Remote Learning Resource
Problematizing Routine

Problematizing is one of five routines that helps students develop and revise their thinking about phenomena. It is critical to the OpenSciEd instructional model, the inquiryHub instructional model, and the NextGen Storylines instructional model.

A key purpose of problematizing is to push students to deepen their thinking. It begins with an idea or question the class holds and the teacher invites students to offer competing perspectives on the idea or answers. A key is keeping students in the driver's seat with respect to *how* to resolve the class' difference.

Problematizing directly supports student interest and learning. Problematizing everyday phenomena for students—that is, inducing "perplexity, confusion, or doubt" in students (Dewey, 1910, p. 12) in relationship to those phenomena—is one strategy for sparking and sustaining interest (Engle, 2012), and to push students to go deeper and develop explanations for phenomena they may take for granted (Manz & Suárez, 2018; Reiser, 2004; Reiser, Novak, & McGill, 2017; Watkins, Hammer, Radoff, Jaber, & Phillips, 2018).

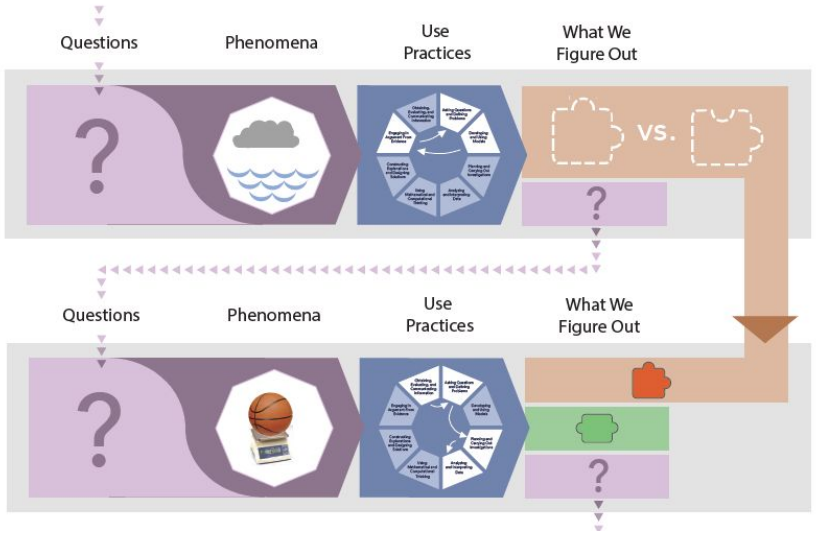
Elements of the Problematizing Routine

The Problematizing Routine has three basic elements:

1. Foreground a new phenomenon or question
2. Argue for competing ideas
3. Determine a way to answer the question or competing explanations

The problematizing routine is useful when an investigation of a question leaves some aspects of the question unanswered.

For example, in one lesson, in the inquiryHub evolution unit, students discover that different populations of birds have different behaviors.



The teacher seeds the questions in the next lesson, "How can a behavior be inherited? Aren't behaviors learned? How could we find out?"

Problematizing is useful in this instance because the idea of a behavior evolving in a population is not necessarily intuitive; it flies in the face of our everyday experience of behaviors as learned. The graphic above represents this flow and additional information about this routine can be found in the OpenSciEd Teacher Handbook.

Adapting the Elements of Problematizing for Remote Teaching

How do we push students to go deeper and revisethe science ideas we have built together so far in remote teaching environments? The table below presents some ideas for each element of the Problematizing Routine.

	Synchronous	Asynchronous	Without Technology
1. Foreground a Question or Phenomenon	• When presenting the phenomenon, begin by having students record noticings and wonderings in chat or with a tool like Flipgrid that allows them to annotate a video • Show and share an annotated EdPuzzle clip • Use Youtube's "copy at time" feature to send students to a very short section of a longer video • Use Flipgrid to show the video and have the students record an explanation and give feedback on other ideas.	• Post a video on pinup.com and invite students to create explanations for what is happening. Students could add pins to comment on each others' explanations. • Have students prepare a statement or model on a Google slide to make their thinking public.	• Send home a set of models to compare and make some initial explanations around. Have a student phone a friend who has the same set and discuss their ideas. The teacher could call students using phone or Google Voice to discuss. Zoom also includes a phone-in option. • Send home a set of simple materials with a related "discrepant event" to consider that pushes their thinking beyond what they have already explored. • Engage students in following initial steps of a Noticing and Wondering protocol for a phenomenon they can investigate in or around their homes.

	Synchronous	Asynchronous	Without Technology
2. Argue for Competing Ideas	• Provide time and space for students to jot down initial ideas that describe the reasoning for their positions, perhaps using chat. • Ask students to state their position (e.g., answer a multiple-choice question). Include a "why?" prompt in small group breakouts to help students go deeper. • Use Poll Everywhere or Kialo to allow students to share thinking supported by current evidence. Make sure students don't just vote; ask them to defend their ideas. • Have students create and share their own video presentations, as a way to show their reasoning.	• Have students share personal experiences using video to provide evidence to support their position. • Use the Question Assignment feature in Google Classroom to invite students to respond to peers' ideas. • If using a system like Canvas, encourage students to respond to others' explanations in a discussion thread. • Provide students with a script or questions to keep them focused on engaging in argument rather than just agreeing with one another. The script could be of a whole class or group conversation where students wrestle with the idea. Use questioning and redirecting to get students to review the script and to continue the conversation. (e.g., Why do you think the teacher asked this question? What response would you give?) • Be prepared to look for specific ideas from students that can be a springboard for what we need or want to investigate next or what questions we still have.	• Present students with two competing arguments presented by a peer, and ask students to say which peer they agree with and why. • Ask students to compare their current position to one they held a few lessons ago, and articulate reasons for why their position has stayed the same or changed. • Ask students to share two different positions and reasons with a family member. Students can gather and record what their family members thought about the different positions and evidence. • Initially begin using sentence starters (e.g., "If this... then this...") to help support the practice of using evidence in arguments. • Present competing yet plausible explanations to students. Ask students to identify reasoning that would make either explanation more compelling.

	Synchronous	Asynchronous	Without Technology
3. Determine a way to answer the question or competing explanations	• Use Jamboard or Pinup.com to have students generate a list of possible investigations the class could do to resolve the disagreement or answer the question. • Use a tool like PollEverywhere. Students post their ideas and use up/down voting to gauge interest in ideas. Be sure when using a polling tool to ask students to write down their reasoning.	• Have students use discussion threads to propose a path to resolve a disagreement. • Post a question in Google Classroom, and allow students to up/down vote for suggestions for how to resolve an open question or add comments to deepen thinking.	• After presenting two competing arguments, ask students to propose an investigation they can do at home to resolve an open question. • Have students consider several given options for resolutions, then add one of their own. Students can poll other family members/friends. • Taking stock of what questions have been answered on the DQB that helps explain the phenomenon in question and then identifying what else still needs to be figured out. In this way, students describe where the holes still are in our explanation and what can we do to figure out how to fill them.

What To Attend To In Using Technology Tools to Support This Phase:

Some crosscutting suggestions for engaging students in problematizing routine are to:

- Be aware that using multiple online platforms or apps may overwhelm students and parents. Keep it simple and try to use online platforms and apps with which students are already familiar.
- Be clear and concise, particularly about what disagreements or different positions are.
- Leave plenty of time for students to think. Remote learning requires extra patience and grace in assuming the best about our students' intentions and efforts.
- Make sure students engage with each others' ideas.
- When using voting tools, make sure students offer their reasoning, and leave open the possibility of new ideas that students didn't vote on (i.e., allowing for synthesizing different groups' ideas).
- Anticipate where students might struggle and consider what you might say when supporting groups in their thinking when they are stuck.

Equity Considerations

A key norm for ensuring problematizing is equitable is to promote the idea of challenging ideas while respecting the person. Students need to be able to voice disagreement or competing perspectives without experiencing a threat to their identities. For some students, this will entail becoming aware when they are putting down others while engaging in argument with evidence; for others, it will involve having the courage to speak up knowing that others may not agree.

Many students are not comfortable being the "only one" who voices a disagreement, a discontent, or a potentially wrong idea, so ask students to think-pair-share and to carefully listen to their partners' ideas. Then ask students to think about what they heard their partners saying, and ask the room if *their partners'* ideas are represented in the class discussion. This supports all students to share, to listen, to be heard, and to be represented.

Routines for allowing all students to offer their perspective can ensure equitable participation, but only if students are encouraged to treat all perspectives on a question as potentially reasonable. Educators can remind students that all ideas need to be treated as reasonable, and that everyone's job is to try and make sense of those ideas.

Students bring diverse sensemaking repertoires to class, and educators can become more aware of these repertoires, developing "interpretive power," that is, greater ability to see how contributions that at first might seem "off-topic" can contribute to deepening the class' understanding. ACESSE Resource G: Learning to See the Resources Students Bring to Sense-Making is something educators can explore with colleagues to help develop a teaching community's interpretive power.

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