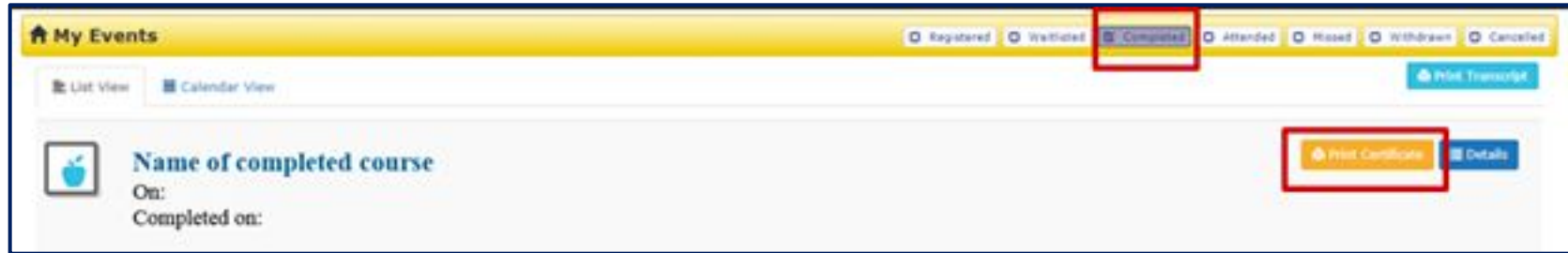


WELCOME!

Please review this information while we wait for all to join!

Attendance, Resources & PD Clock Hours

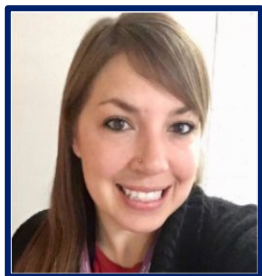
- You must stay on the whole time- 1.25 hours- to receive credit
- YOU print your certificate through ADE Connect (see image)- **please wait 24-48 hours of webinar before printing certificates**



- **AFTER WEBINAR-** Survey & follow-up email from ADE



ADE Webinar: Effective Discourse Strategies for Inclusive STEM Classrooms

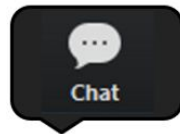


Rebecca Garelli
Science & STEM Specialist
Rebecca.Garelli@azed.gov

Sarah Sleasman
Science & STEM Director
Sarah.Sleasman@azed.gov



Welcome!



- Name
- Current Position
- How did you hear about this opportunity?

Goals for This Session



Understand how academic discourse provides access to scientific knowledge.



Learn practical and effective strategies to facilitate academic discourse.

Resource Dashboard

ADE Webinar: Effective Discourse Strategies for Creating Inclusive STEM Classrooms Resource Dashboard

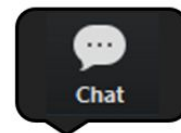
Facilitators: Rebecca Garelli: Rebecca.Garelli@azed.gov | Sarah Sleasman: Sarah.Sleasman@azed.gov

[ADE Science Standards Page](#) | [ADE Science Resource Page](#) | [ADE Science & STEM Professional Learning](#)

1	General Resource	⊕ PDF of Slides/Presentation
2	STEM Teaching Tool #6- How Can I Get My Students to Learn Science by Productively Talking with Each Other?	⊕ STEM Teaching Tool #6
3	RESEARCH: Inquiry Project/TERC- Productive Talk Resources	⊕ Talk Science Primer
4	Productive Talk Videos	⊕ NSTA: Supporting Talk ⊕ Argumentation Toolkit videos ⊕ BSCS videoverse
5	OpenSciEd Classroom Norms from the OpenSciEd Teacher's Handbook	⊕ OpenSciEd Classroom Norms
6	Instructions for Discourse Strategies	⊕ Discourse Strategies Doc (instructions for each strategy included) ⊕ Commit & Toss Classroom Video ⊕ Sticky Bars Strategy



bit.ly/ADE-Webinar-Discourse





Information and knowledge are
totally different...



Information is raw building
materials.



Knowledge is what people
make out of those
materials and build within
themselves.

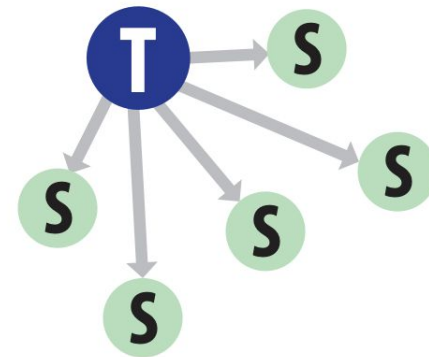
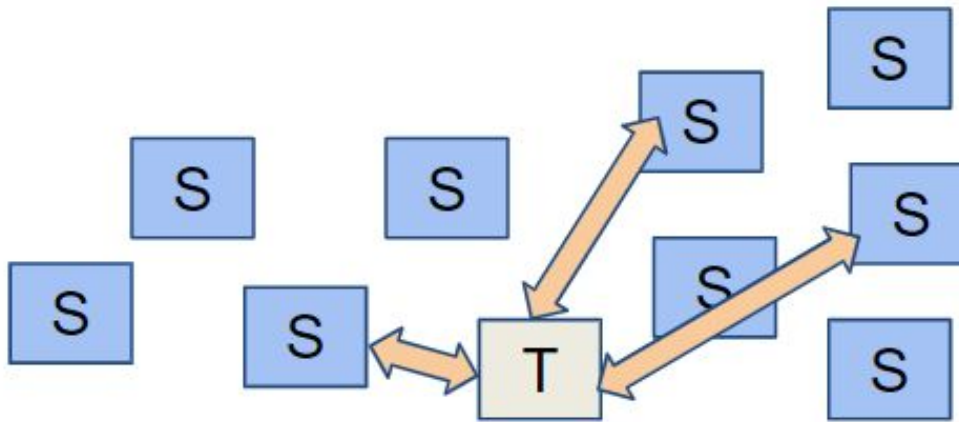


Just because you taught it
doesn't mean they learned it!



Common Patterns of Classroom Talk

- Cycles of **Initiate, Response, Evaluate (IRE)**
- Limited wait time
 - Average: *one second*



Traditional Classroom Talk: I-R-E

I-R-E

Initiation

Response

Evaluation

- Answers are valued over thinking.
- Few students have a chance to participate.
- Only certain types of students participate.
- Encourages the lowest levels of thinking.



2



STEM #6

How can I get my students to learn science by productively talking with each other?

What Is The Issue?

Talking is integral to human learning. The science and engineering practices described in the NRC Framework for K-12 Science Education highlight that scientists and engineers routinely communicate through talk—not merely to share their final form products—but to make sense of their work and to gather feedback and refine their ideas as the work unfolds. Learners benefit from such accountable talk as well, but it can be tricky to scaffold and manage productive discourse in the classroom.

WHY IT MATTERS TO YOU

- Teachers should routinely support students in “sense-making” talk to help them work through their understanding while engaging in the science and engineering practices.
- District staff and PE providers should provide models of productive talk in PE and as an integral part of moving curriculum materials.
- Student teachers should observe productive science talk in classrooms and provide support to teachers as they develop talk facilitation skills.

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11/2012 [nap.edu](http://www.nap.edu)

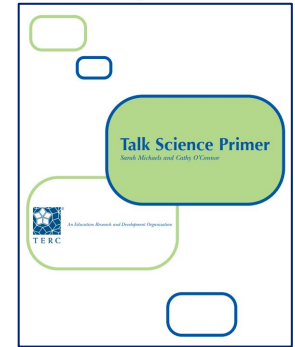
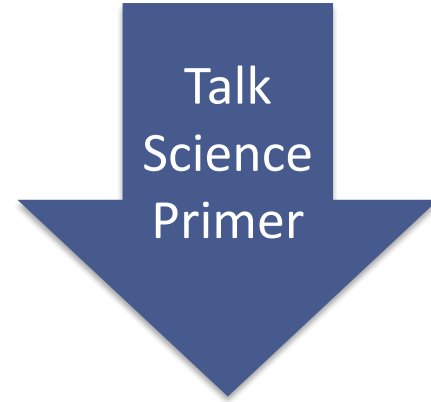
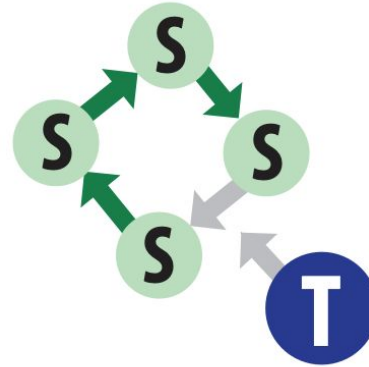
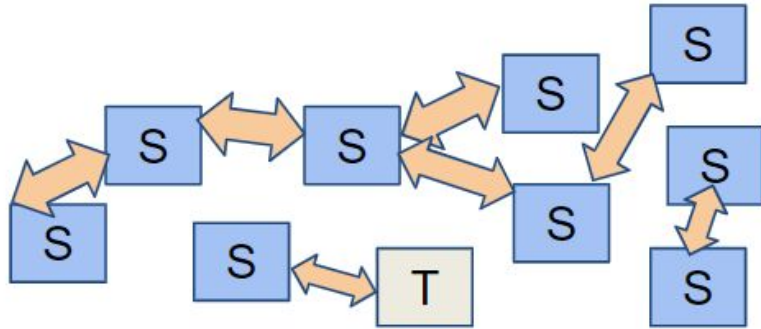
Moving Away from I-R-E



Unintended consequences of
evaluating student ideas ...

More Supportive Classroom Talk

- Students must listen to each other
- Often 20% or more of class time
- Clear goals and format



Students Need to do the “Heavy Lifting”

It is the students’ job to:

- think critically
- muster evidence
- challenge their peers’ evidence or reasoning
- ask questions of each other
- integrate their thinking with others
- judge the value of an idea (not the person putting it forward)



“Shhhh... quiet please.”



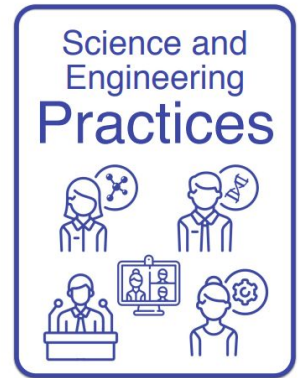
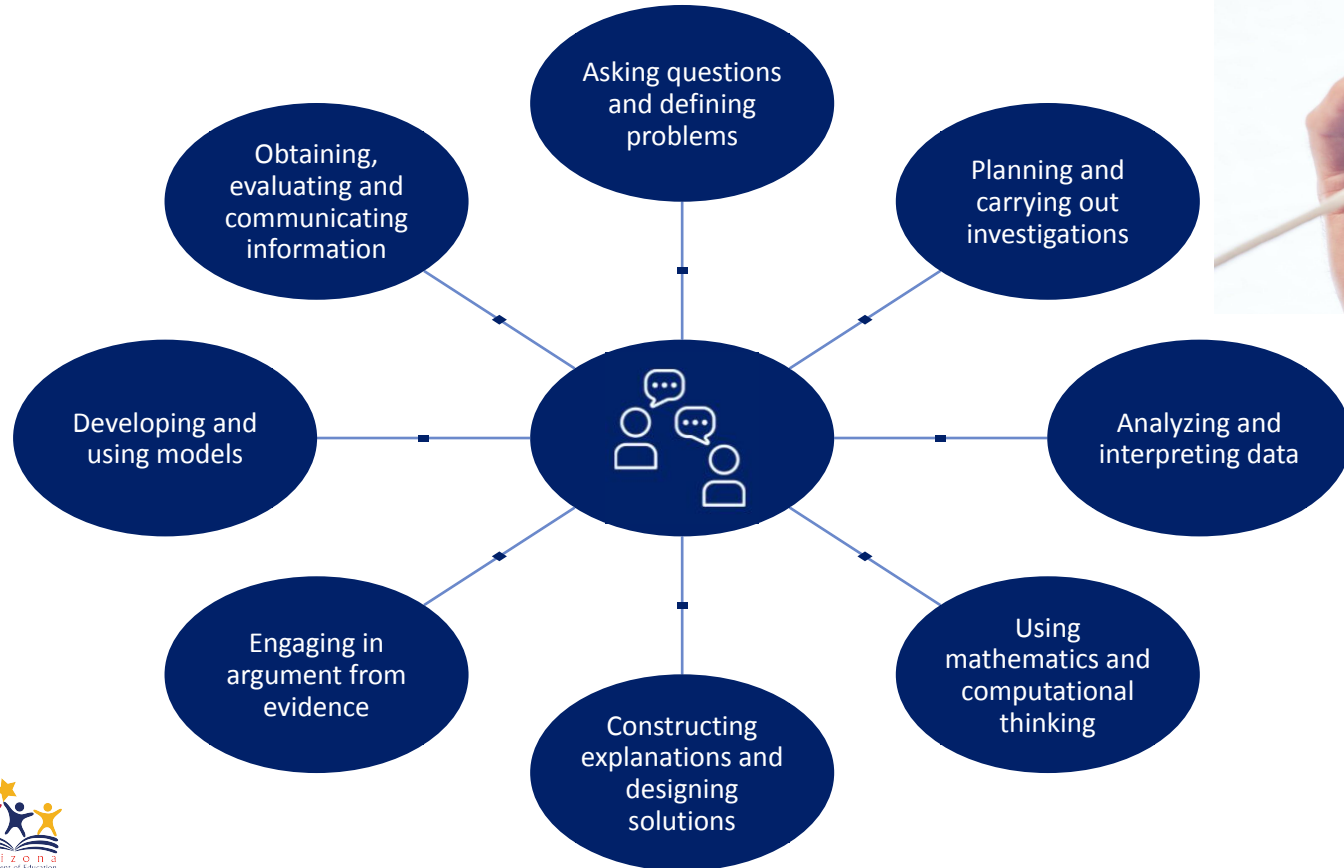
“Shhhh... quiet please.”

Or maybe not...

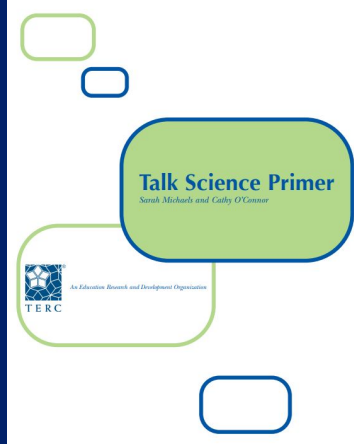
- Thinking and talking are often done simultaneously.
- Students need opportunities to think out loud.
- Conversations can reveal key information about students' initial understanding.



More than “just talking”



Productive Discourse Outcomes:



students' ideas become "visible"



students compare their thinking to others'



peer to peer interaction increases



academic language and English Language fluency increases



students learn to negotiate and refine ideas



evidence used to build and critique academic arguments

How do you support student talk in the classroom?

When student talk is promoting learning,
What do you see? What do you hear?

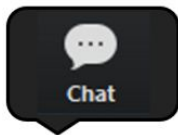
Are students:

- listening?
- explaining ideas with evidence?
- revising their thinking?
- participating?
- connecting their ideas to experience?



Managing Productive Talk in the Classroom

What **routines or structures** do you think a teacher would need to have in place for productive talk in the classroom?



Teacher Tools for Managing Student Talk



Norms/Shared Agreements

Dialogue protocols

Carefully structured groups

Accountability (a product)

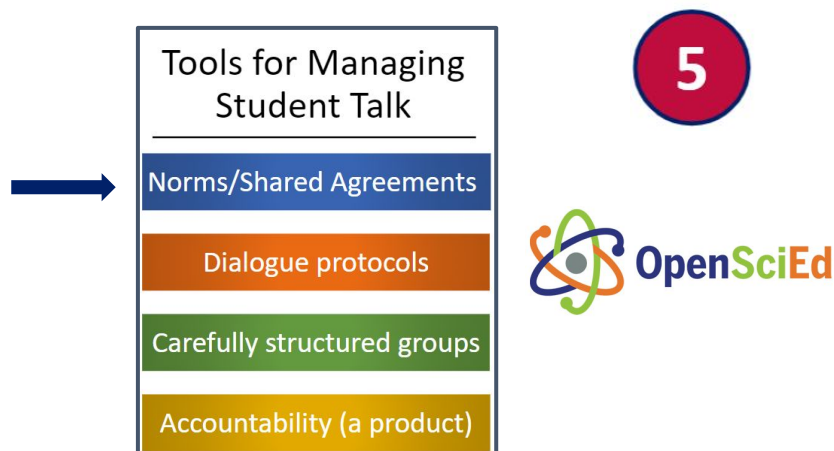


Talk Science Primer
Sarah Minkoff and Cathy O'Connor



Texas Education Research and Development Organization

Setting Classroom Norms- OpenSciEd



Consider: How do these norms differ from traditional style “expectations” or “rules” we often see in classrooms?

Classroom Norms	
Respectful Our classroom is a safe space to share	<ul style="list-style-type: none">• We provide each other with support and encouragement.• We share our time to talk. We do this by giving others time to think and share.• We critique the <i>ideas</i> we are working with, but not the <i>people</i> we are working with.
Equitable Everyone's participation and ideas are valuable	<ul style="list-style-type: none">• We monitor our own time spent talking.• We encourage others' voices who we have not heard from yet.• We recognize and value that people think, share, and represent their ideas in different ways.
Committed to our community We learn together	<ul style="list-style-type: none">• We come prepared to work toward a common goal.• We share our own thinking to help us all learn.• We listen carefully and ask questions to help us understand everyone's ideas.• We speak clearly and loud enough so everyone can hear.
Moving our science thinking forward We work to figure things out	<ul style="list-style-type: none">• We use and build on other's ideas.• We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.• We are open to changing our minds.• We challenge ourselves to think in new ways.

Strategy: Commit and Toss (low risk)

Anna stood on her bathroom scale with 2 feet. She read her weight on the scale. She then lifted one foot. What do you think happened to the reading on the scale?



Increased



Decreased



Stayed the same



Explain your thinking.
What “rule” or reasoning did you use to select your choice?

Strategy: Commit and Toss

Instructions:

1. Teacher provides a forced choice question (at any point in instruction), which may also include an explanation of their thinking.
2. Students are provided time to think about their answer and write down their answer.
3. Students **do not** put their name on the paper.
4. Students crumple their paper into a ball.
5. Teacher instructs students to toss papers back and forth with all other students, so their answer becomes anonymous.
6. Teacher indicates when to stop tossing.
7. Each student has a paper. They divide into groups based on the answer on the paper they have.
8. Students discuss the answers and as a group determine whether their answer (and thinking, if included) is correct. [Video Example.](#)



increased

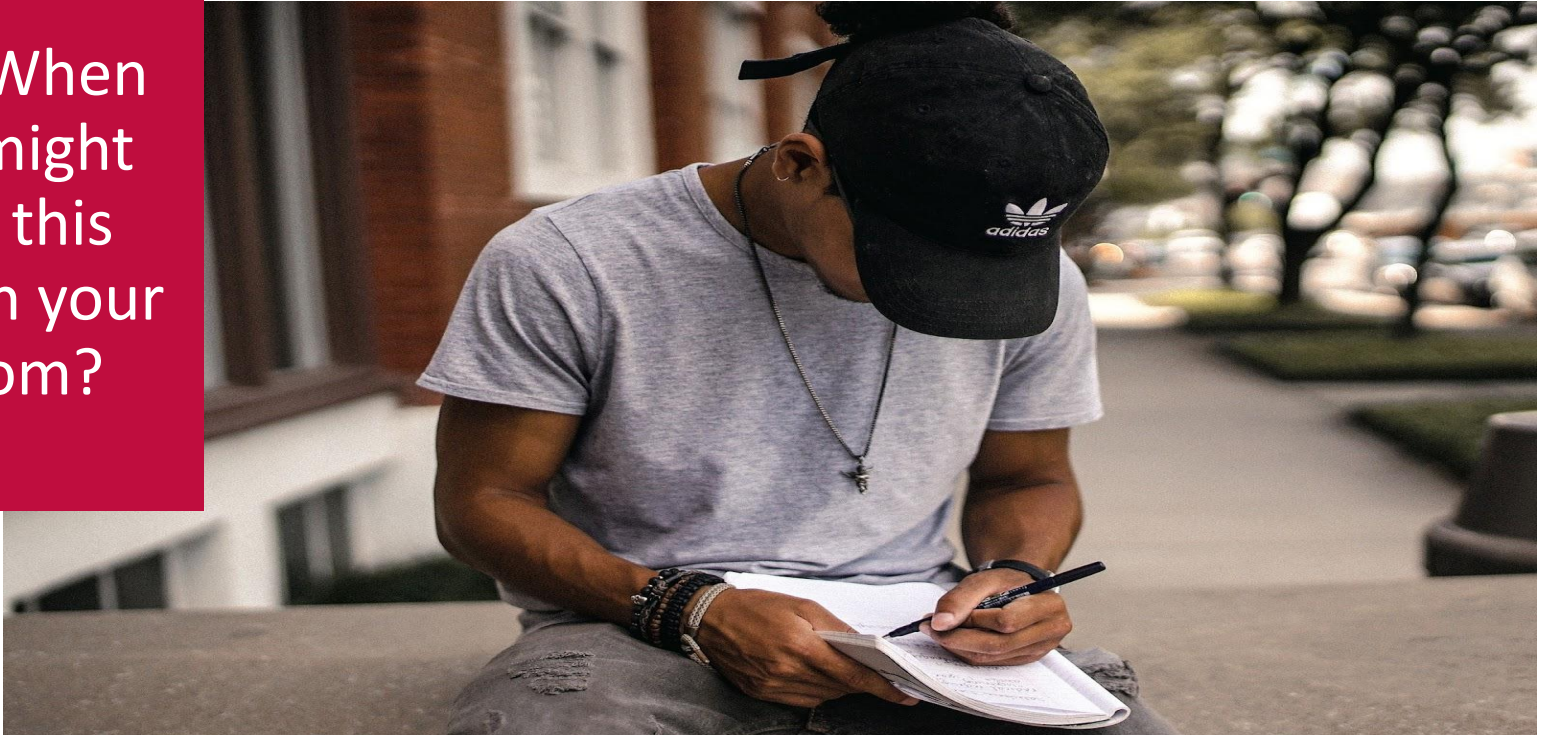
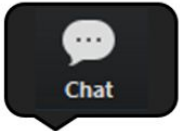
stayed the
same

Corners

decreased

Commit and Toss

Chat in: When or how might you use this strategy in your classroom?



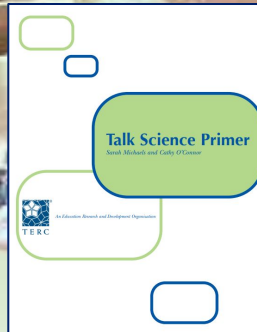
Teacher Tools for Managing Student Talk

Norms/Shared Agreements

➔ Dialogue protocols

Carefully structured groups

Accountability (a product)



How do teachers create a classroom culture that supports productive talk and reasoning?

Checklist: Goals for Productive Discussions and Nine Talk Moves

- Help Students Share, Expand, and Clarify Their Own Thinking
- Help Students Listen Carefully to Each Other
- Help Students Deepen Their Reasoning
- Help Students Think With Others

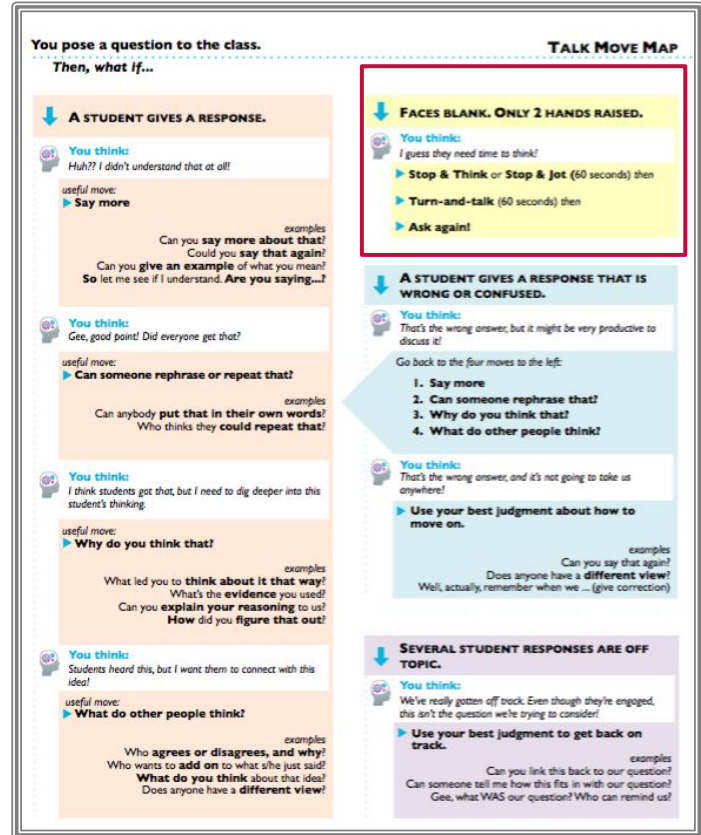
6

Checklist		Talk Science
Goals for Productive Discussions and Nine Talk Moves		www.illustrative-mathematics.org
Goal One Help Individual Students Share, Expand and Clarify Their Own Thinking	Notes/Frequency of Use	
<input type="checkbox"/> 1. Time to Think - Partner Talk - Writing as Think Time - Wait Time		
<input type="checkbox"/> 2. Say More: "Can you say more about that?" "What do you mean by that?" "Can you give an example?"		
<input type="checkbox"/> 3. So, Are You Saying...?: "So, let me see if I've got what you're saying. Are you saying...?" (always leaving space for the original student to agree or disagree and say more)		
Goal Two Help Students Listen Carefully to One Another		
<input type="checkbox"/> 4. Who Can Rephrase or Repeat? "Who can repeat what Javon just said or put it into their own words?" (After a partner talk) "What did your partner say?"		
Goal Three Help Students Deepen Their Reasoning		
<input type="checkbox"/> 5. Asking for Evidence or Reasoning "Why do you think that?" "What's your evidence?" "How did you arrive at that conclusion?"		
<input type="checkbox"/> 6. Challenge or Counterexample "Does it always work that way?" "How does that idea square with Sonia's example?" "What if it had been a copper cube instead?"		
Goal Four Help Students Think With Others		
<input type="checkbox"/> 7. Agree/Disagree and Why? "Do you agree/disagree? (And why?)" "What do people think about what Ian said?" "Does anyone want to respond to that idea?"		
<input type="checkbox"/> 8. Add On: "Who can add onto the idea that Jamal is building?" "Can anyone take that suggestion and push it a little further?"		
<input type="checkbox"/> 9. Explaining What Someone Else Means "Who can explain what Asha means when she says that?" "Who thinks they could explain why Simon came up with that answer?" "Why do you think he said that?"		

The Illustrative Mathematics Project is a not-for-profit organization supported by the National Science Foundation. Copyright 2012, IMC. All Rights Reserved. Adapted from: Chapter 3, 2012, C. A. Anderson, N. A. 2010. Classroom Discourse: Using Math Talk to Help Students Learn. Grades 1-4. Cambridge, MA: Brookline Publishing.

How to use talk moves and norms...

- Give students something to talk about.
- Be prepared to consistently use talk moves for teachers to ensure that talk is productive.
- Be prepared to consistently support students' use of talk moves.



Strategy: See-Think-Wonder

8



SEE

What do you see?



THINK

What do you think is going on?






WONDER

What does it make you wonder?

See - Think - Wonder

1. Engage students with a phenomena (observable event).
2. **See:** Provide students think time in the **Alone Zone (about 2 minutes)** to make observations. Important for kids to commit to their own thinking before sharing with a partner or small group.
3. Ask students to share observations with a small group- take turns to read their list. **Accountability-** as students listed to their group members' ideas, they place a **checkmark** next to ideas they also had (in common) and add new ideas to their list.
4. **Think:** Provide alone zone time for students to think about what is causing the phenomena to occur. Students should/can draw upon their prior knowledge/prior experiences with the phenomena to help them think about what is causing the phenomena to happen.
5. **Wonder:** Provide alone zone time for students to develop questions about how or why the phenomena occurred.

 SEE What do you see?	 THINK What do you think is going on?	 WONDER What does it make you wonder?

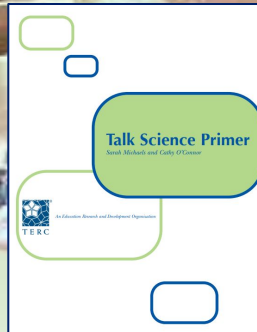
Teacher Tools for Managing Student Talk

Norms/Shared Agreements

Dialogue protocols

➡ Carefully structured groups

Accountability (a product)



What Should Classroom Talk Look Like?

Provide a variety of grouping formats:

- Partner **TALK**
- Small group **WORK**
- Whole Class **DISCUSSION**

Provide students class time to:

- ask questions about science phenomena/problems
- reason together about ideas, data and concepts
- co-construct meaning, explanations, solutions



Talk Format: Partner TALK

STRUCTURE and PURPOSE

Two students engage in focused, exploratory talk **for a few minutes**.



TEACHERS

- Plan partner talk in advance or launch in the moment to support a class discussion.
- Listen in on partner talk.
- Ask students to bring their idea forward to the class.

pp. 8-9



Talk Format: Small Group WORK

STRUCTURE and PURPOSE

2-4 students work in small groups to share materials and ideas and co-create solutions/explanations. Is often followed by whole class discussion to debrief group work.



TEACHERS

- Carefully design the task for group engagement focused on sensemaking.
- Establish norms, expectations, time limit, accountability.
- Listen in and interacts if any support is needed.

Talk Format: Teacher-Guided Whole Group DISCUSSION

STRUCTURE and PURPOSE

Students gather in a circle (ideally) for **whole class** sensemaking around a common question/problem/task.



TEACHERS

- Support and guide
- Bring out student ideas and reasoning
- Facilitate student sensemaking- avoid “telling”

pp. 7-8



Teacher Tools for Managing Student Talk

Norms/Shared Agreements

Dialogue protocols

Carefully structured groups

➔ Accountability (a product)



Strategy: Structured Think-Pair-Share

Why Is the Water in the Glass?

[Share](#) [Add to library](#) [Download PDF](#) [Start a Discussion](#)

Daily Do 



Why is the Water Still in the Glass?

THINK
(Alone Zone)

Your ideas
go here.

PAIR

Listen to your
partner and record
their ideas here.




SHARE

Talk with your partner to come to
some common understanding and
write your joint ideas here.

Strategy: Structured Think-Pair-Share

Instructions

1. Teacher poses a question to students (at any point in instruction).
2. Students are provided time to think about their answer and write down their answer. **(alone zone)**
3. Students talk to a partner and each student records a summary of their partner's answer.
4. Students then discuss any differences in their ideas and reach a shared understanding; they record their common thinking/understanding.

Structured Think-Pair-Share	
<p>Think (record your ideas)</p> 	<p>Pair (record your partner's ideas)</p> 
<p>Share (record your common understandings/ideas)</p> 	

Strategy: Structured Think-Pair-Share

Tools for Managing Student Talk

Norms/Shared Agreements

Dialogue protocols

Carefully structured groups

Accountability (a product)

9

Structured Think-Pair-Share

Think (record your ideas)



Pair (record your partner's ideas)



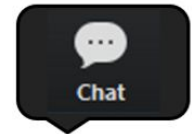
Share (record your common understandings/ideas)



Structured Think-Pair-Share



Chat in: When or how might you use this strategy in your classroom?



Strategy: Think It, Ink It, Speak It

5 friends were talking about forces. This is what they said.

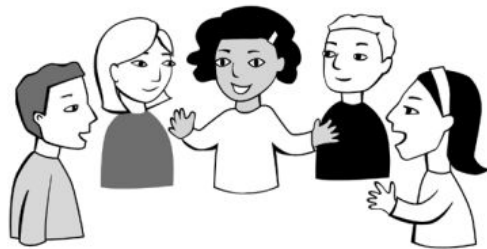
- **Rae:** I think a push is a force and a pull is something else.
- **Scott:** I think a pull is a force and a push is something else.
- **Yolanda:** I think a force is either a push or a pull.
- **Miles:** I think forces are neither pushes nor pulls. I think they are something else.
- **Violet:** I think pushes and pulls are forces, but there is another type of force that just holds things in place.

10

Figure 1.

Talking About Forces.

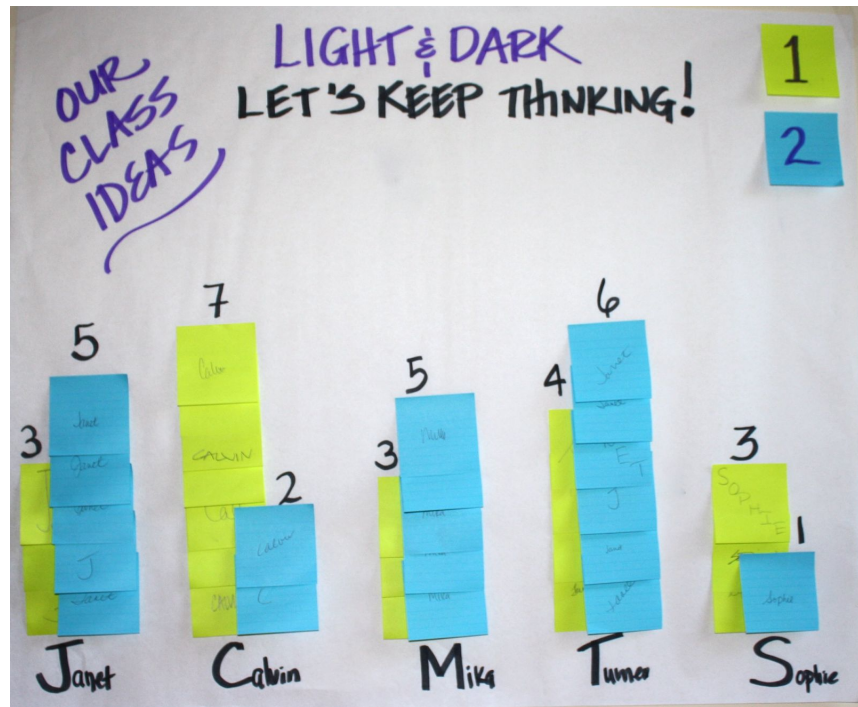
Talking About Forces



Which student do you most agree with?
Explain your thinking.

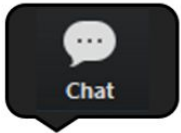
[Talking About Forces Probe](#)

Think It, Ink It, Speak It + Sticky Bars



Think It, Ink It, Speak It + Sticky Bars

Chat in: When or how might you use this strategy in your classroom?



Pro-Con Pairs

TOPIC: A lot of rain is good for people
living in a desert

Find a partner

Decide who will be A and who will be B

Pro-Con Pairs Instructions

Partner A- 30 seconds +
Partner A- 30 seconds -
Partner A- 30 seconds +
Partner A- 30 seconds -



(speaker)



(listener)



Partner B- Tell partner A what side of the argument they **favor**, based on + vs -

Pro-Con Pairs

Chat in: When or how might you use this strategy in your classroom?



Highlighting Some Additional Talk Resources

11

lead4ward Instructional Strategies Playlist

12

Stem Teaching Tools Talk Cards

13

Teacher Discourse Move Cards

Instructional Strategies Playlists for Teachers				
NEW All new instructional strategies are color-coded with orange.				
movement and discourse playlist	rehearsal and practice playlist	extending thinking playlist	learning from mistakes playlist	evidence of learning playlist
Ball Toss Boogie	Each One Teach One	Card Sort	3-2-1 Test Review	3-2-1 Summary
Call Conversations	Fact or Fib Showdown	Compare/Contrast Model	Balloon Bop	Connect 4 Tic
Choose and Chat	Jig Saw "Sell"	Connect the Dots	Brain in the Game	Exit Ticket
Dance It – Chant It	Just the Facts	Crash Card Connections	Catch and Release	Graphic Orga
Four Corners	Mystery Bag	Idea Shuffle	Chatterbox	High-Five Sum
Learning Loops	Mystery Sequence/ Re-sequence	Justified List	Fewer Upper	Independen
Musical Mix-Freeze-Group	Play It – Say It	Link It Up	Focused Listing	Mind Ben
Notable Quotables	Sticker Stickers	Matching Double Trouble	Go with the Flow	One Minute
Pair-SQUARE-Share	Stop, Plop, and Roll	Nine Squares	IQ Slap Down	Show and Tell
Positive Pings	Summary Salad			
Rise and Shine	Tour of Knowledge			
Stand, Stick, or Stay	Triple Play			
Texas Two-Step	Undercover Agent			
Think and Throw	Vocabulary Pyramid Game			
Thinking Partners	Who Am I?			
Vote with Your Feet	Word Whack			
Add YOUR ideas below:	Add YOUR ideas below:			

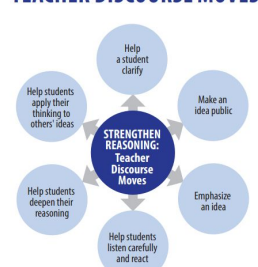
STEM Teaching Tools Talk Science Resource Card Sharing, Expanding and Clarifying Ideas

- Why is this Practice Important?**
- Students learning English are able to have more time to think through their ideas and express them more completely.
 - The teacher's understanding of what students know is more complete and less is assumed, allowing for more accurate assessment of student learning.
 - Students gain confidence that it is important for their ideas to be heard in the classroom and fully understood.
- Other Notes**
- Students can also be encouraged to use the talk options on the other side of this card among one another in group talk.

STEM Teaching Tools Talk Science Resource Card Sharing, Expanding and Clarifying Ideas

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TEACHER DISCOURSE MOVES



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DOING AND TALKING MATH AND SCIENCE
Strengthening Reasoning, Strengthening Language

<p>Help a student clarify his/her thinking</p> <p>Wait time: 20-30 seconds after questions and after responses.</p> <p>"Can you say some more about that?"</p> <p>"Can you show us what you mean?"</p> <p>"Can you show that?"</p>	<p>Make ideas and thinking public and available for discussion</p> <p>"Let us move about what you're thinking." Clarify again how ideas are expressed, without oversteering student's ownership.</p> <p>"Did I say your idea correctly?"</p> <p>Be sure to connect everyday expression to more precise academic language: "So, you're saying..."</p>
<p>Mark/emphasize a particular idea</p> <p>"Reinforce" an idea by modeling, or ask a student to re-voice or paraphrase to give an idea more exposure so everyone can hear it and think about it again.</p> <p>"That's something. Can you say that again for us?"</p> <p>"Will someone re-tell that idea for us?"</p>	<p>Help students listen carefully to and think about others' ideas</p> <p>"Who can rephrase or repeat that idea for us?"</p> <p>Have a list of ideas different from what we had and earlier?</p> <p>"Who wants to explain the evidence that Group A used?"</p> <p>"Do you agree or disagree with that?"</p> <p>"Whose idea/thinking is most different from your own?"</p>
<p>Help students deepen their reasoning</p> <p>"Help you tell us more about your thinking on that? Why do you think that works?"</p> <p>"What's that always be true?" Is there a condition that would make that false?"</p> <p>"How could you show that that is true?"</p> <p>"How could we revise our model to account for this?"</p> <p>"What new questions do you have now? What do we need to know more about now?"</p>	<p>Help students apply their thinking to others' ideas; prompt peer-to-peer talk</p> <p>"Who will re-tell that idea for us? Please check back with it to see if you told it correctly."</p> <p>"Who is ready to tell us the connection between those two ideas?"</p> <p>"You look uncertain. What can you ask X to find out more?"</p> <p>"How does that idea build on the last one? What's the connection?"</p>

Self-Evaluation for Students Engaging in Discourse



14

Appendix

Self-evaluation: Engaging In Classroom Discourse

Setting	Criteria	Absent I do not do this	Developing I occasionally do this (sometimes)	Proficient I often do this	Mastery I consistently do this
In large/whole group settings (Scientist Circle discussions, gallery walks, etc...)	Shares one's own thinking by contributing new ideas, questions, and additional clarification.				
	Listens actively to others , rephrasing, repeating and/or reusing the ideas others have shared and asking others to repeat their statements or to clarify ideas when they are difficult to hear or understand.				
	Respectfully provides and receives critiques about explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions.				
	Invites others to share their thinking and contribute their ideas.				

Final Thought...

Opportunities to effectively engage in scientific discourse shifts the cognitive tasks to students, who in turn develop deeper understanding and greater academic success.



Thank you for sharing this space!

What questions do you have?

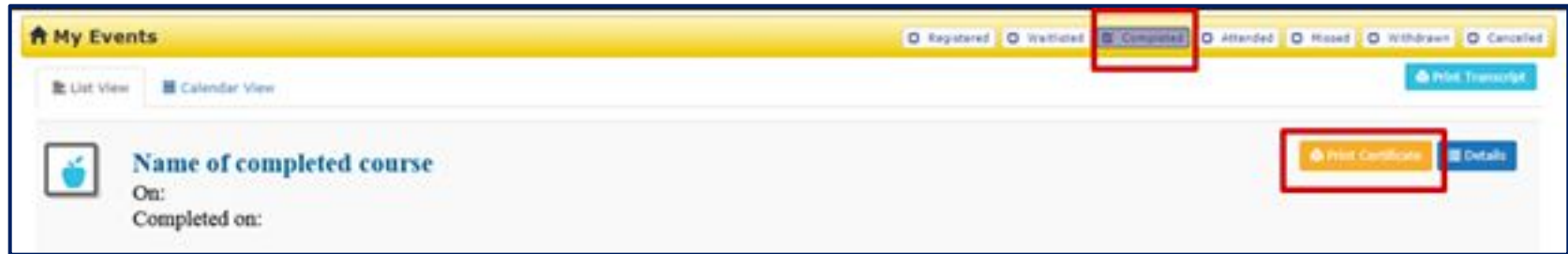


Thank you!

Please keep an eye out for the survey!

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