



Creating
**Math
Talk
Communities**



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Use these five strategies to encourage meaningful classroom discussions.

Twenty-one fourth graders are actively listening and constructively critiquing mathematical statements. Each student is eagerly participating in mathematical discussions that involve multiple strategies to discover solutions. What a dramatic change since the first months of school when the same students sat as quiet as stone statues, hoping their teacher would just tell them how to solve the problem. This mathematics classroom has transformed from students blurting out solutions and arguing over correct answers to a group that collaboratively perseveres through problem solving. Student cooperation is evident through the desire not only to justify strategies but also to learn different strategies from peers. This article will detail the value of math talk and five strategies for building such a community in your classroom.

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Changing times

With many states adopting the Common Core State Standards for Mathematics (CCSSM) (CCSSI 2010), teachers are seeing a shift in the way we are expected to have our students engage in mathematics instruction. Teachers are charged with pressing students to provide meaningful explanations to help support higher level mathematical thinking and reasoning (Henningsen and Stein 1997). The Common Core's Standards for Mathematical Practice (SMP) state that students should engage in discussion that constructs viable arguments and critiques each other's reasoning (SMP 3). During mathematical discussions, students should be able to "justify their conclusions, communicate them to others, and respond to the arguments of others" (CCSSI 2010, pp. 6–7). Each discussion should have a specific purpose, with the overlying purpose of learning mathematics.

A math-talk learning community is a place where meaningful mathematical discussions construct knowledge and support the mathematical learning of all participants" (Hufferd-Ackles et al. 2004). Teachers are not the bearers of knowledge, but instead, they guide and extend students' thinking as the class listens and learns to accept other students' ideas (Ball 1993). Students are held responsible for justifying their reasoning, therefore increasing their mathematical knowledge and understanding (Rawding and Wills 2012). When students work together in cooperative learning groups, they work toward common goals (Chiu 2004). When the common goal of the group is to learn mathematics, the purpose of the discussion remains

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mathematical, and knowledge increases. If all students are involved in math talk, meaningful learning will take place. Students become co-investigators and holders of knowledge instead of the teacher imparting all her knowledge to students (Zack and Graves 2001).

Five strategies to encourage meaningful math talk

Over the past two years, I have strived to improve the math-talk learning community within my classroom. Although I had previously asked students to discuss their mathematical thinking through small-group and whole-class discussion, I was often disappointed with the lack of quality of the student math talk. In particular, many mathematical discussions were one-sided and just quickly stated the solution. If a student in the group disagreed with the solution, rather than participating in productive math talk, students would argue. Through my own experimentation with different activities to address my concerns, I found five strategies to be particularly helpful in supporting the development of more meaningful math talk:

1. Discuss why math talk is important.
2. Teach students how to listen and respond.
3. Introduce sentence stems.
4. Contrast explanation versus justification.
5. Give an example.

Why should we talk?

To properly engage in meaningful mathematics discussions, students should understand why math talk is important. A few weeks into the school year, I asked my students to contribute their personal opinions about why they felt math talk was important. I posed the open-ended question—why is math talk important? As students shared freely, I jotted down their responses for everyone to view:

"I think math talk is important because it's better than sitting quietly and figuring out the problem yourself," one student chimed in, as others nodded their heads in agreement.

"You learn different strategies from other people," voiced another student.

And the statement I found the most profound was, "Mathematics discussions help us learn from each other, and we get to help others learn."

My students understood the basis of a math-talk learning community! At this point, I knew they found math talk helpful for understanding mathematics concepts because the students recognized its importance in our daily curriculum. Every couple of weeks, the class revisits these comments for reminders of why math talk is so important to their learning. This initial discussion set the stage to introduce other strategies to continue to improve our math talk community.

How to listen and respond

Explicit instruction on active listening and voicing helps students understand how to engage in meaningful mathematics discussions. Shortly after our discussion about the importance of math talk, my students participated in a minilesson about how to listen and respond to their peers—active listening. Active listening involves listening to the speaker and trying to understand the complete meaning behind what is being said. First, students defined active listening in their own words:

- “It is when you look at the person who is speaking to you.”
- “Active listening means you make eye contact the entire time.”

Although my students had the basis of active listening, they were missing some key points. A PowerPoint® presentation taught students the steps of active listening (see **fig. 1**).

Step 1: Pay attention to the speaker.

Immediately, the class sat up straight and made eye contact with me. After I chuckled, I reminded them this is how they should respond when their peers speak, too.

Step 2: Show you are listening through verbal and nonverbal cues.

Our practice entailed shoulder-partner sets listening to what their partner had for dinner the night before. Listeners had to nod their head every so often and respond with “Uh-huh” or “Yes” to show interest. The verbal cues made them laugh, but I gave the reminder that they say those things while they are engaged in casual conversation with their friends.

FIGURE 1

When the author realized that her students had only the basics of active listening, this PowerPoint presentation taught them some key points.

Steps to active listening

1. Pay attention to the speaker.
2. Show you are listening through verbal and nonverbal cues.
3. Provide feedback by asking questions or summarizing what the speaker is saying.
4. Allow the speaker to finish before asking questions or stating opinions.
5. Respond appropriately by being open, honest, and respectful.

Step 3: Provide feedback by asking questions or summarizing what the speaker is saying.

Once again, shoulder-partner sets practiced by engaging in casual conversation about their weekend plans. Each partner had to ask at least one question, and they were challenged to summarize their partner’s thoughts. During math talk, my students must summarize one another’s thoughts by restating their partner’s strategy or solution, so active listening provided great practice.

Step 4: Allow the speaker to finish before asking questions or stating opinions.

I reminded students of how they have the tendency to interrupt each other when someone makes an error, instead of allowing that student to finish his or her thought. All the students agreed to make a conscious effort not to interrupt each other.

Step 5: Respond appropriately by being open, honest, and respectful.

Because my students had engaged in math talk all school year, they were comfortable being open and honest with one another. No one’s feelings were hurt anymore when their peers corrected their errors.

“When you are respectful, you listen to another person. You can disagree with them, but you need to speak kindly,” a student responded.

During math talk and math lessons, all I have to say is, “Are you actively listening?” The class immediately sits up straight and makes

eye contact, engaging in verbal and nonverbal cues to show engagement. Every so often, as a class, we review the steps to active listening as a reminder. Through discussion, I concluded that my students found that engaging in active listening forced them to comprehend what their shoulder partner was saying, and it made them aware of how important it is to listen carefully to one another.

Revoicing provided students with another means of responding to each other appropriately. If a student did not understand a peer's comment, the most common response was "What?" or "Huh?" most likely voiced in a demeaning tone. I knew this needed to change, especially because my students had pledged to respond to one another respectfully. The revoicing concept was the answer. When revoicing, the listener repeats part or all of the speaker's words and asks the speaker to say whether the repeated words are correct (Chapin, O'Connor, and Anderson 2003). First, I displayed the definition of revoicing for the students, and we broke down the meaning. Then, I challenged them to use revoicing throughout our math talk, whether in a whole group or as shoulder partners. Students became more successful with revoicing each day, as I strived to model revoicing as often as possible. If a student's response was unclear, I would rephrase his or her words and ask if that is what was meant. As students responded to each other during math talk, I explicitly asked them to practice revoicing their shoulder partner's reasoning. When they struggled with mathematics vocabulary, I

would revoice their sentence, adding the correct vocabulary, and ask them to repeat the sentence. The more I revoiced my students' responses, the more comfortable they became with using revoicing. If I overheard a student revoicing someone's comment, I would praise him or her for using revoicing. After practicing, it became much easier for my students to respond to one another appropriately by rephrasing the speaker's words while asking for clarification.

Sentence stems

After reading many articles about fostering math talk in the classroom, I came across an article by Rawding and Wills (2012), who introduced sentence stems as tools that can support students with knowing what to say during mathematics discussions (see **fig. 2**). I introduced sentence stems by asking my students if they had ever felt unsure about how to start or respond during math talk. Many of them nodded their heads in agreement. Then I introduced the sentence stems, and many of my students sighed in relief. Sentence stems gave my students a guide on how to begin math talk with their partner as well as examples on how to disagree with their peers respectfully and appropriately. As a class, we discussed each sentence stem and completed each sentence with an example from our current unit: "I have a different perspective because area is a flat surface, not filling up a space like a box." Finally, a copy of the sentence stems was taped to each desk. During math talk, students referred to the sentence stems often, but mostly when they were constructing a viable argument for a peer's solution.

Explanation versus justification

All during the school year, I prompted my students to justify their reasoning, which they could do. However, if I did not ask them why or how they used the strategy or reached that solution, students would just explain their problem-solving steps. I wanted them to share their reasoning without my prompts, so I taught a minilesson about the difference between explaining and justifying. I prepared a PowerPoint presentation that contained definitions of explaining and justifying with a simple example for each. *Explaining* was defined as "telling the

FIGURE 2

After in-depth reading about how to foster classroom math talk, the author presented sentence stems, a tool introduced by Rawding and Wills (2012).

Sentence stems

I agree with ____ because . . .

This is what I think . . .

I have a different perspective because . . .

I made a connection with what ____ said . . .

When I thought about the question, I remembered . . .

I chose this method because . . .

steps to solving a problem, such as $2 + 2 = 4$.” *Justifying* was “proving how or why the problem was solved a particular way, such as to solve $2 + 2$.” I would draw two counters. Then I would draw two more counters. I would count all the counters to get a sum of four. Many audible exclamations of understanding rang through the classroom after this statement.

To aid in hearing justification during math talk, another teacher and I created a podcast of solving a multidigit multiplication problem. As we solved the problem, we justified our steps by discussing why we placed our zeros in certain spots because of the place value and how we could estimate the multiplication problem to check whether our product was reasonable. The word problem that we modeled was very simple for students to understand and solve, which allowed them to focus on the justification portion rather than on the math. After listening to the audio model, students discussed the difference between explaining and justifying their solutions.

That same day, shoulder partner sets practiced justifying their strategy to solve an word problem about area. To check for understanding of justification, I asked students to share how their shoulder partner justified his or her strategy. This not only made the shoulder partners accountable for practicing active listening but also allowed them to discover whether they were using justification or explanation in relation to their strategy. Each day for the next few weeks, I reminded my students to justify their reasoning, but I found myself reminding them less and less as time went on. Every once in a while, I need to remind students to share why they used a strategy, but for the most part, almost all my students share their reasoning and include the justification naturally during math talk.

What I learned along the way

When being introduced to the steps to a math talk community, students find it much easier to focus on each new step in a small time frame. For example, my students used active listening and revoicing only during our problem of the day, which usually took about ten minutes. Then, I reminded my students more and more often to use active listening and revoicing throughout the math block. Similarly, when I



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introduced sentence stems, I initially reminded students to use them during homework review and slowly infused sentence stems for use throughout math time.

Make sure that modeling happens for each new step. I modeled each new step multiple times a day throughout the math period and explicitly pointed out which step I was modeling: “When I repeated John’s solution in a different way, I was revoicing his solution to make sure I heard it correctly.” The more I explicitly modeled each step, the more often my students used it.

Now we know how!

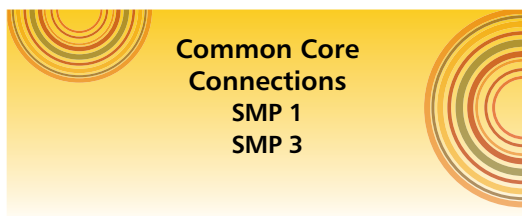
With the switch to Common Core State Standards, teachers are charged to engage our students in meaningful math talk that allows them to construct viable arguments and critique the reasoning of others. Students must also justify their reasoning while communicating to others. When students engage in meaningful math talk, they have the opportunity to increase their conceptual understanding and deepen mathematics content knowledge. Students can become accepting of one another’s ideas and willing to learn from errors. When all students

Targeted instruction to develop math talk strategies results in students who actively listen and constructively critique mathematical statements.

“I think math talk is important because it’s better than sitting quietly and figuring out the problem yourself.”

contribute in the math talk community, everyone feels that his or her ideas are welcome, and learning takes place.

After the introduction of how to engage in mathematics discussions with justification, math talk in my classroom changed dramatically. In the beginning, I often reminded students to actively listen, refer to the sentence stems, and justify their reasoning. Within a few weeks, students were engaging in active listening with few reminders, using sentence stems frequently, and justifying their reasoning with greater regularity. Finally, students became a comfortable part of the math talk community, naturally engaging in mathematics conversation throughout the course of the mathematics period. With the introduction of the strategies explained in this article, you could attain a meaningful math talk community in your own classroom.



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