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! – That's So Meta(cognitive)!: The Metacognitive Mindset*

- Develop a better understanding of metacognition and the ways metacognitive skills influence learning and academic achievement
- Learn about the different types of knowledge and their respective roles in cognition
- Identify situations in which you use metacognitive strategies to overcome barriers to understanding
- Exchange ideas and pick up tips for modeling metacognitive strategies in the classroom to support student learning and problem solving

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 define metacognition?
    - How do you typically approach a significant barrier to understanding?
    - Are there certain strategies you use to help your students teach themselves necessary information?

3. **Watch the Episode**: *Good Thinking! – That's So Meta(cognitive)!: The Metacognitive Mindset*
    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 the video, Gummerson explains the different types of knowledge, and their respective roles in cognition. What strategies can teachers use to shift classroom science toward conceptual knowledge, rather than just procedural and declarative knowledge (rote memorization)?
  Option: Return to the video and re-watch section: **0:48-1:44**.
- As Ms. King explains in the video, students often seem to understand new material but struggle with long-term retention and application to novel situations. Have you observed this in your teaching experience? How have you addressed these issues with your students?
- **Option**: Return to the video and re-watch section: **5:46-7:06**. What strategies could Ms. Reyes have used *before* the start of the modeling activity in order to better prepare her students for the lesson?
- Research has demonstrated that students with a better grasp of metacognitive strategies are more effective lifelong learners (Ornstein et al. 2010). Why do you think this is the case? Consider both the information presented in the video and your experiences in the classroom.

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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Suggested Resources:

STEMVISIONS Blog: *That's So Meta(cognitive)!* — https://ssec.si.edu/stemvisions-blog/thats-so-meta-cognitive