

# Talk Science Primer

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*An Education Research and Development Organization*

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## Part 1: What is Academically Productive Talk?

### *The Vision*

Imagine a classroom where students have just completed a science investigation and a whole class discussion is underway. Students put forth competing ideas in their clearest and strongest form, even though some ideas may turn out to be more correct than others. Students explain their ideas in detail with evidence. They listen carefully to each other with respect. Students take seriously and evaluate their own and others' competing ideas. In other words, they are intellectually engaged.

What are the hallmarks of a productive discussion such as this one?

- Everyone can hear and understand what is being said, so that every single student is part of the conversation.
- The conversation is focused, coherent, rigorous, and leads to deep conceptual understanding.
- Students are motivated to participate and want to go public with their thinking, feeling like they have a stake in the conversation.
- Conversation is not just for good talkers; everyone has a right and responsibility to contribute.
- The teacher guides students in practicing new ways of talking, reasoning, and collaborating with one another.

In the context of the classroom, talk is not an add-on. It addresses important academic content and is a critical component of the lesson, including whole class, small group, or pair or partner discussions. Through talk, teachers and students explore ideas and use evidence to build and critique academic arguments.

There is solid research evidence and widespread agreement that academically productive talk is critical for learning in science (NRC Consensus Report Taking Science to School (2007)).

### **Isn't all classroom talk productive?**

This is the vision, and yet we know that much of the talk typically occurring in classrooms is not academically productive. Teachers at all grade levels often fall back on the kinds of discussions we experienced in our own learning. These discussions were something more like recitation, where the teacher asks a question with a single right answer, calls on a student to respond, indicates whether the answer is correct, and moves on to another question. While this is often helpful for review or for checking what students remember, it fails to create a culture where students take each other seriously, take risks, and build complex arguments together.

How do we break away from this conventional pattern and facilitate discussions that support reasoning and deepen student understanding of complex material? Making the break may require a shift in classroom culture, new norms and practices, as well as a belief that students learn more when they do the "heavy lifting."

Orchestrating talk that is focused on key content, where every student is motivated and willing to participate, can indeed be challenging. However, there is a set of key elements of academically productive talk that makes this doable.

### ***What are the elements of academically productive talk?***

1. A belief that students can do it
2. Well-established ground rules

3. Clear academic purposes
4. Deep understanding of the academic content
5. A framing question and follow-up questions
6. An appropriate talk format
7. A set of strategic “talk moves”

**1) A belief in the possibility and efficacy of this kind of talk.**

The first key element is a belief from the outset that all students can learn from participating in well-structured discussions, and that all students are smart and capable of doing this.

*“Students have to feel a sense of trust that their ideas will be taken seriously and that disagreements will be handled respectfully, so that ideas—not individuals—are challenged.”*

In addition, a teacher must be committed to two major learning objectives: deep understanding of concepts (as contrasted to familiarity with concepts), and students’ ability to learn with increasing independence. Teachers who orchestrate productive talk believe that even very young children can tackle challenging, rich, and ambiguous problems, and reason about them with evidence. They believe that if their students work hard at explaining their own ideas and think through the ideas of their classmates, they will become strong reasoners. They believe that all their students—even struggling ones—are smart and have something to contribute to discussions.

**2) Well-established ground rules for talk.**

Before you can use talk reliably to promote learning, you must lay the foundations for it by establishing a set of clear norms or ground rules for class discussions. Most important are the norms that students will listen to one another attentively and respond respectfully. Students have to feel a sense of trust that their ideas will be taken seriously and that disagreements will be handled respectfully, so that ideas—not individuals—are challenged. Students have to speak loudly enough so that everyone can hear (which is not easy for many students to do at first), and all students have to be on notice that if they cannot hear or understand what someone has said, they have to speak up and ask for clarification. Students need to understand that this kind of talk is expected of everyone, and everyone will have a chance to participate and express their ideas, perhaps not in every discussion, but certainly over the course of several days. There are a number of ways that teachers establish these norms and many helpful strategies for holding students accountable for them, which are discussed more fully in Part 3: Establishing a Culture of Productive Talk.

**3) Clear academic purposes for the discussion**

Teachers who orchestrate academically productive talk take the time to plan and prepare for discussions. They make sure that they truly understand the key science concepts in play, and how they relate to other concepts that students have learned or will learn later. But most important, they take the time to get clear on the specific academic purposes of each discussion.

The Inquiry Project investigations incorporate four discussion types, each with a unique purpose:

- **Elicitation discussions** uncover students' prior experience or knowledge about a phenomenon or topic, provide insight into their thinking, and pique students' interest in new learning.
- **Consolidation discussions** help students solidify their understanding of the steps they took during an investigation, as well as the underlying science concepts.
- **Data discussions** help students focus on the dimensions of the data set that are most relevant to the investigation; for example, interpreting data or evaluating different data representations.
- **Explanation discussions** help students learn how to make claims, provide evidence to support their claims, and explain why they think the evidence and claims are tied together.

Part of the planning process for a productive discussion includes teachers anticipating how the discussion might unfold. It is helpful to articulate to yourself the key ideas you hope to bring forward, to be aware of what children typically think about a concept, and to have strategies for dealing with challenging content. And it helps for teachers to think about their particular students. Who has been quiet lately and might be brought into this discussion? Might there be an opportunity for partner talk, and what partner talk question will help me achieve the goals of my discussion?

#### **4) Deep understanding of the academic content**

The better you understand the science, the better you will facilitate discussions. The Scientist Video Cases and Roger Tobin's

essays on Key Science Concepts in the Inquiry Curriculum address the essential science ideas highlighted in each section of the curriculum for each grade. Additionally, Carol Smith's essays on Children's Understanding of these concepts will help you to anticipate how your students are likely to think about these very same science topics. Understanding the core science concepts, scientific processes and habits of mind, and students' common ideas will help you recognize which ideas to bring forward for further discussion and debate.

#### **5) A well-thought out question to frame the discussion, and a few follow-up questions.**

The teacher starts the discussion with an open, clear, framing question. It should be designed to spark multiple positions, perspectives, or solution paths that can be taken, explicated, and argued for with evidence. Often, this launching question is suggested in the curriculum materials. Sometimes the teacher has to invent or adapt it from the curriculum guide. Crafting a good framing question is key to a yeasty and rich discussion.

In addition to having a good framing question, it is helpful to prepare a few follow-up questions that will help keep the discussion focused. Developing a set of questions helps the teacher to anticipate or prepare for discussion and be better able to listen hard to the students' ideas, hear connections among them, and support their development.

#### **6) An appropriate talk format or set of formats to guide and scaffold academically productive talk.**

There are different ways to organize groups for talk—whole group discussion, small group work, and partner talk. Each talk format creates different opportunities for talk and allows students to participate in a number of

ways with different levels of support.

We can think of these formats as tools teachers can use strategically to support productive talk. The talk formats are discussed in more detail later in this document.

**7) A set of strategic “talk moves” to help maintain a rigorous, coherent, engaging, and equitable discussion.**

The final element is a set of general all-purpose moves that can be used at any point in any kind of discussion (elicitation, data, explanation, or consolidation) and can be used at any grade level. These moves support the essential goals of academically productive discussions. The goals are discussed in more detail below in Part 4: How can teachers support productive talk? Facilitating a group discussion takes work, but there is good news here. These talk moves are remarkably helpful tools for making discussions effective. You can keep them in your back pocket, so to speak, or better yet, on a clipboard in front of you, and they are especially well-designed tools for talk in busy and heterogeneous classroom settings. You will learn more about talk moves in Part 4. In addition, the Talk Science program includes videos that describe each of nine talk moves and show teachers using the moves to facilitate productive discussions in real classrooms.

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## **Part 2: Why is talk important?**

In the U.S., we have achieved a national consensus that it is critical to promote talk in all instructional subject areas and at all grade levels. All major teacher organizations and all recent National Research Council consensus reports emphasize the need to involve students actively in “communication” about their thinking and investigations, and to encourage them to use evidence to support their claims, conjectures, predictions, and explanations (NCTM, NSTA, NRC reports). Why this emphasis on

talk? How does talk promote learning? And why is it particularly critical in science?

**1. Talk provides a window into student thinking,** revealing understanding and misunderstanding. If students talk about the content they are studying, teachers can see more clearly what they do not understand and what they do understand. Students themselves may realize what they do not and do understand. In this way, talk about academic content helps teachers and students take stock of where they are and assess ongoing learning, so that instruction can build on students’ current understandings and advance their thinking in productive ways. This is formative assessment at its best.

**2. Talk supports robust learning by boosting memory, providing richer associations, and supporting language development.** Talk is a fertile source of information. By hearing and talking about concepts, procedures, representations, and data, our minds have more to work with. Talk provides food for thought. By talking about academic content with others, students begin to see ideas from more angles, and make links to other concepts and meanings they already have. This helps them remember new ideas and develop a richer set of associations with them, so that they can use them in new contexts. Students gain a deeper sense of what words and expressions mean and how to use them. By using scientific vocabulary, they build their ability to use this vocabulary effectively. Talk supports language acquisition, vocabulary development, and the acquisition of the particular ways of speaking and writing that are valued in science. In science and other disciplines, it can be said that “talk builds the mind.”

**3. Talk supports deeper reasoning and encourages students to reason with evidence.** All students are adept language users, able to think abstractly and argue for what they think is right. But not all have been exposed to the