough time, being discouraged, and trying to tell students how to do it. We felt that dividing by 10 was too simple with a round number like 30, and wouldn't challenge the group at all. It was a nod to #3, "Start simple," and they thought it was funny that it was too easy. So, we settled on the question 30 divided by 10.

When we sat down to plan our Number Talk, we wrote out all the effective moves we had learned throughout the course, but then changed them to be the opposite of what they should have been. For example, to start the Number Talk, we decided not to give them enough time to turn and talk. This prompted a few raised eyebrows among our peers, but we continued.

After hearing a student's answer, we decided not to give them the chance to explain how they saw it. Instead, we told them *how* to visualize the problem by saying, "You should use base-ten blocks." We also asked, "Does anyone have any better ideas?," before picking a "best idea" and discouraging students from talking about any other one. This was the moment that our peers picked up on our demonstration of what not to do. It was hard to maintain our composure and go through with it because the class didn't know what we were doing at first. We knew it appeared mean because it showed exactly what not to do—but it taught a good lesson for the pre-service teachers!

The week before our Number Talk, we explained to Evan that we wanted to explore the *11 "Don'ts" of a Number Talk* further. We thought it was important to have Evan on board before our Number Talk started. We didn't want to catch him off guard. It meant that Evan knew the purpose behind our bad Number Talk and would support us in debriefing with our class. Our intent was to contrast "what *to* do" with "what *not* to do" in the Number Talk and to show how just a change in wording from the teacher can really discourage students. In our follow-up discussion, our classmates identified everything we changed in our Number Talk, and they had no problem giving us feedback about it!

Here's what Alyssa had to say about the experience:

Using the *11 "Don'ts" of a Number Talk* was a powerful way to highlight poor teaching practices. Observing my peers act out these mistakes in a safe space during our curriculum course allowed me to easily identify areas for improvement in their student interactions.

For instance, one peer suggested dividing 30 by 10 by subitizing the groups, which was their first "don't" move. This teaching move influenced my thinking and limited the solutions I might have considered if I hadn't heard the teacher's idea first.

Additionally, phrases like "Does anyone have better ideas?" made me hesitant to participate and created an intimidating classroom environment where the teacher's opinion dominated.

Jenna commented on the group's word choices and language use:

When solving the problem, I visualized in my head three ten-frames all filled in to give me a total of thirty. From this, I knew that the answer was three because the thirty units were already in groups of ten. However, I was caught off guard by the group's word choice that they used as co-teachers. Within the lesson, they repeatedly used words like "I think it would be best to…" and "is there a way it can be done better...," given that it was not inclusive or student friendly language.

This was surprising because from my perspective, their word choice hindered if not stumped students' overall engagement and willingness to contribute to whole-class discussion.

Jenna also reflected on how the experience put her in the students' shoes, which did not feel supportive:

I thought it was interesting how they used words throughout their lesson that essentially put down students' responses that were shared to the whole group for discussion, which can already be a scary thing to do.

I did not think how they spoke about the students' answers and contributions to the discussion was kind and what we should be doing as teachers. I made it a point to express my feelings because I would not want to be a student of a teacher whose classroom feels like an environment where I cannot share my thoughts, nor do I think it is okay for a teacher to speak or lead a lesson in such a way that hinders students' confidence in the classroom.

Reminding ourselves as new teachers of the "don'ts" of teaching lets us be more aware of how important our role is for shaping confident, curious minds of tomorrow.

Kaia also reflected on how the experience put her in the students' shoes, making her hesitant to participate and question whether her thinking was valued:

A classmate explained their way of solving it, which they [took up]. Kaia then asked for another example. I spoke up and said to take three groups of nine and place them in three different ten-frames. I then knew that the answer to 9 x 3 was 27, so I took the three leftover magnets and asked them to put one magnet in each ten-frame to complete the three ten-frames. 10 x 3 = 30, which means that 30/3 = 10. I did repeated addition in my head to solve this.

Once I explained my answer, Kaia said, "Why didn't you use 10's?" At this moment, I was a little taken aback by the statement and explained my reasoning that the first thing I thought of was 9 x 3 = 27, and then adding 3 equals 30. I thought in all seriousness that she did not like my answer to the question.

After someone else spoke up and the conducting group responded with a negative statement, I clued into what was going on and did not feel as if I gave the wrong answer. This allowed us, as learners and pre-service teachers, to see what not to do when teaching a math lesson.

I felt very nervous and did not want to speak up after Kaia said what she said to me. Creating a classroom environment that is friendly, safe, positive, and open allows students to speak in front of the class, answer questions, and explain their thinking more comfortably. Getting students to explain the process of their way of thinking is more important than getting to the final answer. Number Talks allow for the class to do this, and asking students to explain their process engages and enhances other students to learn and think of new ways to solve.

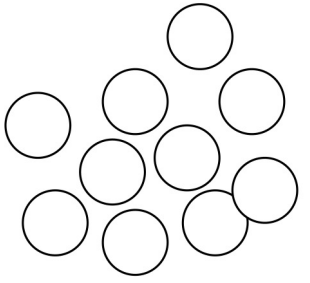
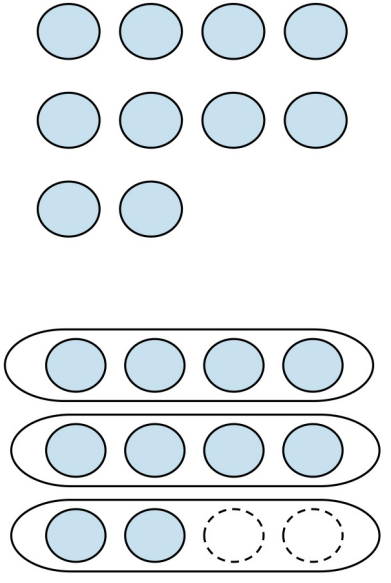
Our reflections on the experience:

Afterward, our group reflected on the experience of leading a Number Talk. Laura said she was surprised that her peers "caught everything because we had some small things that we did, but we did Number Talks for so long that it was obvious when we did them badly." She also wrote, "I'm glad we went through with it because sometimes visually seeing something, rather than just discussing it, can really put into perspective why we shouldn't do the things we did." Joni reflected that "a Number Talk done 'wrong' encouraged us as pre-service teachers to acknowledge and discuss what not to do in a classroom setting and to better our understanding of working with students." Kaia said that it was difficult to question how her classmates responded and gave the example of "when someone stated they saw the answer in groups of 9, to which I asked, "Why not in groups of 10?" Despite our awkwardness leading a Number Talk in this way and speaking to students like this, it showed us how discouraged they could get. We felt it was a unique experience to see how our peers viewed us as teachers, before telling them that our Number Talk was intentionally done badly. As Alyssa pointed out to us in our Number Talk debriefing, "Seeing what *not* to do reinforced the importance of the student-centred approaches to Number Talks we've been learning in the course."

For future issues of the *Abacus*, hearing from other teachers who are exploring how to create safe and open classroom environments that reduce math anxiety would help support our learning as PSTs.

USING 10 ÷ 4 AS A NUMBER TALK: A SCRIPT YOU CAN FOLLOW

Here is a transcript from a Number Talk that happened in a classroom in Nova Scotia. We have adapted it to create a script you can use in your classroom!

Dialogue: Teacher says, Student says	Imaging on the board	Purposeful actions: The DO's
Teacher: I'm going to have us close our eyes and we're going to imagine how you would divide 10 by 4. So, if you had 10 items, and you had to divide them by 4, how would you do that? **One minute later…** If you have an idea, can you give me your thumb? Show me your thumb if you have an idea. I'd like you to turn and talk to the person beside you and tell them your idea for 10 divided by 4.		**Start the dots in a random pile.** **Visualizing** **Turn & Talk**
Idea 1: Dealing with the remainder by illustrating what's missing from a whole group **Student 1:** You could just add it into groups and have 2 groups of 4 with a remainder of 2. **Teacher:** So you said 2 groups of 4? **Student 1:** Yeah, and then have a remainder of 2. **Teacher:** What do I do with those 2? So, 2 groups of 4 – could we just put a circle around the 2 groups of 4? So this is 1 group of 4 *[circles one group of 4]* and 2 groups of 4 *[circles a second group of 4].* And then we have these 2 remaining?		**Eliciting and recording Idea #1, moving the dots into rows** **• Circle the groups.** **• Draw two dotted counters to represent the missing two counters to make a full group.**

Student: Yeah. **Teacher:** Okay, who also did that? *(Pause for students to raise their hands).* You thought about it like that? 2 groups of 4, and then the 2 remaining? Isn't that interesting? **Teacher:** Okay, so we know it goes in twice, right? And how much is left over? **Student:** 2. **Teacher:** 2? **Student:** So it would be 2 remainder 2, or known as 2R2. **Teacher:** Okay, so there's 2 remaining. Did anyone have an idea of how much of this [*points to the 2 remaining*] – how much of these 2 are part of the whole?... Because this is another group here *[circles group of 2]*, but I don't quite have enough. How much is remaining of a whole group? **Student:** Half. **Teacher:** Half of a whole. Okay. Raise your hand if you thought about this as the 2 groups of 4 and then a half remaining? Okay, a couple of people. Who thought about it differently? Did anyone think about this differently?		**Surveying the group for similarity** **Surveying the group for difference**

Idea 2: Dealing with the remainder by sharing it equally in buckets

[Student distributes counters by 1's]

Teacher: So, if we had to put those into the buckets, how many would be in each bucket?

Student: One.

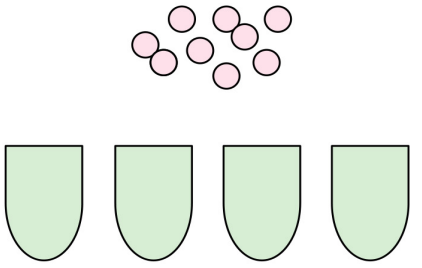
Teacher: One? Yep, okay. Let's do that…So that one's going to go up in that one?

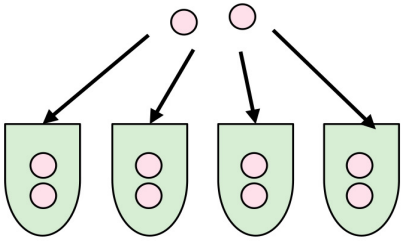
Student: Mmmhmm.

Teacher: And this one's going to go in here. Another one's going to go in this one. And that one's going to go in this one: Okay, I have a question. How many times does 4 go into 10? Turn and talk to the person beside you. Based on what you see up here, how many times does 4 go into 10?

Classroom chatter

Teacher: Okay, so, what do you think? How many times does 4 go into 10?





Eliciting and recording Idea #2

Draw four buckets on the board.

Turn & Talk to make connections

Move dots one at a time into the buckets.

Student: 2 and a half.

Teacher: 2 and a half. Where do you see the 2 and a half on the board?

Student: [*points to where they image each counter cut in half*] Because there's 2 here, and then there's one half of the one right there.

Teacher: So, my question is: If this is 2 and a half, where's the 2 and a half here on the green side (i.e., previous idea)? Turn and talk to the person beside you. Where's the 2 and a half here? See if you can find 2 and a half.

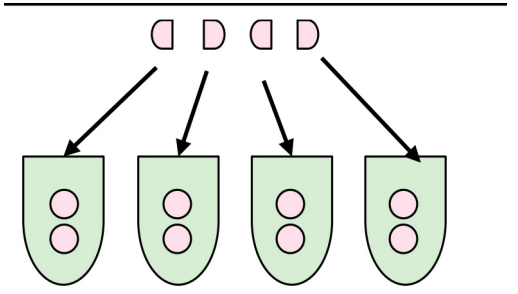
[Classroom chatter]

Teacher: So, where's the 2 and a half here?

Student: 2 full ones on the top and then on the bottom, it's half.

Teacher: You see 1, 2, and then the half, yeah?

Student: Yeah.

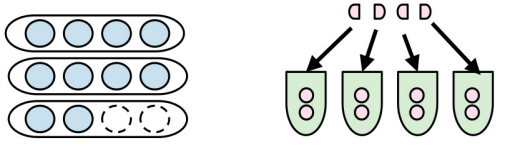


Draw half circles to represent the halves.

Each half gets moved into a bucket.

Connecting the two images–finding *this* in *that*

Teacher: How would you turn this picture into this one, and how would you turn this picture into this one?



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Send your teaching-strategy ideas, problems, and student solutions to the *Abacus* Co-Editors via email abacus@oame.on.ca.