

Facilitating Meaningful Math Discourse

October 24, 2017



LEARNING TARGETS

- What is mathematical discourse?
- Why should we facilitate math discourse?
- What are the 5 components of effective classroom discourse and how do they each contribute to meaningful math discourse?
- Where are my strengths and opportunities for growth related to facilitating math discourse?

CRITERIA FOR SUCCESS

- I can describe the key characteristics of mathematical discourse and identify the purpose of mathematical discourse.
- I can name the 5 components of effective classroom discourse and describe how at least one of the components contributes to meaningful discourse.
- I can reflect about student discourse in my classroom and am committed to growing my practice in at least one component.

Engage in the Math Task

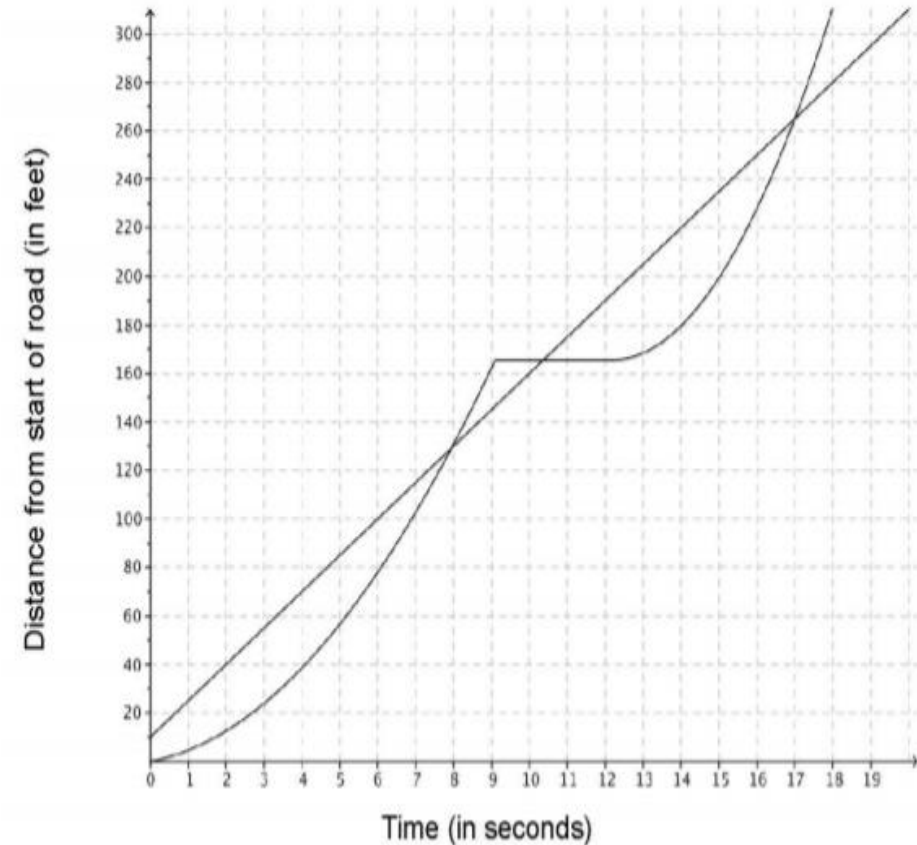
Task: “Bike and Truck”

Spend a few minutes engaging in the mathematics of the task.

As you work, be thinking about how you believe your students would approach & answer this task.

Bike and Truck

A bicycle traveling at a steady rate and a truck are moving along a road in the same direction. The graph below shows their positions as a function of time. Let $B(t)$ represent the bicycle's distance and $K(t)$ represent the truck's distance.



Key Ideas of Mathematical Discourse

“Mathematical discourse includes the purposeful exchange of ideas through classroom discussion, as well as through other forms of verbal, visual, and written communication. The discourse in the mathematics classroom gives students opportunities to share ideas and clarify understandings, construct convincing arguments regarding why and how things work, develop a language for expressing mathematical ideas, and learn to see things from other perspectives (NCTM 1991, 2000).”

Source: *Principles to Action*, NCTM, 2014.

Key Ideas of Mathematical Discourse

- Focuses on tasks that promote reasoning and problem solving
- Develops conceptual understanding meaningful learning
- Builds on and honor student thinking
- Keeps mathematical ideas at the heart of the lesson prominent in class discussions
- Provides students with opportunities to talk with, respond to, and question one another in ways that support the mathematics learning of all students in the class.

Source: *Principles to Action*, NCTM, 2014.

Sentence Frame

Mathematical discourse includes _____,
_____ , _____ and is important because
_____ and _____.

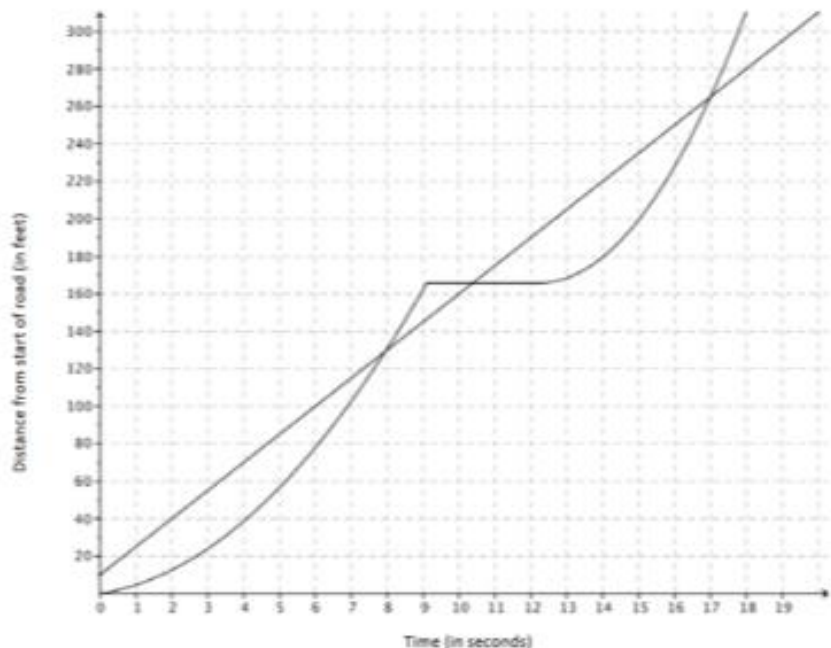
Bike and Truck Task in Action - Evaluating Discourse

As you watch the video, think about your sentence frame for mathematical discourse. What do you notice? What do you wonder?

Bike and Truck Task



A bicycle traveling at a steady rate and a truck are moving along a road in the same direction. The graph below shows their positions as a function of time. Let $B(t)$ represent the bicycle's distance and $K(t)$ represent the truck's distance.



What observations can you make about the Bike and Truck based on the graph?

NCTM members can access the video for this lesson at:

http://www.nctm.org/Publications/More4U/Taking-Action-in-Grades-9-12/ATL-2_2-Bike-and-Truck-Task-Video-Clip-1/

Bike and Truck Task in Action - Evaluating Discourse

Choose one of the 5 categories to focus on and watch the video through that specific lens.

Collect evidence to support this teacher's practice related to the particular discourse component lens you are focusing on.

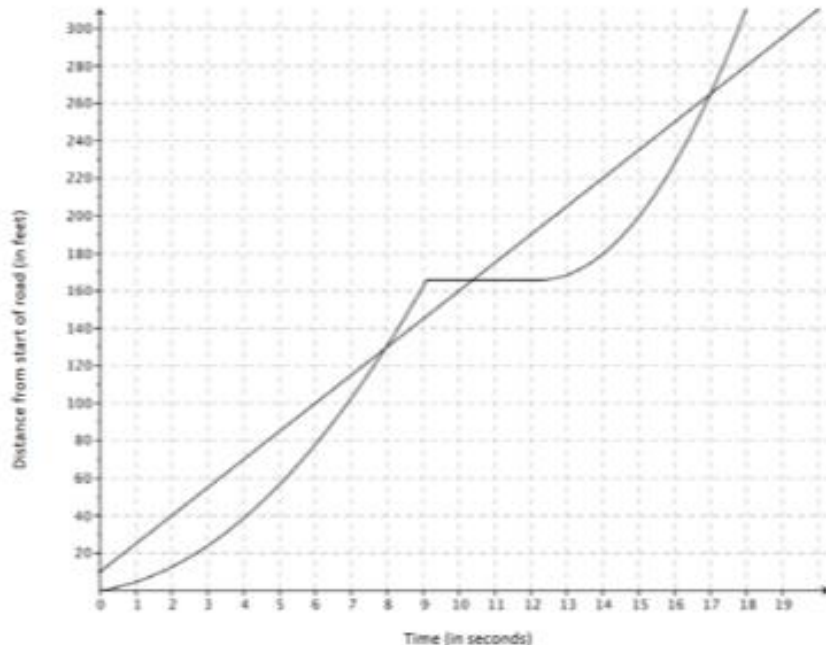
	Teacher role	Questioning	Explaining mathematical thinking	Mathematical representations	Building student responsibility within the community
Level 0	Teacher is at the front of the room and dominates conversation.	Teacher is only questioner. Questions serve to keep students listening to teacher. Students give short answers and respond to teacher only.	Teacher questions focus on correctness. Students provide short answer-focused responses. Teacher may give answers.	Representations are missing, or teacher shows them to students.	Culture supports students keeping ideas to themselves or just providing answers when asked.
Level 1	Teacher encourages the sharing of math ideas and directs speaker to talk to the class, not to the teacher only.	Teacher questions begin to focus on student thinking and less on answers. Only teacher asks questions.	Teacher probes student thinking somewhat. One or two strategies may be elicited. Teacher may fill in an explanation. Students provide brief descriptions of their thinking in response to teacher probing.	Students learn to create math drawings to depict their mathematical thinking.	Students believe that their ideas are accepted by the classroom community. They begin to listen to one another supportively and to restate in their own words what another student has said.
Level 2	Teacher facilitates conversation between students, and encourages students to ask questions of one another.	Teacher asks probing questions and facilitates some student-to-student talk. Students ask questions of one another with prompting from teacher.	Teacher probes more deeply to learn about student thinking. Teacher elicits multiple strategies. Students respond to teacher probing and volunteer their thinking. Students begin to defend their answers.	Students label their math drawings so that others are able to follow their mathematical thinking.	Students believe that they are math learners and that their ideas and the ideas of their classmates are important. They listen actively so that they can contribute significantly.
Level 3	Students carry the conversation themselves. Teacher only guides from the periphery of the conversation. Teacher waits for students to clarify thinking of others.	Student-to-student talk is student initiated. Students ask questions and listen to responses. Many questions ask "why" and call for justification. Teacher questions may still guide discourse.	Teacher follows student explanations closely. Teacher asks students to contrast strategies. Students defend and justify their answers with little prompting from the teacher.	Students follow and help shape the descriptions of others' math thinking through math drawings and may suggest edits in others' math drawings.	Students believe that they are math leaders and can help shape the thinking of others. They help shape others' math thinking in supportive, collegial ways and accept the same support from others.

Fig. 11. Levels of classroom discourse. From Hufford-Ackles, Fuson, and Sherin (2014), table 1.

Bike and Truck Task



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Bike and Truck Task in Action - Evaluating Discourse

***What can this teacher do
to move up to the next
level for that category?***

	Teacher role	Questioning	Explaining mathematical thinking	Mathematical representations	Building student responsibility within the community
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Self-Reflection

Think about a lesson you taught in the last week. Consider your practice with respect to each of the 5 components of classroom discourse. Where is your greatest strength? How can you build on that strength? Where is your greatest opportunity for growth?

Plan of Action

Choose one component to focus on. What is your commitment to action to strengthen that component in your classroom? What steps will you take between now and next Tuesday to start this process?

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What matters is not what we teach; it's what they learn, and the probability of real learning is far higher when the students have a lot to say about both the content and the process.

Alfie Kohn
(Feel-Bad Education)