Student Science Discourse

By: State Science Education Coordinating Committee | Aug 2023

BACKGROUND

What is discourse and how does it help students?

Discourse is a crucial component of learning science because it allows individuals to exchange ideas, challenge assumptions, and collaboratively construct knowledge. Science is a complex and ever-evolving field that relies on evidence-based inquiry and critical thinking skills. By engaging in discourse, students can develop these skills as they learn to gather information about a phenomenon, reason about the information, and communicate an explanation of that phenomenon. Additionally, discourse provides opportunities for students to articulate their own understanding of science concepts and to receive feedback from others, which can help them refine their thinking and deepen their understanding.

Effective classroom discourse is planned and intentional. It focuses on a specific goal for student learning. This means that the teacher carefully designs and structures the discourse to achieve a desired outcome.

Why is discourse important to three-dimensional science instruction?

Discourse promotes active student engagement and helps construct scientific understanding. By carefully planning discourse, teachers create an environment that supports respect, inclusion, and learning objectives. Well-crafted discourse strategies encourage students to ask questions, share perspectives, and engage in meaningful discussions, fostering deep learning and personal growth.

CLASSROOM APPLICATION

When observing a classroom in which instruction uses student discourse effectively, the following **student actions** should be visible:

- Students listening closely to one another
- Students engaging in discourse with peers by:
    - Analyzing and developing their ideas
    - Reasoning with evidence and models
    - Building on the thinking of others (agreeing, disagreeing, and questioning)
    - Making thinking- questions, models, data, arguments, explanations- public and available
- Students and teacher working together to clarify, challenge, and improve the group's thinking
- Students taking risks and feeling safe to revise their thinking

To support student discourse **teachers**' plan by:

1. Defining the purpose: Decide on the learning objectives, select the discussion topic, and identify the expected outcomes of the conversation
2. Selecting discussion strategies: Consider strategies that are appropriate for the topic, the students' abilities, and the learning objectives. Some strategies include using teacher and student talk moves, Socratic seminars, debates, think-pair-share, and jigsaw discussions.
3. Establishing norms: Ensure that all students have the opportunity to participate, and the conversation remains respectful and focused on the topic.
4. Preparing discussion prompts: Develop open-ended questions that will stimulate students' thinking and promote dialogue. Consider CCCs in developing prompts.
5. Anticipating responses: Prepare follow-up questions or comments to keep the conversation flowing.
6. Monitoring and assessing: Use observations, note-taking, or recordings to monitor students' participation and assess their understanding of the topic.
7. Reflecting: Evaluate the effectiveness of strategies used and adjust them as needed for future conversations.

IMPLEMENTATION RUBRIC

Basic	Emerging	Effective	Exceptional
Teacher lectures and dominates conversation. Their questions focus on correctness.	**Teacher** questions begin to focus on student thinking and less on answers to reveal student thinking.	**Teacher** asks probing questions in response to student ideas that move student sense-making forward.	**Teacher** acts as a facilitator for student discourse. (ie. sage on the stage vs. guide on the side.)
Students do not give answers that reveal their thinking or reasoning.	**Students** provide brief responses that make some of their thinking visible.	**Students** use discourse to understand the ideas of others and support their own understanding.	**Students** carry the conversation and productively listen to each other, build on each other's ideas, and use discourse to support sensemaking.
Classroom culture focuses on recitation-style questions with one "right" answer.	**Classroom culture** allows for students to share their thinking (even if they are incomplete or incorrect).	**Classroom culture** allows for students to support each others' scientific ideas.	**Classroom culture** allows for all students to share and build upon the ideas of others to confirm or revise their own thinking.

RESOURCES

Ambitious Science Teaching by Windschitl, Thompson, Braaten - Chapters 3-5
Ambitious Science Teaching Discourse Primer
Talk Science Primer
Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices by Schwarz, Passmore, Reiser - Chapter 14
Stem Teaching Tool #35 - How can I foster curiosity and learning in my classroom? Through talk!
Three Discussion Types from OpenSciEd
Communicating in Scientific Ways from OpenSciEd
Classroom Norms from OpenSciEd
Features of Classroom Culture from OpenSciEd
Science Discussion Planning and Reflection Tool from Louisiana Dept of Ed