



Science Talk: A Tool for Learning Science and Developing Language

This paper was written as a component of the “Educators Guide for Inquiry-based Science and English Language Development,” a web resource created by the Institute for Inquiry® (IFI). It illuminates the classroom practice of science talk as an element in IFI’s framework for supporting students’ science learning and English language development. For more about this framework, visit exploratorium.edu/ifi/inquiry-and-eld/educators-guide.

The direct and engaging experiences of hands-on, inquiry-based science draw out students’ sense of wonder, and readily lend themselves to conversation. Students are excited by their discoveries, motivating them to share, discuss, and debate their ideas with others. Science talk is an instructional discourse practice that capitalizes on this enthusiasm and gives students regular and deliberate opportunities to process their thinking and communicate about what they have seen and done. Through exchanging views with others, students develop their understanding of the science beyond what could be achieved individually.

Discussions are an integral part of doing science. When students have conversations in which they share their observations, interpret evidence, and explain their findings, they support one another in making connections, refining ideas, and developing new perspectives. The student-to-student and student-to-teacher interactions that take place during science talk not only support science learning, but also lead to the development of language.

The use of language supports the development of language. Experiences and ideas are expressed through producing and listening to language that is used in meaningful contexts. Providing frequent opportunities for talk within a science unit affords multiple meaningful contexts for developing language and creates opportunities to bridge from using everyday language to developing the language of science. This is beneficial to all students, but particularly to English language learners.

“Language is our essential cultural tool—we use it to share experience and so to collectively, jointly, make sense of it... Language is therefore not just a means by which individuals can formulate ideas and communicate them, it is also a means for people to think and learn together.”

Neil Mercer, *The Guided Construction of Knowledge: Talk Amongst Teachers and Learners*, Multilingual Matters Ltd., ©1995

The ultimate goal of science talk is to create a discourse-rich classroom culture where the natural synergy between language and meaning making supports all students in expressing ideas, developing language and acquiring new knowledge of scientific phenomena.

There can be many speaking and listening demands embedded in science talks, especially for English language learners. Students may have a lot to say, but may not have the ability to say it perfectly in English. The language that individual students use may range from a few words, to everyday language, to formal scientific and academic language. In science talks, students are encouraged and allowed to use the type of language that is accessible to them in order to fully support the expressions of their ideas. Determining appropriate scaffolds to support varying levels of language proficiency is critical to enable all students to engage, make meaning, and show what they know.

Science talk supports science learning by:

- Providing opportunities to clarify thoughts, generate conclusions, develop theories, and ask new questions
- Exposing learners to new ideas and perspectives, thereby encouraging the growth of new understanding
- Connecting what students already know from their prior experiences to what they are being asked to learn
- Acknowledging the value of students' own ideas and empowering them to gradually take more responsibility for their learning
- Building an understanding of the collaborative nature of doing science
- Privileging the expression of personally meaningful ideas and the use of everyday language rather than focusing on the correct answers and the use of perfect language

Science talk supports language development by:

- Providing a context for language use in association with phenomena that all students have experienced
- Placing a higher cognitive demand on learners than more conventional monologic forms of classroom interaction, such as IRE (Initiation/Response/Evaluation), where the teacher initiates the request for a response, the student provides the response, and the teacher evaluates the response; interaction between students to build on their thinking requires more elaboration, revisiting ideas, and clarification of meaning

- Connecting talk to other language-rich classroom practices (science writing, reading, etc.)
- Allowing students to learn from each other's examples; it enables students of varying language proficiencies to produce and listen to a greater variety of language, because they express similar ideas in different ways
- Establishing norms that ease students' inhibitions, motivate sharing, and promote respectful communication
- Valuing cultural differences and encouraging students to use the language they have in order to communicate their ideas

Science Talk can take on many different forms, but in all cases it relies on the establishment of a welcoming environment where all students feel respected and comfortable taking risks. It requires conscious effort and patience on the part of the teacher to set the conditions that address its inherent language demands (i.e., the language needed to express one's ideas and understand those of others) and provide the supports necessary for students of all language proficiencies to participate. Creating a culture of talk is a purposeful process; it takes time for both teachers and students to develop the skills that support productive conversations.

Classrooms with successful cultures of talk tend to share certain features and practices:

- Science talk is a regular occurrence woven into classroom activities, not an isolated exercise.
- Students are paired or grouped strategically by the teacher to maximize productive interaction between students of varying English language proficiencies.
- Students are encouraged and supported to talk, but are not forced to talk.
- In a whole-group setting, the teacher takes on the role of a facilitator, refocusing the group when necessary and encouraging a natural flow to the conversation where students respond to each other's ideas and no one person, including the teacher, dominates.
- Students are encouraged to use the language they have to express their ideas (e.g., everyday language, imperfect English, native language).
- Scientifically inaccurate ideas are not dismissed; open discussion and further investigation are relied on to help students construct ideas that support them to progress in their scientific understanding.
- The teacher uses carefully constructed focus questions to frame pair, small-group, and whole-group discussions.

- Guidelines for behavior during talk are explicit, mutually agreed upon, and frequently reviewed. The following list of science talk norms was created by a fourth-grade class.
 - *Listen carefully to each other.*
 - *Take turns talking.*
 - *Speak one at a time, without interrupting.*
 - *Politely agree or disagree and explain why.*
 - *If confused, ask questions.*
 - *Stay focused on the discussion topic.*
 - *Respond to one another.*

- The teacher provides scaffolds that allow students of different language proficiencies to be able to participate in talks (e.g., prompts are tailored to students' varying needs; students are grouped strategically; examples of environmental print, including charts, posters, word walls and thinking maps, are abundant in the classroom).

Science talk can be used for various purposes, all of which can be productive to students' meaning making. Talks can be conducted to elicit students' prior knowledge, gather initial ideas about an investigation, generate questions, plan investigations, make meaning of data, and draw conclusions. Science talk gives teachers a window into students' thinking, which helps them make decisions about how to support students as they progress in their language development and science understanding.

The purpose of a science talk can guide the teacher in determining its timing and format. Science talks can take on many different participant structures (pair share, small-group, whole-group, etc.); they can be brief or extended, and they can occur at different stages in an investigation. For example, a teacher may initiate a science talk between pairs of students to allow them to summarize their observations before sharing them aloud or recording them on a class chart. A small-group discussion can be a good way to give students opportunities to share and discuss their ideas informally before creating a more formal presentation to the group. A whole-group discussion can support students working together at the end of a unit to make meaning of a series of experiences.

There is a strong reciprocal relationship between science talk and science writing. Talking can be a precursor to writing, and writing can be a precursor to talking. For instance, students can have a science talk before writing so they can listen to others and rehearse their own language and ideas before committing them to print. Writing in their notebooks, in turn, can give students a reference to draw upon when sharing out in a

whole-group science talk. The combination of science talk and science writing supports the learning of science ideas and, in the process, helps students develop the language to express these ideas.

To see examples of science talk in action, explore the annotated classroom video gallery that accompanies IFI's online resource, an "Educators Guide for Inquiry-based Science and English Language Development," available at exploratorium.edu/ifi/eld-and-science/educators-guide.

Additional resources for information on science talk can be found in the Institute for Inquiry Resource Library, available at exploratorium.edu/ifi/resource-library.

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For more information about IFI's program of professional development in Sonoma, see the project website, "Educators Guide for Inquiry-based Science and English Language Development," at exploratorium.edu/ifi/inquiry-and-eld/educators-guide.

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