Zooming Through Number Talks: Considerations for Virtual Instruction

As we approached 2020, this was supposed to be a riveting year like the 1920's with celebrations and roaring activities. No one expected to have a turn of events that meant a worldwide pandemic. When COVID-19 made its way into the world, it left a lot of panic and confusion with everyone, especially teachers. Teachers were left more confused than ever on how to adjust their interactive, hands-on teaching styles to a virtual environment through a computer screen.

During this time, I was a preservice teacher who used number talks with third-grade students as a tool for developing their multiplication fluency. I recognized that memorizing facts is not the best way to build fluency with multiplication facts, so I used number talks as a way to help students build their repertoire of strategies through collaborative learning with their peers. Once instruction moved online, I wanted to continue to learn and practice this teaching strategy in a virtual format. I continued to work with third grade students conducting number talks and analyzing how virtual adjustment affected their learning ability and my ability to provide a positive learning environment.

Developing Multiplication Fluency

There are four different classes of multiplicative structures: equal groups, comparison, area, and combinations (Van de Walle et al., 2019). Third grade students mainly focus on the equal groups structure. This structure involves three quantities: the number of groups (sets or parts of equal size), the size of each group (set or part), and the total of all the groups (whole or part). The parts and wholes terminology helps students make the connection to repeated addition since the equal group is added over and over again. This is important for third grade students to make the connection from repeated addition (additive thinking) to (equal groups) multiplicative

thinking since it will produce the same results for positive whole numbers (Van de Walle et al., 2019).

Third grade students in North Carolina are expected to become fluent with their multiplication facts within 10 (North Carolina Department of Instruction, 2018). To be fluent means more than just solving multiplication problems quickly. It is the skill to find products flexibly, accurately, efficiently, and with appropriate strategies (Bay-Williams & Kling, 2019). Baroody (2006) suggests that students develop fluency as they progress through three developmental phases.

- Phase 1: students use direct modeling and/or counting to find the answer
- Phase 2: students derive answers using reasoning strategies based on known facts
- Phase 3: students demonstrate mastery through efficiently producing answers

Phase 2 is centered around the development and use of reasoning strategies that allow students to derive facts based on known facts. Derived fact strategies for multiplication include 1) adding or subtracting a group, 2) doubling and halving, 3) using a square product, and 4) decomposing a factor. Skipping phase 2 does not work for many students as they do not retain the facts they memorized. Memorization of facts discourages students from looking for patterns and relationships and also does not allow students to flexibly apply strategies to find facts, which means they are unlikely to develop fluency with multiplication (Kling & Bay-Williams, 2015).

Benefits of Number Talks

Number talks are a tool teachers can incorporate into their classroom instruction to enhance students' reasoning strategies and build their mental math skills (Parrish, 2011). Number talks are usually a five to fifteen minute conversation around a purposefully crafted computation problem in which students share and discuss computation strategies (Parrish, 2010). The role of

the teacher is to facilitate the conversation and make the students' thinking visible to the class to aid in discussion. During these number talks, students have the opportunity to clarify their thinking, investigate and apply mathematical relationships, build a repertoire of strategies, select efficient strategies for specific problems, and then consider and test strategies to check for reasonableness (Parrish, 2011). Number talks allow students to collaboratively explore different students' strategies and develop their fluency with multiplication. As a preservice teacher, I felt like this teaching strategy is essential for me to learn to enact and incorporate into my future classroom instruction.

Planning to Teach Online

With the abrupt shift to online instruction, platforms such as Zoom became popular environments for teaching. This video-based communication tool allows for groups to gather synchronously, at the same time, in virtual environments while maintaining a safe distance. When teachers made the shift to online teaching, they had to consider the functionality of the online platform they chose to use, the technology students had available to them, and how to create a classroom community in this setting. As a preservice teacher, I did not have the experience of teaching online and was suddenly challenged to enact a new teaching practice while doing so in an online environment.

As I planned the number talks, I decided that my goal was for the students to begin with foundational facts and move toward derived facts. Table 1 shows the multiplication problems I planned to pose as well as the strategies I anticipated students might use to solve the problems.

Table 1: Number Talk Planning

Session	Multiplication Problems	Anticipated Student Strategies
Session 1	6x3, 8x4, 8x12, 4x15	Decomposing
Session 2	7x13, 4x5	Decomposing, "groups of"
Session 3	6x9, 4x11	Benchmarking 10
Session 4	8x9, 6x12	Benchmarking 10, doubling and halving
Session 5	6x12, 5x9, 3x4	Decomposing, benchmarking 10, doubling and halving, recall

I decided to work with three boys who were at the end of their third-grade year. I did not know these boys ahead of time, nor did they know each other. These boys' parents agreed to let me meet with each one individually first so we could practice with the technology and so I could assess their current thinking with multiplication using a pre-assessment. I took notes during the pre-assessment on how the boys solved each multiplication problem. Then we met as a small group for five different number talk sessions over the span of four weeks. After each session, I would reflect on how the strategies the boys used and any tensions that would arise. Once we completed all five number talk sessions, I then met with each boy individually again to assess their multiplication fluency using the same questions that I asked in the pre-assessment. I found that before the number talk sessions the boys used a repeated addition strategy and could answer about 4 out of 6 of the multiplication problems. The boys continued to use the repeated addition strategy on the post assessment, but this time they were able to answer all the multiplication problems.

Though the experience of conducting virtual number talks seemed to be beneficial to the boys, what I learned the most from was from my reflections after each meeting. I noticed patterns of tensions that arose when I read through my reflections. These tensions are where I feel other teachers could learn from my experiences to improve their own virtual instruction.

Tensions When Conducting Virtual Number Talks

Tensions arose throughout my implementation of virtual number talks. These tensions included how to cultivate a classroom community, students not using the anticipated strategies, difficulties with recording students' thinking, and dealing with technical difficulties. Each of these tensions are described below and how I worked through each of these tensions as the sessions progressed.

Tension 1: How do I create a classroom community online?

With the mindset that myself nor any of those boys had met in a fac-to-face classroom setting, I attempted to create a classroom community virtually. During the individual pre-assessments, I spent time with each of the boys getting to know them and letting them get to know me. This time spent individually supported the boys getting to know one another on the first synchronous session. I spent time allowing them to introduce themselves, share fun facts, and interact. I explained how each session would flow and gave the boys time to play around with the zoom program features. This served to be very beneficial as it resulted in the boys being willing to share different strategies with one another, listen and encourage one another in the chat boxes, and create an overall positive rapport with myself and each other.

Tension 2: What happens when students do not use the anticipated strategies?

I intentionally planned the number talks to bring out specific strategies' students might use to solve multiplication problems. During this intentional planning, I considered the problems

I chose and questions I would ask the students so they could make connections among strategies and evaluate their efficiency. It is ideal for students to use strategies, such as decomposing or double and halving, and explain their mathematical thinking to their peers during a number talk. However, I did not anticipate that the students would continuously choose to use the repeated addition strategy. When the students did not use the strategies I anticipated, I decided to be the one to introduce the new strategies to the boys. They would try out the newly introduced strategies like decomposing or doubling and halving during the same session, but then they would revert back to using repeated addition in the subsequent sessions.

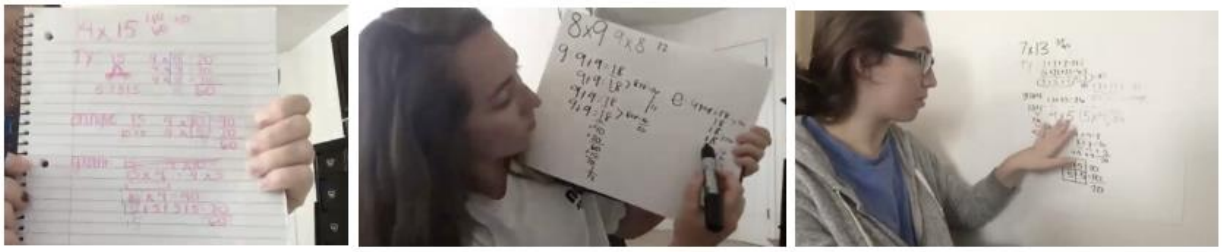
I am curious if they would have been more inclined to adopt the new strategies for themselves if they had been introduced to new strategies by one of their peers. In the future, I will think of questions to push their thinking beyond using repeated addition like, "Is there a faster way to do this?" I could also give them multiplication problems where the repeated addition strategy would be inefficient and hopefully lead to other strategies. Looking over the problems I posed for the students, in the future, I would spend more time on the intentionality of the anticipated strategies I want to elicit and modify some of the number selections in the problems to achieve the learning goals.

Tension 3: How do I record student thinking in a way that makes it visible to all students?

The biggest obstacle I came across was being able to record students' thinking in a way where they could view it as I recorded it. I tried a variety of ways to represent students' thinking as seen in Figure 1. First, I wrote on a paper and then held it up. Next, I tried holding up a whiteboard the entire time while I wrote the students' strategies. Finally, I tried posting a sheet of poster board paper behind me to try to create the illusion of a whiteboard. While the whiteboard illusion was most ideal because I could write and have the students view at the same time, I ran

into the problem of the students not being able to see my writing through the computer screen. During the majority of the sessions, I would hold up a whiteboard, write on it, and then hold it to the camera for students to see better. The students could see the whiteboard well, but it was a bit harder for me to hold it up the entire time in a good position for them to see as I talked. Whiteboards also only allowed me to record one or two of the student's work without having to erase or have smudges.

Figure 1: Progression of representing students' thinking



After going through these number talk sessions, I learned about virtual whiteboards in Zoom where I can write straight onto the board through the computer. This allows students to view what I write on the Zoom screen, which is a lot more effective than the solutions I previously came up with. Sometimes it is helpful for students to be able to represent their thinking themselves during a number talk. In order for students to do this so that everyone in the class can see, they could use another whiteboard such as Whiteboard.fi. By having either the teacher represent student thinking or the students represent their own thinking, the visual representation of the mental math strategies allows students to make connections among different strategies and potentially move them forward in their strategy selection.

Tension 4: What should I do when technical difficulties arise?

Technical difficulties are inevitable when teaching online. A speaker might not work, the internet connection is being buggy, the screen is lagging, and the list could go on. Over the span

of five sessions, we had our fair share of technical difficulties. Since I was only working with three boys, I really wanted to help each of them so I could get the most out of these sessions. However, I cannot be there to see what technical difficulties arise on their end, and I could only do my best to walk them through some ways to troubleshoot. For instance, one of the boys had a speaker issue where he could hear me, but we could not hear him. We solved this problem through utilizing the chat box and the emojis that are in the Zoom program. I wanted the student to still participate in the number talk, and we were able to find a solution for him in the moment. After the session ended, I communicated with the family and they were able to resolve the problem by our next session. Technology can be very unpredictable, so teachers need to be resilient and flexible when using technology to teach. It is also helpful for teachers to have good communication with students' families so that they can work with you to troubleshoot technical issues when they arise.

Discussion

Overall, this experience was very beneficial to me as I continued to develop my teaching practices in a virtual environment. I was still very new to enacting number talks with students when instruction moved online, and I found it challenging to practice a new teaching skill while simultaneously learning a new platform for instruction. This experience taught me that technological resources (virtual communications programs and virtual whiteboards) are key in being able to enact synchronous online teaching effectively. This experience also seemed to be beneficial to the students I worked with. During the post assessment, I asked the students the questions, "How did you feel being at home learning?" and "Was it hard to understand concepts through the computer?" This conversation during the post assessment was particularly interesting to hear how they felt about their learning. Two of the boys said it was easy to learn through

virtual sessions, while another struggled with technical difficulties that posed a barrier in his ability to learn. All of the boys felt it was fun and still felt like school, which was important since these sessions occurred within the first month that COVID-19 made an impact and before all instruction moved online. Unfortunately, I am no longer working with these boys since I am finishing up my senior year of my teacher preparation program. I would be curious to reach out and see how they feel about online instruction now that their online learning environment has continued through this school year.

If others are interested in conducting virtual number talks, I suggest using online whiteboard tools, such as the whiteboard tool in Zoom or Whiteboard.fi, to help with recording student thinking and eliciting discussions based on students' strategies. I also suggest spending time building an online classroom community that is a supportive and safe environment for students to provide encouragement to one another through the use of the chat box and emojis. This classroom community will allow students to feel safe to share their thinking, which will benefit all students during virtual number talks.

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