Smithsonian
Science Education Center

Good Thinking! The Science of Teaching Science

Professional Development Discussion Guide

About *Good Thinking!*

Good Thinking! is an original animated series developed by the Smithsonian Science Education Center (SSEC) and FableVision Studios as a professional development resource for K-12 science educators. The series brings viewers into the classroom of science educator Isabella Reyes as she explores "the science of teaching science." Drawing from peer-reviewed research in science, cognition, and pedagogy, *Good Thinking!* distills valuable findings from hard-to-access journal articles to reveal common student misconceptions and promote effective classroom practices.

How to use this guide:

This format was designed to flexibly fit into PLC meetings, PD workshops, or any time that you and your colleagues can meet to absorb some new ideas and discuss your experiences as educators.

The students in the *Good Thinking!* classroom were designed as 5th graders, but research has shown that student ideas about major topics in science are remarkably similar across K-12 grade levels, mainly due to common misconceptions being inadequately addressed or unintentionally reinforced during formal education. While the content of the series is relevant to all levels of instruction, teachers working at the oldest and youngest ends of the K-12 range may need to include additional discussion during the post-viewing conversation that addresses the implications of the videos for their specific grade level.

Requirements:

- Access to a strong internet connection for streaming video
- A screen large enough for group viewing
- Copies of this guide for each participant

Discussion objectives: *Good Thinking! – What the Cell's the Matter with Atoms (and Cells)?*

- Identify common student misconceptions surrounding the relationship between atoms and cells
- Share strategies and resources to improve connections between physical science and life science content throughout education
- Pick up tips to better elicit misconceptions and identify sources of student confusion stemming from separation of scientific subject matter

Procedure

1. Establish ground rules to create an environment conducive to professional development:
    a. Introduce yourself to any participants you may not know. In a large group it may be helpful to select one individual to serve as the facilitator for the session.
    b. Agree upon a brief outline of session length, goals and structure. This module is designed to promote exchanges of knowledge between a group of peers, so it may be helpful to divide participants into smaller subgroups by similar academic levels or content area.
    c. Establish guidelines for productive participation and distribute writing materials to each participant.

2. **Before Viewing** – Each participant should take some time to respond to the questions below on their paper. The amount of time needed to answer these questions may vary, but thorough responses are encouraged, as they will be helpful to the discussion later in the session:
    - How would you describe the relationship between cells and atoms to a group of students in simple terms?
    - In your teaching experience, is physical science content commonly incorporated into life science education? What about life science content in physical science education?
    - Is the order in which students learn about the foundations of physical science and life science important? How so?
    - Do you think the separation of science content into different disciplines (Earth science, biology, chemistry, physics, etc.) reflects the practice of real-world science? Why?

3. **Watch the Episode**: *Good Thinking! – What the Cell's the Matter with Atoms (and Cells)?*
    Streaming video links available via:
    a. YouTube
    b. Smithsonian Science Education Center
    c. PBS LearningMedia

4. **After Viewing** – Once you have finished watching the episode, begin a discussion using the following questions as a framework. For larger groups, it may be helpful to have the PD facilitator read the prompts aloud and actively manage the time and flow of the conversation:

- In your experience as a teacher, have you observed any misconceptions stemming from putting academic content into different "mental boxes"? How did you address these ideas?
- **Option**: Return to the video and re-watch section: **3:52-4:56**. As shown in the video, connections to physical science are often omitted from life science education, despite critical overlaps in the content. Why do you think this is? What effects do you think this separation has on students?
- **Option**: Return to the video and re-watch section: **5:15-5:40**. In the clip, Blossom shows an example of a resource that connects chemistry and biology content. Do you use any resources that are particularly effective for helping students make similar interdisciplinary connections?
- What strategies can be employed to better connect different academic subjects throughout education? Why is this important for student learning?

5. **After the Discussion** – Once your group has finished discussing the prompts and exchanging experiences, give a brief recap of the major takeaways from the conversation. For larger groups, it may be useful for the facilitator to collect one or two salient points from each subgroup's discussion to share on a large sheet of paper. Conclude the session by highlighting any suggestions for effective practices that were shared by the group.

Thanks for tuning in to Good Thinking! We hope you found this session to be informative, and appreciate the contribution of your experience, time, and ideas.

References:

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