

Unwieldy Situations in Science Classroom Discussions: What Skilled Facilitators Do to Move the Group Forward

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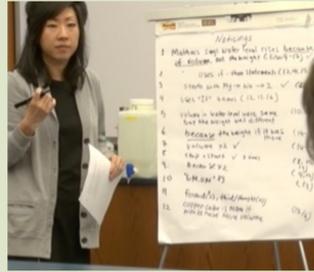
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The Problem

Productive classroom discourse is critical for science learning, but it remains extremely rare in US science classrooms (Osborne, 2014; Schwartz et al., 2017). One of the many reasons it does not often happen in science, as theorized by scholars, is that discussion is very challenging, since much is out of the teacher's control. Students' contributions can be unexpected, unclear, or simply wrong.

Such unwieldy situations are common. Yet, despite the growing number of studies on science classroom discourse in the last two decades, there is a limited literature on the types of situations that make classroom discussion so difficult, and strategies that can be used in those moments.

Using recordings from professional development sessions in which teachers are themselves engaging in science discussions, we identified 5 types of unwieldy situations that arose in their discourse. We then asked expert facilitators to describe the challenges they saw in vignettes of these 5 situation types without revealing to them our categories. Here we analyze their responses, and the strategies they would use in those situations.



Research Questions

Do expert facilitators recognize core types of unwieldy situations found in science classroom discussions, and if so, what do they describe as challenging in those situations?

What do expert facilitators do when faced with these unwieldy situations?

Instructional Context



Professional Development for K-12 Science Teachers

How? When? Where?	Who?	What?	Why?
<ul style="list-style-type: none"> face-to-face study groups web-based platform 30 hours 	<ul style="list-style-type: none"> groups are led by trained facilitators NGSX has curricula for training facilitators 	<ul style="list-style-type: none"> teachers engage with the practices and disciplinary core ideas in NGSS learn talk moves that can facilitate this new science learning 	<ul style="list-style-type: none"> most science teachers need to teach science differently classroom talk is key to reaching the goals of NGSS

Over 6,500 participants have enrolled in NGSX to date!

Phenomenon-Based Science Discussions in NGSX



Why doesn't your nose collapse even though air exerts 14.7 pounds/sq inch on everything it touches?	Why doesn't an empty plastic bottle collapse even though air exerts 14.7 pounds/sq inch on everything it touches?	Why is it easier to use a straw to drink out of a bottle without a stoppered top than it is to drink out of a bottle with a stoppered top?	Why does a soap bubble grow in hot water and shrink in cold water?
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Expert Facilitators

Andrea	Deanna	Kate	Tara	TJ
experienced science teachers				
identified and mentored by the lead designers and primary investigators of NGSX				
each has led several NGSX trainings for facilitators				
members of the NGSX design team				

Situation #1: A very unclear response (a group participant responds to the facilitator's question with a very unclear contribution that even the facilitator cannot understand)

What aspects of this situation, if any, might be challenging for a facilitator?

All the experts described the participant's comment/idea as "confusing." Different experts worried that it might:

- Lead the group in the wrong direction**
"What Participant 3 said is really confusing, and it doesn't really seem to be the direction you want to go anyway."
- Confuse others in the group**
"...there is lack of clarity in the utterance that probably confused not only the facilitator, but also other participants."
- Make it difficult for the facilitator to respond in the moment**
"I think it would be challenging to figure out how to respond to participant 3 in the moment. Do you dive in to participant 3's thinking? Do you 'let it ride' and see what other participants are thinking?"
- Make it challenging for others to work with the idea**
"Participant 3 says something that is confusing which makes building off or working with that idea challenging."

What would you do? How would you respond in this situation?

Attempt to revoice the idea
"...probably saying 'so are you saying...'" because they shared that they felt it was an unclear statement..."

Ask "Who can rephrase or repeat that?"
"I would use the talk move of rephrase or repeat that - It's great if someone in the group who thinks they understand what the participant was saying can rephrase it in their own words so the group can work with Participant 3's idea."

Acknowledge the idea and redirect
"There's a lot about the cap in what you just said. And I agree the cap's kinda tricky to think about. How about we back up a minute and see if we can agree..."

Give time for others to respond
"I might just pause, and look like I was thinking/processing. Then someone might jump in and say their idea..."



Situation #2: A contribution that is not scientifically accurate (a group participant provides a response that contains information that is scientifically incorrect)

What aspects of this situation, if any, might be challenging for a facilitator?

Several experts agreed that the participant offered an inaccurate idea. They gave different reasons why that's challenging:

- The facilitator should keep a poker face upon hearing incorrect ideas**
"...it can be challenging to keep a poker face, not broadcasting the correct idea."
- Ideally the participants should themselves figure out that the idea is wrong**
"It's not easy to think, right away, of what exactly is 'wrong with' the incorrect part. In other words, what would help someone see that this isn't what actually happens? How could we support the participants to work this out themselves?"
- The facilitator must find ways to challenge incorrect ideas**
"The challenging aspect is of this situation is pushing on the idea that the molecules move faster (and don't get bigger). It is hard because we can't 'see' the molecules and we can't help participants 'see' the molecules. We can push on 'what do we have evidence for?' and we don't have any evidence that they get bigger (and it isn't a part of our explanation), but it can be challenging to have participants think about it in terms of what we have evidence for."

What would you do? How would you respond in this situation?



Ask if people agree or disagree with the idea
"I'd like someone to explain why they think the molecules are going faster, and then I'd like someone to explain why they think the molecules are getting bigger. (Then...ask if anyone agrees or disagrees with these explanations.)"

Push for evidence for claims
"I would do something like the following: 'Hmm...so it sounds like we have two ideas out there - one is that the puppies move faster with heat and the other is that the puppies actually get bigger with heat. I wonder - what evidence do we have to support either of these claims?'"

Revoice then put it back to the group
"I would then revoice the two ideas on the table, 1) that the temperature makes air puppies move faster 2) that the air puppies may be getting bigger...Then put it back out to the group by asking, 'what do you all think?'"

Unwieldy Situations in Science Discussions

We searched through dozens of videos and transcripts of NGSX science discussions listed above and identified five *unwieldy situations* - situations in which deciding how to respond is not easy for the facilitator of the discussion: 1) a very unclear response, 2) a contribution that is not scientifically accurate, 3) movement away from the focus, 4) a long, meandering response, and 5) a complete and accurate explanation early on in the discussion.

To validate that these are indeed common unwieldy situations, we created 5 vignettes to illustrate the situations (see handout for examples). We then showed these vignettes to 5 expert facilitators, without sharing the situation types we think they illustrate, and we asked them a series of questions (see below).

Three of the five situations are featured here, along with some of the facilitators' responses.



Situation #3: Movement away from the focus (group participants start contributing ideas that veer away from the goal of the discussion or the phenomenon at hand)

What aspects of this situation, if any, might be challenging for a facilitator?

All experts suggested that the participants in this vignette were moving the discussion away from the phenomenon at hand and thus, the goal, which is to come to a consensus around an explanation of the phenomenon:

"Participants are bringing up other variables (temperature), taking the conversation away from the topic of - talking about the bottle right here"

"People are talking about ideas that are relevant to the overall unit, but not relevant to the question at hand."

This particular situation can make it difficult to honor all participants' ideas

"It can be challenging for a facilitator to honor the thought process (and a potentially productive line of thinking), while simultaneously maintaining focus on the question at hand."

What would you do? How would you respond in this situation?

Refocus group on the phenomenon
"I would have interrupted the flow about temperature earlier on, by saying, 'Hold on a minute. Are we still talking about the bottle on the table here? In this phenomenon, is temperature a factor?' This hopefully would help them to refocus talk around the phenomenon at hand."



Refocus group on the question
"State our original question...Why doesn't THIS bottle expand or collapse?"

Pause the discussion on the tangent
"I would direct participants to the bottle and ask if this bottle is heating or cooling. Given that someone shares - so this one is at room temperature...we could pause this conversation about temperature..."

Discussion

- The expert facilitators recognized the same five challenging situation types that we intended to exemplify in the vignettes, confirming that there are recurring, identifiable "types" of challenges.
- Across the situations, the experts emphasized the importance of taking participants' ideas seriously and working with those ideas even if those ideas were unclear or scientifically inaccurate. In cases of ideas that are tangential to the goal, they encourage gentle redirection.
- Across situations, the experts said they would use talk moves (Michaels & O'Connor, 2012) such as: time to think, revoicing, asking if anyone can rephrase or repeat another's idea, asking for evidence, and asking if others agree or disagree with another's idea. In some situations, experts chose the same talk move, and in other situations, they chose different talk moves.

Next Steps

- Canvas expert facilitators for other challenging situations. Create more vignettes based on the new challenging situations and get other expert facilitators to respond.
- Use our situation types to analyze the discussion transcripts of novice facilitators, identifying how they respond to these situations and comparing those responses to expert facilitators.
- Use the vignettes in NGSX facilitator trainings.
- Use the situation types to design tools to support facilitator development.

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