

Session 9: Promoting Discussion

Overview

Perhaps the only thing as important to good teaching as questioning strategies is *responding* strategies! There is much research supporting the idea that the ways in which a teacher responds to students' questions, answers, and ideas can profoundly influence the learning environment and tone in a classroom. Is the environment one in which it is safe to share your ideas and to ask what you don't know? Is critical and original thinking valued by a teacher, or just right answers? Promoting discussions that draw in all students can help a teacher understand what students are thinking, and help to create an open intellectual environment where students learn through discourse.

This session focuses on how teachers can build upon students' diverse responses to questions to engage them in learning through discussions. It offers a number of practical discussion-leading strategies. Through a series of engaging activities, these strategies are modeled and background information supporting their use is provided.

Background Information for the Presenter

Forums for discussions of ideas have the potential to provide powerful learning experiences. But sometimes discussions can also be frustrating experiences. From the student's perspective, most of us only need to remember back to the humiliation of being told one's idea was wrong; the embarrassment of being singled out for an answer; the frustration of being constantly overlooked in favor of a more vocal student; or the feeling of being left behind in a discussion that you don't quite understand. From the teaching perspective, one learns very quickly how a few very vocal students can dominate a discussion; how challenging it can be to engage the reluctant-to-speak student in discussion; how off-track responses, if not handled well, can derail a discussion; and of how tricky it can be to communicate accurate information without discouraging participation by students who contribute inaccurate information. The response strategies discussed in this session can make a huge difference in the number of students who respond, as well as in the quality of their responses.

Using Wait Time

The concept of "wait-time" as an instructional variable was originated by Mary Budd Rowe (1972). The "wait-time" periods she found—periods of silence that followed teacher questions and students' completed responses—rarely lasted more than 1.5 seconds in typical classrooms. She discovered, however, that when these periods of silence lasted at least three seconds, many positive things happened to students' and teachers' behaviors and attitudes. To attain these benefits, teachers were urged to "wait" in silence for three or more seconds after their questions, and after students completed their responses (Casteel and Stahl, 1973; Rowe, 1972; Stahl, 1990; Tobin, 1987).

These studies found that when students are given three or more seconds of undisturbed “wait-time,” there are certain positive outcomes: the length and correctness of their responses increase; the number of their “I don’t know” and no answer responses decreases; the number of volunteered, appropriate answers by larger numbers of students greatly increases; and students’ scores on academic achievement tests tend to increase. When teachers wait patiently in silence for three or more seconds at appropriate places, positive changes in their own teacher behaviors also occur: their questioning strategies tend to be more varied and flexible; they decrease the quantity and increase the quality and variety of their questions; they ask additional questions that require more complex information processing and higher-level thinking on the part of students. Considering the benefits of implementing such a simple strategy in the classroom, we highly encourage course participants (and instructors!) to employ wait time after asking questions in class.

Handling Dominating Students

Dominating students can be a real problem during open-ended classroom discussions. As reported in “The One or Two Who Talk Too Much” (1988), researchers Karp and Yoels found that in classes with fewer than forty students, four or five students accounted for 75 percent of the total interactions per session. In classes with more than forty students, two or three students accounted for 51 percent of the exchanges. In the session handout, we offer several ways to handle dominating students. Classroom structures such as discussing in small groups, assigning specific roles for students, or placing a time limit on responses can help provide more space for less dominant students to participate. Providing an initial pre-thinking activity, such as talking with a partner or jotting down ideas, can help more quiet students to gather their thoughts. Being transparent about your intentions to have everyone participate and asking for other students to contribute ideas can also encourage the dominant student to step-down and others to step-up to the discussion.

Hand Raising During Discussions

The use of hand raising can be controversial in the classroom, as there are both benefits and drawbacks to employing this strategy. According to Dixon, Egendoerfer, Taylor, and Clements, when students were observed conversing with their friends in an informal setting prior to the introduction of the new social norms, they were animated, excited, quick to correct each other, and they appeared to be consumed by whatever topic was at hand. This was a stark contrast to what was observed during the phase of the study during which the “raise your hand” rule was in place in their mathematics classrooms.

They noticed that students had consistent, observable patterns established in regard to raising their hands. The videotapes confirmed that many students would raise their hand to speak, but as soon as a student was selected to speak, the other students appeared to disengage. It was as if they assumed that if they were not chosen, they no longer needed to be active participants in instruction. It appeared at times that students were completely uninterested in the lesson being taught. The same students would raise their hands to participate while other students would sit daydreaming or drifting during instruction. It was observed

frequently that while one student was answering a question, others would sit with their hand up. This may have been an indication that although they were engaged in the topic at hand, they were most likely thinking of what they wanted to say next, instead of listening to the student who was speaking.

However, when students were given the ability to talk directly to one another without first needing to raise their hands, several things happened. First, students stayed engaged in the conversations. They seemed to realize that they would have an equal opportunity to share their ideas. Within the context of this setting, they were invigorated and excited to converse with their peers. Most importantly, they began to understand that mathematics was something to explore. Perhaps they could see that getting correct answers was not as important as sharing ideas and exploring the mathematical concepts.

On the other hand, in her book *The Art of Inquiry* (1995), Nancy Cecil offers this advice: “When you ask questions, do not recognize students who shout out responses; instead, insist that they raise their hands and wait to be called upon before they respond. Though many teachers worry that such rules are unnecessarily rigid and other teachers are delighted when they hear immediate responses shouted out, such behavior results in unequal interactions. Boys tend to be more vociferous than girls in class, for example. On the other hand, children from certain cultural groups are taught at home to be polite and even self-effacing; they too are usually overshadowed by children who shout out answers (Davidman, 1994).”

In addition, Michael Linsin (*Dream Class*, 2009) points out several drawbacks to allowing students to “call out” in response to a question. He points to effects on the overall discussion, interrupting the flow of ideas, and possibly halting it completely. He also emphasizes the equity issues involved in having more vociferous students or those who are more socially confident—and sometimes even rude—receive undue recognition for their classroom contributions. However, his most compelling argument is that good teaching allows students to form their own ideas, opinions, and conclusions before an answer is revealed or a thought expressed. He points out that students need time—even if it’s just a few seconds—to puzzle over presented material before discussion takes place.

Calling on Boys versus Girls

Current research confirms that teachers tend to call on boys more often than girls, accept more call-out responses from boys than girls, give boys more wait-time to respond, and give boys more praise and remediation than girls (Sadker & Sadker, 1994; Biklen & Pollard, 1993). Teachers usually are not aware that they favor the boys in their classroom over girls and are genuinely surprised when they learn of these inequities as they conference with trained observers or watch videotapes of their teaching. (Wellhousen & Yin, 1997). Becoming more attentive to the issue of balance between boys’ and girls’ participation can be helpful for all teachers.

Encouraging Students

In her book *Tools for Teaching* (1993), Barbara Gross Davis offers some very useful information about encouraging reluctant students to participate in discussion. She suggests using simple, yet effective, non-verbal cues that indicate interest such as smiling expectantly, nodding as people talk, and maintaining eye contact with students. There are also various less-threatening ways to include students, by asking simple or casual questions of quieter students, asking what others think about a previous statement, or even having students use hand signals to indicate agreement and disagreement on a topic. She also points out that quiet students are not necessarily uninvolved and to avoid “picking on them” to draw them out. You may also provide these students with opportunities to participate in a small group discussion and assign them to report out for the rest of the group. Something as simple as writing their responses on the board can help to boost their confidence in making contributions to the class.

Many educators also emphasize the importance of avoiding any type of disapproval for unexpected answers, which may inhibit student participation or interrupt their thinking and learning. More supportive ways of responding to incorrect answers are: asking probing questions to try to understand the thinking behind the response; offering an empathetic response showing you understand how they arrived at that answer and/or how difficult it is to understand; and merely suggesting re-testing to be sure of results.

Types of Teacher Responses

As stated before, how a teacher responds to students can contribute greatly to creating a classroom climate that is open to inquiry and discussion. A teacher who takes on a collaborative role during a meaning-making discussion, and emphasizes hearing a variety of voices and collectively sorting out ideas, allows students to be responsible for their own learning and to express themselves more freely. One way to encourage this type of higher-level thinking and active engagement with students is for the teacher to offer accepting responses. By communicating that all answers are important and contribute to group understanding, an accepting response indicates that everyone’s ideas and thinking are valued. According to Cecil (*Art of Inquiry*, 1995) “non-judgmental acceptance of all ideas generates the greatest amount of critical and creative reflection.” This is why broad questions, for which a variety of responses are possible, go hand-in-hand with accepting responses. In fact, if a student responds to a broad question and is met by an evaluative or corrective teacher response, it indicates to the student that the teacher is really fishing for the right answer, and not trying to engage in open discussion.

In contrast, if a teacher has posed a focused question, for which there is an expected response, and students attempt to answer, it is more appropriate for the teacher to indicate if the student has correctly understood and answered the question. It may actually confuse students if they are met with an accepting or neutral response to an answer they have made for a factual question. The teacher should simply inform them if they are correct and/or otherwise indicate that they are on the right path. Teachers may also choose to judiciously use praise as a way of acknowledging a student’s response to a focused question, however, the

goal should be for students to find their own intrinsic motivation for responding during a discussion.

Session Objectives

In this session, participants:

- learn about and analyze a variety of teacher response strategies including:
 - using “wait time” to encourage more students to respond, and to respond more thoughtfully;
 - the use of hand raising and the importance of clearly defining student response expectations;
 - calling on equal numbers of boys and girls;
 - asking “safe” questions to encourage participation of reluctant-to-speak students;
 - strategies for dealing with dominating students; and
 - supportive ways of dealing with incorrect answers.

- learn that asking broad questions requires an accepting response from the teacher;
- learn that asking focused questions requires a confirming response from the teacher;
- observe student/teacher interactions that model effective teacher response strategies, and experience some negative examples of less effective techniques that should be avoided; and
- practice leading a discussion and formulating responses to students.

Session Activities at a Glance

Quick Write

Students do a Quick Write to reflect on something from their assigned reading.

Introduction

Small groups discuss a list of focus topics related to effective teacher response strategies.

Skit: Tides Discussion

Volunteers then read a short skit depicting seventh grade students involved in a teacher-led discussion after they have done hands-on activities about tides. The skit illustrates a variety of important teaching and learning behaviors related to discussion.

Relating Research to Tides Discussion

After observing the skit, each small group selects a specific topic to focus their discussion. Each group is then given copies of some research cards related to promoting discussion. After discussing what they noticed during the skit, and reading and discussing the research cards, each group summarizes what they discussed, and what they learned from the research.

Brainstorming Responses to Students

Participants are then shown a variety of student responses to a question asked by the teacher. They are challenged in small teams to brainstorm appropriate responses to these sample student answers. In the large group, the course instructor plays the part of each child, and challenges participants to respond to the child, engaging in a mock teacher-student dialogue with the participants.

Swirling Colors Activity Role-Play

One person in each table group plays the part of “teacher,” while the others play the parts of first through third graders. The “teacher” leads the “students” through the Swirling Colors activity, attempting to incorporate effective questioning and discussion-leading strategies. Afterwards each group discusses successes and issues, and other ways in which the activity could have been led.

Oil on the Beach Activity

A science lesson is modeled by the instructor, which includes exemplars of good questioning techniques. The participants experience the activity as their students would, while also trying to analyze the various strategies used by the instructor. The model lesson is called *Oil on the Beach* and it comes from the GEMS guide, *On Sandy Shores*. In this engaging activity, students make predictions about which clean-up items will be the most effective to clean up a simulated oil spill. They then test the items as they try to clean up an oil spill in a model ocean.

Strategy Debrief

The *Oil on the Beach* Activity ends with a short discussion reviewing the questioning and responding strategies participants observed as well as other features that relate to topics learned in previous sessions.

Quick Write

The session concludes with a Quick Write in which the participants reflect on their learning as a result of the session.

Time Frame

Total Workshop: 2 hours 55 min
Quick Write (5 minutes)
Discussing Response Strategies (5 minutes)
Tides Discussion Skit (10 minutes)
Relating Research to Tides Discussion (30 minutes)
Brainstorming Responses to Students (20 minutes)
Enacting Response Ideas (20 minutes)
Swirling Colors Role-Play Activity (30 minutes)
Oil on the Beach Activity (40 minutes)
Strategy Debrief (10 minutes)
Quick Write (5 minutes)

Materials Needed

For the class:

- an LCD projector (or overhead projector)
- 1 slide or transparency of each of the following:
 - Focus Topics for Session
 - Student Responses
 - Quick Write Prompt

For the Tides Discussion Skit

- 6 highlighted copies of the script for each of the characters in the *Tides Discussion*
- 1 copy of the *Tides Discussion* script for each participant
- 1 copy of the *Research Related to Promoting Discussion* handout for each participant
- 3"x 5" cards
- yarn for making name tags
- a highlighter pen

For the Brainstorming Responses Activity

- 1 copy of the *Student Responses* sheet for each participant

For the Swirling Colors Role Play

For each table group:

- 1 *Swirling Colors* teacher's sheet
- 2 cups of water, one labeled "plain," and the other labeled "salt"
- 1 teaspoon
- 1 popsicle stick
- approximately 5 teaspoons of kosher salt in a paper cup (note: iodized salt will appear cloudy in the water, whereas kosher salt will dissolve clear)
- 1 squeeze bottle (or dropper) of blue food coloring (note: green or red food coloring will also work, but yellow is too light to see well)

For the class:

- 1 pitcher

For the *Oil on the Beach* Activity:

For the class:

- 1 cup of olive oil or other heavy vegetable oil (for the oil spill)
- 1 teaspoon of dry black tempera paint powder (to color oil)
- 1 dropper bottle or squeeze bottle (for containing oil)
- 1 overhead transparency of prediction data sheet
- 1 overhead transparency of the results data sheet

For each group of 4-6 students

- a ziplock bag with one of each of the following clean-up items:
 - nylon stocking square (about 2" x 2")
 - cotton ball
 - sand
 - hay or straw (a small handful)
 - feather
 - fake fur (about 2" x 2")
- a plastic or paper bowl
- enough water to fill bowls 3/4 full
- several paper towels
- 6 copies of prediction data sheet
- 6 copies of results data sheet
- 6 pencils

For each student:

- 1 copy of *Strategy Checklist*

Preparation of Materials**For the Tides Discussion Skit**

1. Make name tags. Note: If you make necklace-style name tags using 3 x 5 cards and yarn they can be re-used. Label the six name tags, "MALE #1," "MALE #," "MALE #3," "FEMALE #1," "FEMALE #2," and "TEACHER."
2. Duplicate and highlight scripts. Duplicate six copies of the tides script, one for each character. Write one of the following character titles at the top of each of the scripts: TEACHER, MALE STUDENT #1, MALE STUDENT #2, MALE STUDENT #3, FEMALE STUDENT #1, and FEMALE STUDENT #2. On each character's script, use a highlighting pen to indicate the lines and the instructions in italics pertaining to that character.
3. Duplicate one copy of the *Tides Discussion* script for each participant.
4. Duplicate one copy of the *Research Related to Promoting Discussion* 4-page handout for each participant.
5. Duplicate one copy of the *Student Responses* handout for each participant.
6. Set up the LCD or overhead projector and have the overhead transparencies on hand.
7. Write these on the board or chart paper beforehand. Keep them posted throughout the session:
 - A. Types of teacher responses to students
 - B. How students respond to the teacher
 - C. Timing of teacher responses
 - D. Strategies for involving everyone in the discussion

For the Swirling Colors Role-Play:
Prepare trays for each table:

1. Label one cup, "Plain," and the other cup, "Salt" water
2. Use your pitcher to fill each cup three-quarters full with water.
3. Place at least 4 teaspoons of kosher salt in the paper cup.
4. Place small bottle of food coloring on tray, along with Swirling Colors teacher's sheet.

For the *Oil on the Beach* Activity:

1. Duplicate data sheets and *Strategy Checklist*.
2. Prepare oil using the following recipe:
 - 1 cup olive oil or other vegetable oil
 - 1 very scant teaspoon black powdered tempera paint

Place in a dropper bottle or squeeze bottle and shake very well. Shake it again very well before every use. This is enough oil for the whole group.

3. Plan how you will divide students into groups.

Instructor's Guide–Session Details

Quick Write (5 minutes)

Have participants write for five minutes about their response to a prompt about the assigned reading.

Discussing Response Strategies (5 minutes)

1. Introduce focus topics for the session. Seat participants in groups of six. Tell them that in today's session they will continue with the topic of questioning strategies and leading classroom discussions. They will be exploring some additional facilitation techniques involving how to respond to students during a discussion. Display list and point out some issues or focus topics to consider for today's session:

- A. Types of teacher responses to students
- B. How students respond to the teacher
- C. Timing of teacher responses
- D. Involving everyone in the discussion

2. Partners discuss topics. Ask participants to discuss their ideas regarding the topics on the list with another person at their table. Give them about five minutes to share their initial thoughts with a partner.

Tides Discussion Skit (10 minutes)

1. Prepare for skit. Recruit six participants to read the parts in the script. Ask them not to show their scripts to other members of the class. Do your best to select participants who are able to read and speak in a voice loud enough for the class to understand them. The ability to “ham it up” certainly improves this activity, but is not necessary. Make sure that they read the notes at the top of the skit describing the role of their character.

Note: There is a teacher's role in the script that should be read by someone other than the course instructor. The instructor will be sufficiently occupied with reading the part of the narrator, and prompting the actors as necessary.

2. Gather actors in the front of the room. Ask the participants in the skit to put on their name-tags, and to sit or stand at the front of the room facing the audience. Remind them to read loudly and clearly. Give them a few minutes to read through the description of their character's role and the stage directions (written in italics) so they'll have an idea of what to do.

3. Instruct participants to consider focus topics while observing skit. Tell the participants they'll be watching a short skit simulating a classroom discussion. As they watch it they should be looking for the kinds of behaviors that they have just discussed. Remind them that they will be looking for both effective and ineffective teacher behaviors.

4. Begin the skit. Tell them that this skit is based on actual teacher-student interactions that have been observed in classrooms. Start by reading the part of the narrator. Follow along with the readers, prompting them as necessary until they have read through the entire Tides Discussion script.

Relating Research to the Tides Discussion Skit (30 minutes)

1. Groups discuss topics. Remind participants that they had various topics to consider as they watched the skit. Ask them to select one of the topics to discuss in their group.

- A. Types of Teacher responses to Students
- B. How Students respond to Teacher responses
- C. Timing of Teacher responses
- D. Involving everyone in the discussion

2. Small groups discuss script. Distribute a copy of the script to each person and instruct the table groups to look for teacher-student interactions that are related to the focus topic they've chosen. Point out that each line of the script is numbered, to make it easier to refer to particular statements during their discussion.

3. Hand out copies of research sheet to each table. After they have had a few minutes to discuss their ideas about the focus topic, distribute a copy of the *Research Related to Promoting Discussion* sheet to each person.

4. Explain the task. Describe to participants how they will first read the research sheet, then discuss how this information might influence their ideas about teaching in the classroom. Ask: How could this information potentially inform your approach to leading a discussion in the classroom?

5. Each group decides on something to share with the class. After 15–20 minutes of small group discussion, tell each group to try to summarize their thoughts regarding the research and their focus topic. Each group should be prepared to describe the main ideas from their group for the whole class discussion.

6. Each group shares discussion points. Have each group assign a member to present their ideas to the class and call on them to report about their discussion.

7. Whole class discussion. Ask the participants what they noticed about the interactions between the teacher and the students in the skit. Provide an opportunity for participants to share out questions or comments about any topics and research they discussed. You may also wish to share some examples from your teaching experience that are relevant to the focus topics.

Brainstorming Responses to Students (20 minutes)

1. Introduce teacher question to group. Display the *Student Responses* slide (or overhead transparency) and “fly in” (or uncover) the teacher’s question. Tell participants to imagine that they are a teacher who has just led an activity about sinking and floating objects with her class and they ask this question.

Teacher: “What can you tell me about things that float in water without using tricks?”

2. Reveal each student response one at a time. Tell them that five different students respond to the question in different ways. Reveal and read aloud each student response, one by one.

Student Responses:

Student #1: Spoons float.

Student #2: The mocus they’re moving. But then they stop. And when they stop, it floats.

Student #3: Light things float.

Student #4: Things that are less dense than water float.

Student #5: My uncle has a boat. And when we go fishing, we catch lotsa fish, but my brother doesn’t like to fish, ‘cause he thinks they’re gross.

3. Small groups will brainstorm teacher responses to the student responses. Introduce the task of developing responses to these student statements. Tell your participants they’ll have around 10 minutes to discuss each of the student responses in small groups and decide what they think are appropriate teacher responses.

4. Distribute *Student Responses* sheet and begin brainstorming. Give each participant a *Student Responses* sheet, so that they can read and record their ideas. Suggest that they look at the section of the research sheet describing various types of teacher responses to help identify the types of responses that might be appropriate. Ask them to begin.

Enacting Response Ideas

1. Have groups share ideas. Once groups have finished brainstorming responses, tell participants you’d like them to share some of the ideas they had for responding to each of the student answers. Explain that you will take on the role of the student and respond back to them as a student might, to help them evaluate the effect of the teacher response.

2. Improvise a dialogue with participants based on teacher response. As the first group shares their response, take on the role of the child and try to respond in an authentic manner. Invite individuals to continue to respond and carry on a conversation, attempting to create a realistic back and forth discussion between child (you) and teacher (participants). Keep up this dialogue with the participants until the exchange seems to have run its course.

For example:

Teacher (played by a participant): What can you tell me about things that float in water without using tricks?

Child (played by the instructor): Spoons float.

Teacher: How do you know spoons float? Cause I put a spoon in the water, and it floated.

Teacher: What was the spoon you tested made of?

Child: Plastic

Teacher: Do you have spoons made of other materials at home?

Child: Yeah, we have metal spoons.

Teacher: Do you think the metal spoons would float?

Child: I think they might sink

Teacher: Why don't you try testing one at home, and tell us what happens.

Child: OK.

Note: Playing the role of the child and improvising a discussion in the manner that each child might respond gives participants practice engaging in dialogue, and allows other participants to observe and note the different strategies and their effects. The more effectively and authentically you play this role, the more potentially valuable the experience for your participants. Be careful not to try to "stump" your students, but simply keep up the dialogue in an authentic manner.

3. Conduct additional conversations based on different teacher responses.

Challenge another group to come up with a different response for the same student statement, and play out this conversation as well. Continue enacting various teacher-student dialogues based on various teacher responses to the student statement.

4. Analyze the effectiveness of different teacher responses. After several teacher-student dialogues, help participants to identify the teacher responses as *accepting, probing or confirming*. Discuss the benefits / drawbacks of each of the teacher responses you enacted. Refer to the *Notes for the Presenter: Brainstorming Responses* handout for more information about possible teacher responses.

Note: See "Notes for the Presenter: Brainstorming Responses" handout for ideas on how to analyze each type of teacher response. Refrain from reading the information out loud, but try to incorporate it into the discussion as you discuss each student response.

5. Continue improvising dialogues using the other student statements.

Continue improvising conversations while taking on the role of the student until the group has explored all five of the student responses. Allow some time between enacting each teacher-student dialogue to discuss the advantages and disadvantages of various types of responses.

Swirling Colors Role-Play Activity (30 minutes)

1. Introduce discussion-leading activity. Tell the participants they'll now get a chance to take turns trying their hand at leading a discussion with their peers acting as students. Explain that they will have the opportunity to try to apply what they have been learning about promoting discussion and using effective questioning strategies.

2. Explain roles for the activity. Show them the *Swirling Colors* sheet, and explain that it is adapted from the GEMS curriculum guide, *Liquid Explorations* for first through third grade students. Tell them one member of each table group will be the “teacher,” and the rest will play the parts of first grade students. Remind participants to continue to play the part of *well-behaved* seven year olds, and not to give their “teachers” a hard time.

3. Describe the focus on discussion for the activity, including observations and explanations. Tell them the “teacher” will direct the “students” to do the activity as described on the sheet. The “teacher’s” main focus, however, will be leading discussions about their predictions, observations and explanations. It will be up to the “teacher” to improvise how to best do this, incorporating strategies they have learned in this session.

4. “Teachers” can switch roles or ask for suggestions from peers. If a “teacher” gets “stuck” or frustrated, suggest that they ask others in their group for suggestions on how to lead the discussion, or allow someone else in the group to be “teacher” for a while. If a group finishes early, tell them to choose a different person be the “teacher,” and lead them through the discussion again, using the same cups as before.

5. Teachers conduct the activity. Allow fifteen minutes for “teachers” to practice leading the activity with their “students.” Call time after fifteen minutes, and tell the groups to stop the activity and discussion, whether or not they have finished.

6. Collect materials while groups discuss the activity. Instruct the table groups to discuss what worked well, as you circulate and collect all the materials from the tables. They can also discuss any issues that might have come up, and what a teacher might do to avoid or address those issues. Ask them to try to brainstorm other possible ways the activity and discussion might have been led. Allow about five minutes for this discussion.

7. Large group share of what worked well, issues, ideas. After five minutes, get the attention of the class. Ask participants to share with the whole group what worked well in their discussion. After a few participants have shared, ask them to share any issues that came up, as well as ideas they discussed about how to address those issues.

8. Emphasize the power of developing a strategy for using particular response strategies in the classroom. Tell participants that through selective use of appropriate response strategies and awareness of the effects of different types of responses, a teacher can effectively support student participation in classroom discussions as well as other activities.

Oil on the Beach Activity

- 1. Introduce activity.** Tell the class that now you're going to model teach an activity for them to participate in.
- 2. Distribute *Strategies Checklist* to each participant.** Distribute a *Strategies Checklist* to each participant. Tell them that they will be taking part in the activity as students would, but they will also need to be aware on a **metacognitive** level, and take notes on the teaching strategies incorporated in the lesson.
- 3. Model strategies during lesson.** Remember to model wait time and inclusive discussion strategies during the lesson.

Setting the Stage

- 1. Content explanation about oil.** Explain that people use a lot of industrial oil in our everyday life. We use it to make gasoline to run cars and to make machinery run more smoothly and even to make many things like plastic, nylon, and Styrofoam. People drill oil wells to get oil out from under the ocean, and oil is transported in ships from the oil wells to places where it is changed into different forms of oil and refined. Sometimes oil wells leak, and sometime oil tankers have accidents at sea; oil rushes from the wells or tankers into the ocean. This creates a disaster, harming ocean organisms and traveling long distances in currents where it washes ashore on beaches.
- 2. Participants discuss ideas about cleaning up oil with partner.** Ask participants (in the role of elementary students) to discuss the following question for one or two minutes with the person next to them, "If you had the opportunity to help clean up an oil spill, what would you use?"
- 3. Model using a signal, and participants share ideas about how they would clean it up.** Use a signal (hand clapping, flick lights, hand signal, bell, or whatever) to get the whole group's attention, and ask them to raise their hands to share their ideas with the large group. Call on a few volunteers and accept all answers.
- 4. Participants raise hands about cleaning up ALL the oil.** Ask participants to raise their hands to answer this question: "Do you think you could clean all the oil off a beach that currents carried there?" "Does it make a difference if the oil was on the sand or in the water?" Call on a few volunteers. Accept all answers. Ask for rephrasing where needed and other ideas.
- 5. Explain cleanup scenario.** After generating a few ideas, tell the participants that they will now get a chance to try to clean up an oil spill—before it comes ashore. Tell them to imagine that they are scientists and engineers trying desperately to find the right materials and tools to surround and absorb the oil before it harms the ocean and beach organisms and habitats.
- 6. Display model ocean and oil.** Show the participants the model ocean (bowl of water) that they will try to clean up and the squeeze bottle filled with oil.

Making Predictions

1. Divide the class into groups. Tell them that each group is a taskforce, trying to find the best clean-up item as well as the worst clean-up item from a given collection of items. Each team will have the same clean-up items, but it will be up to the team to decide how to use the items.

2. Explain how to make predictions. Before getting started on the clean-up, each team will need to make predictions about which items they think will work the best. But before they can make a prediction about an item, they will need to look at it very closely to explain why they think it will or will not work. Tell the participants that they will have a few minutes to check out all the clean-up items and discuss with their group which ones they think will clean up a lot of oil, and which ones will clean up only a little oil.

3. Observe clean-up materials. Distribute a bag of clean-up items to each team. Have them place all the clean-up items contained in the bag in the center of the table so that everyone on the team can see and take turns touching them. Circulate around the room, asking questions about what they predicted and asking them to explain their reasoning. Tell them that everyone in the group does not have to agree with the same prediction, but they do need to discuss their reasons. Remind them to look at each of the items carefully before making a decision about its effectiveness.

4. Introduce prediction data sheet. After most groups have carefully observed and discussed each item, use a signal to get everyone's attention. Show them an overhead or slide of the prediction data sheet and model how to do the first item on the list. Ask the class, "Do you predict that nylon will clean up a little or a lot of oil?" Tell them to discuss it again with their group before anyone raises their hands. Remind them that they will need to give a reason for their prediction. After about a minute, ask the question again and have participants raise their hands to answer. Call on a few. Ask for other ideas. Record responses on the data sheet.

5. Distribute a prediction data sheet to each participant. Distribute a prediction data sheet to each participant. Tell them to complete the data sheet as individuals, but they are welcome to discuss their ideas again with their team. Circulate and check to see that each participant understands how to record his or her predictions. Remind participants to help their teammates and discuss their ideas.

6. Record ideas on class data sheet. After most participants have completed the data sheet, regain the classes attention with a signal. Lead a class discussion and record their ideas on the prediction data sheet shown on the overhead. Ask for alternate ideas and explanations. Make noncommittal, yet encouraging, responses.

Cleaning the Oil Spill

1. Introduce oil spill scenario. Tell participants that they are now ready to try to clean up the oil spill. Say, “Something terrible has happened. A ship has run aground and oil is spilling into the ocean.” Shake the squeeze bottle of oil vigorously and place 5–6 drops of oil into the model ocean (bowl 3/4 filled with water).

2. Show overhead of the Results data sheet. Model how to complete the data sheet by taking the first item on the list and dabbing it into the oil. Show the participants the item coated with oil and then place it onto a paper towel. Ask participants to think silently to themselves about this question: “Would you say this cleaned up a little or a lot of oil?” After a minute or so, have teams discuss this question. Call on a few and lead a class discussion about their ideas.

3. Explain how to use results data sheet. Tell participants that they will be given a data sheet and each person will pick one of the items on the list to try. The participant with the first item listed on the data sheet tries to clean up the oil from the water first. Then the participant with the second item on the list tries, and so on. Participants should place the oiled clean-up items on the paper towels. Everyone will need to complete the results column for each item before they can go onto the next item on the list. Again, they don’t all have to agree on whether it cleaned up a little or a lot, but they do need to discuss the results and write down their observations.

4. Distribute model ocean and oil. Distribute the model oceans to each team and squeeze drops of oil into each.

5. Circulate around room. Circulate to be sure participants understand the task and are working together. When teams have completed the clean-up, get the classes attention with a signal. Ask participants to wipe their hands, pick up their results sheet and sit away from the materials.

Debriefing the Results

1. Display the results overhead. Ask the class to help complete the observation portion of the data sheet for the first item. Have participants raise their hands and record their ideas. Ask if other participants made the same observations and who saw something different. Say, “Raise your hand if you think this item cleaned up a little oil.” Ask for explanations of their ideas. Then, “Raise your hand if you think *this* item cleaned up a lot of oil.” Again, ask for explanations for their ideas. Repeat for every item, asking first for observations and then for whether it cleaned up a little or a lot of oil.

2. Participants do Quick Write about recommendations for cleanup. Have participants do a 3 minute Quick Write about what item they would most highly recommend scientists to use when cleaning up an oil spill and which item would they most definitely not recommend. Tell them they have to use observations and evidence in their writing. (To do a Quick Write, ask participants to write non-stop for 3 minutes, recording any thought they have about the question.) After 3 minutes, use a signal to get the whole group’s attention, and call on a few participants to share their ideas.

3. Pose question about extent of clean-up. Ask: “Would any group say they really cleaned up their oil spill?” “Was any group 100% successful?” [Their responses may lead the class to conclude that the phrase “oil spill clean-up” contradicts itself, because it is not really possible to clean up an oil spill completely.]

4. Small groups discuss ideas to prevent oil spills. Have participants discuss with their group, and be ready to share out an answer to this question in three minutes: “What can we do to prevent oil spills from happening in the first place?” Tell them to have one person act as a recorder of the group’s ideas.

5. Circulate, then one person from each group shares. Circulate to make sure everyone is participating in the discussion and then call on someone from each group to share out their ideas. [Engage in oil conservation, encourage use of alternative energy sources, tune up cars.]

6. Content discussion about oil pollution. Remind participants that although oil spills by large vessels are major disasters, much more oil makes its way to the ocean each year by leaking out of cars onto streets or being poured in small amounts down storm drains where it eventually drains to the ocean. This emphasizes the fact that individuals also have a great deal of responsibility for reducing oil pollution. As a society, we can also propose laws that make oil drilling and transportation safer.

Optional Content Note: Actual clean-up procedures were simulated by the items used in this activity. For example, oil is strongly attracted to oil-based materials like nylon — the nylon floats on the surface and acts as a filter or sieve, collecting the oil and letting the water pass through. Sand absorbs the oil, but because sand is heavier than water, as it sinks it carries the oil to the bottom with it. Cotton and hay are also used to absorb the oil. Feathers and fake fur represent the unlucky animals coming in contact with the sticky oil.

Strategy Debrief

1. Display strategy checklist. Tell your course participants to focus on their *strategy checklist*. Give them a few minutes to review their notes and to add more.

2. Participants share their observations. Go through each item on the list, asking your participants to provide examples they witnessed. Move quickly through those that do not appear to warrant discussion, but spend time on any that do.

3. Emphasize whole class response strategies. Point out that many of the response strategies modeled allow the whole class to respond.

- Hand signals
- Tell a neighbor
- Partner discussion, then large group discussion
- Quick Write assignment

Reflecting on the Session (5 minutes)

1. Introduce Quick Write prompt for the session. Tell each participant to take out a piece of paper and write their thoughts about how the session has affected their ideas about teaching and learning. Display the following slide:

Summarize your thinking about responding to students during a discussion. If you can, include:

- How have your ideas about teacher responses changed?
- What do you think made your ideas change?
- How might you use this in your science teaching?

Homework (5 minutes)

Assign reading from course reader.

Notes for the Presenter: Modeling Effective Discussion-Leading Techniques

Some general strategies to keep in mind while leading a discussion:

- Create a safe, non-intimidating environment
- Use wait time (pause ~3–5 seconds after asking a question before calling on students)
- Try to call on the same number of females and males
- Try to include the whole group in the discussion
- Offer safe questions to shy students
- Use the discussion map:
 - Ask a broad question
 - Listen to response and thinking
 - Ask for evidence or explanation
 - Ask for alternative opinions or ideas
- Use broad (open-ended) questions to encourage participation
- Encourage student-to-student talk by suggesting that they direct their statements to each other
- When appropriate, employ hand-raising or hand signals to ensure that aggressive students do not dominate
- Try to find out what students are thinking
- Show students you value what they are saying, by incorporating what they have said into what you say, and building on previous comments creating continuity in the discourse
- Consider your role as the teacher to be a collaborator with the students, trying to figure things out together
- Provide a chance for students to figure things out for themselves, rather than telling them the answer
- Give non-judgmental responses, even to seemingly outlandish ideas

Roles:

Teacher: Trying to get discussion going.

Male students #1 & #2: Enthusiastically raise their hands immediately after most questions by the teacher.

Male student #3: Shy and reluctant to participate. Easily embarrassed.

Female students #1 & #2: Interested in the discussion.

Tides Discussion Skit

Narrator: The scene is a seventh grade classroom. Students have recently participated in hands-on activities about tides, and the teacher is now leading a discussion about their findings.

1. Teacher: What are some interesting things you learned about the tides?

Male student #1 hand goes up immediately, and teacher calls on him immediately. (Female students #1 and #2 and male student #3 do not raise their hands.)

2. Male student #1: The moon creates the tides.

3. Teacher: Would someone like to try to explain how the moon creates the tides?

Male student #1's hand goes up immediately, and teacher calls on him immediately.

4. Male student #1: Because of gravity.

5. Teacher: Gravity from where? Can someone explain how that might affect the tides?

6. Male student #1: Gravity of the moon pulling on the Earth.

7. Teacher: What do you mean by the moon pulling on the Earth?

8. Male student #1: I dunno.

Male student #2's hand shoots up and teacher calls on him immediately.

9. Male student #2: It's the earth spinning too.

10. Teacher: What do you mean by the Earth spinning?

11. Male student #2: As the Earth rotates, the moon's gravity pulls on the land and water below it.

12. Teacher: Can you explain a little more what you mean?

13. Male student #2: The pull of water or bulge of water that the moon is pulling on is a high tide and that high tide moves as the Earth rotates.

14. Teacher: Hmmmm interesting. What do you think? *(Calls on male student #3)*

15. Male student #3: *He is surprised to be called on and embarrassed. Huh? Uh... I dunno.*

16. Teacher: Does anyone have any different ideas of what might be going on? *Male student #1's hand goes up immediately, and teacher calls on him immediately. Male student #3 continues to look embarrassed.*

17. Male student #1: Yeah, I think that there's not just a bulge of high tide directly under the moon, but also on the other side of the Earth, opposite the moon.

18. Teacher: Hmmm. We seem to have a strange phenomenon here. Can anyone think of a way to explain how a bulge of water could form on the opposite side of the Earth as well? *Male student #2's hand goes up immediately, and teacher calls on him immediately.*

19. Male student #2: The spin of the Earth is what also throws the bulge of water on the opposite side.

20. Teacher: Can you explain a little more?

21. Male student #2: Its like if you're on a really fast merry-go-round. You feel a force pulling you to the outside of the ride. That force is also pulling water to the opposite side of the Earth.

22. Teacher: Has anyone else ever felt this sort of force? *Male student #1's hand goes up immediately, and teacher calls on him immediately.*

23. Male student #1: Yeah, actually I feel it when my dad is driving and he goes around a curve really fast. I get pressed up against the door by the same kind of force.

24. Teacher: So the force you both are describing is the tendency for moving objects to continue to move in a straight line. As the car begins to follow a curve in a road, your body continues to move in a straight line. You eventually feel the force of being pressed against the window or door as the car adjusts the direction of your body's motion. That force you feel is centrifugal force. But we'll get into these forces in more detail later. Now let's keep thinking about the tides, 'cause I have another question.
Directs attention to student #3.

25. Teacher: Didn't I see you using paper models of the Earth and moon to help understand the tides?

26. Male student #3: Uh huh.

27. Teacher: About how big was the moon model? *Male student #3 indicates ~ 3 inches with his hands.*

28. Teacher: About how big was the Earth model? *Male student #3 indicates ~ 1 foot with his hands.*

29. Teacher: So here's my question. How does the sun... which is so much larger than the Earth and moon and has so much more gravity... how does the sun play a role in the tides?

Teacher waits at least 3 seconds. The two male students' hands are raised immediately, female student #1 raises hers after ~2 seconds, and female #2 after ~3 seconds. Teacher calls on Female student #1.

30. Female student #1: The sun is bigger than both the Earth and moon but it's also much farther away.

31. Teacher: So then does the sun have an effect on gravity?

Wait 3 seconds.

Teacher waits at least 3 seconds. The two male students' hands are raised immediately, female student #1 raises hers after ~2 seconds, and female #2 after ~3 seconds. Teacher calls on female student #2.

32. Female student #2: The sun has gravity that affects the Earth. It's what keeps the Earth in orbit around it. But with the tides, it's the weaker force compared with the moon's gravity.

33. Teacher: So you are saying that the gravitational pull that creates the tides is exerted by both the sun and the moon, but the moon's force is much greater because the moon is so much closer to Earth.

34. Female student #2: Yeah.

35. Teacher: So are there times when the sun's weaker gravitational pull on Earth's water is more obvious?

Teacher waits at least 3 seconds. The two male students' hands are raised immediately, female student #2 raises hers after ~2 seconds, and female #1 after ~3 seconds. Teacher calls on male student #1.

36. Male student #1: Yeah, when the Earth, moon, and sun are in a straight line.

37. Teacher: So what should be observed when the Earth, moon, and sun are in a straight line?

Teacher waits at least 3 seconds. The two male students' hands are raised immediately, female student #2 raises hers after ~2 seconds, and female #1 after ~3 seconds. Teacher calls on Male student #3.

38. Male student #3: That's when we have really high high tides and low low tides.

Research Related to Promoting Discussion

Using Wait Time

The concept of “wait-time” as an instructional variable was invented by Mary Budd Rowe (1972). The “wait-time” periods she found—periods of silence that followed teacher questions and students’ completed responses—rarely lasted more than 1.5 seconds in typical classrooms. She discovered, however, that when these periods of silence lasted at least 3 seconds, many positive things happened to students’ and teachers’ behaviors and attitudes. To attain these benefits, teachers were urged to “wait” in silence for 3 or more seconds after their questions, and after students completed their responses (Casteel and Stahl, 1973; Rowe, 1972; Stahl, 1990; Tobin, 1987).

When students are given 3 or more seconds of undisturbed “wait-time,” there are certain positive outcomes:

- The length and correctness of their responses increase.
- The number of their “I don’t know” and no answer responses decreases.
- The number of volunteered, appropriate answers by larger numbers of students greatly increases.
- The scores of students on academic achievement tests tend to increase.

When teachers wait patiently in silence for 3 or more seconds at appropriate places, positive changes in their own teacher behaviors also occur:

- Their questioning strategies tend to be more varied and flexible.
- They decrease the quantity and increase the quality and variety of their questions.
- They ask additional questions that require more complex information processing and higher-level thinking on the part of students.

Handling Dominating Students

As reported in “The One or Two Who Talk Too Much” (1988), researchers Karp and Yoels found that in classes with fewer than forty students, four or five students accounted for 75 percent of the total interactions per session. In classes with more than forty students, two or three students accounted for 51 percent of the exchanges. Here are some ways to handle dominating students:

- Break the class into small groups or assign tasks to pairs of students.
- Ask everyone to jot down a response to your question and then choose someone to speak.
- If only the dominant students raise their hand, restate your desire for greater student participation: “I’d like to hear from others in the class.”
- Avoid making eye contact with the talkative.
- If one student has been dominating the discussion, ask other students whether they agree or disagree with that student.
- Explain that the discussion has become too one-sided and ask the monopolizer to help by remaining silent: “Larry, can you hold off on talking for now, so that we can hear the reactions of other group members.”
- Assign a specific role to the dominant student that limits participation (for example, periodic summarizer/synthesizer for the group).
- Acknowledge the time constraints: “Jon, I notice that our time is running out. Let’s set a time limit on everybody’s comments from now on.”
- If the monopolizer is a serious problem, speak to him or her after class or during office hours. Tell the student that you value his or her participation and wish more students contributed. If this student’s comments are good, say so; but point out that learning results from give-and-take, and everyone benefits from hearing a range of opinions and views.

Hand Raising during Discussions

When students were observed conversing with their friends in an informal setting prior to the introduction of the new social norms, they were animated, excited, quick to correct each other, and they appeared to be consumed by whatever topic was at hand. This was a stark contrast to what was observed during the phase of the study during which the “raise your hand” rule was

in place.

Students had consistent, observable patterns established in regard to raising their hands. The videotapes confirmed that many of the students would raise their hand to speak, but as soon as a student was selected to speak, the other students appeared to disengage. It was as if they realized that if they were not chosen, they no longer needed to be active participants in instruction. It appeared at times that students were completely uninterested in the lesson being taught. The same students would raise their hands to participate while other students would sit daydreaming or drifting during instruction. It was observed frequently that while one student was answering a question, others would sit with their hand up. This was an indication that although they were engaged in the topic at hand, they were most likely thinking of what they wanted to say next instead of listening to the student who was speaking.

When students were given the ability to talk directly to one another without first needing to raise their hands, several things happened. First, students stayed engaged in the conversations. They knew that they would have an equal opportunity to share their ideas. Within the context of this setting, they were invigorated and excited to converse with their peers. Most importantly, they began to understand that mathematics was something to explore. Perhaps they could see that getting correct answers was not as important as sharing ideas and exploring the mathematical concepts (Dixon, Egendoerfer, Taylor, Clements).

On the other hand...

According to *The Art of Inquiry* (Cecil, 1995): When you ask questions, do not recognize students who shout out responses; instead, insist that they raise their hands and wait to be called upon before they respond. Though many teachers worry that such rules are unnecessarily rigid and other teachers are delighted when they hear immediate responses shouted out, such behavior results in unequal interactions. Boys tend to be more vociferous than girls in class, for example. On the other hand children from certain cultural groups are taught at home to be polite and even self-effacing; they too are usually overshadowed by children who shout out answers (Davidman, 1994).

According to Michael Linsin (*Dream Class* 2009): Calling out is a momentum killer of the highest order and can turn a well-planned lesson into a halting mess.

Calling out is unfair: Every student has a right to participate, not just those who are more assertive. If calling out is allowed, a segment of your classroom will rarely be heard from.

Calling out inhibits learning: Good teaching allows students to form their own ideas, opinions, and conclusions before an answer is revealed or a thought expressed. Students need time—even if it's just a few seconds—to puzzle over the presented material before discussion takes place.

Calling out tilts the playing field: Students who participate are more recognized than those who are more reluctant. Allowing students to call out gives socially confident students an unfair advantage. Shy or less confident students, then, are left feeling unwelcome and disconnected from the rest of the class.

Calling out is rude: Allowing students to call out encourages selfishness. Students think, *if I want something in this class, I'm going to have to bully my way to the front because that's what everyone else is doing*. In this environment, rudeness, unhappiness, and misbehavior are commonplace.

An Exception:

An exception to the hand-raising rule is when you're working with a small group of students. Guided reading or literature circles should allow for polite but free-flowing conversation.

Calling on Boys versus Girls

Current research confirms that teachers call on boys more often than girls, accept more call out responses from boys than girls, give boys more wait-time to respond, and give boys more praise and remediation than girls (Sadker & Sadker, 1994; Biklen & Pollard, 1993). Teachers usually are not aware that they favor the boys in their classroom over girls and are genuinely surprised when they learn of these inequities as they conference with trained observers or watch videotapes of their teaching (Wellhousen & Yin, 1997).

Encouraging Students

(Adapted from the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey-Bass Publishers: San Francisco, 1993.)

Use nonverbal cues to encourage participation. For example, smile expectantly and nod as students talk. Maintain eye contact with students. Look relaxed and interested.

Draw all students into the discussion. You can involve more students by asking whether they agree with what has just been said or whether someone can provide another example to support or contradict a point: “How do the rest of you feel about that?” or “Does anyone who hasn’t spoken care to comment on the plans for People’s Park?” Moreover, if you move away from—rather than toward—a student who makes a comment, the student will speak up and outward, drawing everyone into the conversation. The comment will be “on the floor,” open for students to respond to.

Give quiet students special encouragement. Quiet students are not necessarily uninvolved, so avoid excessive efforts to draw them out. Some quiet students, though, are just waiting for a non-threatening opportunity to speak. To help these students, consider the following strategies:

- Arrange small group (two to four students) discussions.
- Pose casual questions that don’t call for a detailed correct response: “What are some reasons why people may not vote?” or “What do you remember most from the reading?” or “Which of the articles did you find most difficult?” (McKeachie, 1986).
- Assign a small specific task to a quiet student: “Carrie, would you find out for next class session what Chile’s GNP was last year?”
- Reward infrequent contributors with a smile.
- Bolster students’ self-confidence by writing their comments on the board (Welty, 1989).
- Stand or sit next to someone who has not contributed; your proximity may draw a hesitant student into the discussion.

Tactfully correct wrong answers. Any type of put-down or disapproval will inhibit students from speaking up and from learning. Say something positive about those aspects of the response that are insightful or creative and point out those aspects that are off base. Provide hints, suggestions, or follow-up questions that will enable students to understand and correct their own errors. Billson (1986) suggests prompts such as “Good—now let’s take it a step further;” “Keep going;” “Not quite, but keep thinking about it.”

Types of Teacher Responses

(From *The Art of Inquiry* Nancy Lee Cecil, 1995)

Accepting Teacher Responses

The teacher should give an accepting response after asking a broad question. The goal here is to bring about further thought and interactions between students. Accepting responses tend to:

- Create a safe climate for participation
- Encourage a variety of responses
- Allow students to be responsible for deciding what to do for themselves, take risks, and learn consequences of their actions

Passive Acceptance: A response that does not indicate agreement or disagreement with the student’s answer. Allows the teacher to acknowledge the contribution made by the student. Can be useful to use when a student gives an unexpected answer and the teacher wants to encourage continued discussion.

- Examples: “Interesting idea.” “That’s a possibility.” “Does anyone have a different idea?”

Active Acceptance: Restating the student’s answer in a way that shows understanding. Lets the student know that the idea has been received and is understood. Can also help to clarify the student’s statement.

- Example: “So Sara is saying that the wood floats.”

Empathic Acceptance: Teacher attempts to explain the reasoning behind the student's answer. Lets the student know the teacher understands what they're saying as well as the evidence (or the emotion) behind it.

- Example: "Oh, I see why you think that all spoons float, because look at all these spoons - they all float."

Probing Teacher Responses

When students respond and it is not clear what is meant by their statement or how they have arrived at their understanding, the teacher should respond by asking follow-up questions to obtain more information. The goal is to reveal and better understand student thinking and also to encourage students to build on each other's ideas.

- Example: "What makes you say that?" "I'm curious what you meant by 'chemicals are reacting.'" "Can you say more about that?" "Can anyone else help to explain this idea?"

Confirming Teacher Responses

When students respond to a focused question, the teacher should give a confirming response. Both praising and informing responses can help to summarize or close the discussion, as well as confirm students' understanding.

Praising Response: The teacher indicates to the student that his or her response is correct. When the goal is for students to think critically and creatively, the teacher should be careful with the use of strong praise, as it tends to squelch higher-level thinking.

- Examples: "Right!" "Good thinking!"

Informing Response: The teacher indicates that the student has correctly understood and responded to the question or that he or she needs to think about it further.

- Example: "Yes, you are on the right track, but have you thought about..."

Student Responses

Teacher: “What can you tell me about things that float without using tricks?”

Student Responses:

Student #1: “Spoons float.”

Student #2: “The mocus they’re moving. But then they stop. And when they stop, it floats.”

Student #3: “Light things float.”

Student #4: “Things that are less dense than water float.”

Student #5: “My uncle has a boat. And when we go fishing, we catch lotsa fish, but my brother doesn’t like to fish, ‘cause he thinks they’re gross.”

Discuss how you might respond to each of these student responses.

Notes for the Presenter: Brainstorming Responses

Below are some possible responses to the children's responses that your participants may bring up and the rationale for using specific teacher responses. You may refer to these notes as needed while leading your discussion.

Student response: "Spoons float."

An inaccurate statement, but it could be merely based on limited testing.

Possible teacher response: Empathic response: "This spoon floats, and so does this one. That seems to be a pretty accurate thing to say based on the spoons we have tested so far. I wonder if all spoons will float? Let's test some more."

Note: By responding this way, the teacher validates the child's thinking, as well as the evidence their statement seems to be based upon. By guiding the students to test more spoons, the teacher allows the student to discover through additional evidence that the statement is inaccurate. If necessary, the teacher can bring in more spoons for the children to test, including at least one that sinks. There are certainly times when a teacher will find it best to verbally correct a student's inaccurate idea, but it is generally more effective to guide the students towards evidence that conflicts with their ideas, and allow them to discover inaccuracies themselves.

Student response: "The mocus they're moving. But then they stop. And when they stop, it floats."

This response seems to indicate some confusion, including what's probably a mispronounced version of "molecules."

Possible teacher response: Active response: "What do you mean by 'mocus'?" "Do you mean molecules?" "Why would it float if the 'mocus or molecules' stop?"

Note: This response allows the teacher to probe more to find out what the student is thinking. The student may have some understanding of molecules and be hypothesizing that they have something to do with floating and sinking, or they may just be using a "science word." If the student's response to probing seems really convoluted and you have no idea what they are talking about, you may need to use a more passive response, such as, "could be," or "Hmm, interesting idea," and then just move along with the discussion.

Student response: "Light things float."

It could be that the student is expressing a commonly held misconception about floating—that light things float and heavy things sink. However, it could also be that they understand that less dense materials float, but they just aren't using the more accurate phrasing.

Possible teacher response: Empathic response, while pushing them to go further: "This light thing floats, and so does this one. Can you give us an example of some other light things that float? I wonder if all light things will float? Would you call this grain of sand light? Let's test to see if it will float."

Note: This series of questions and testing can help guide other students in the class to formulate more accurate ideas about "light" versus "heavy" objects.

Student response: “Things that are less dense than water float.”

The statement may indicate that this student has an understanding of density or it may simply be something they have heard before and not understood completely.

Possible teacher response: Active response: “What do you mean by things that are less dense? Can you give some examples of things that we could test?”

Note: An active response allows the teacher to check the student’s understanding, and also to give other students the opportunity to listen to the child’s explanation, and perhaps expand their own understanding. Be sure to continue to take other responses as well, to indicate to the group that all responses are valued in the discussion. If you want the discussion and thinking in the group to continue, don’t get too excited in your response to this student or simply announce that they are correct. Other students may then stop participating for fear of providing wrong answers and you would not have the opportunity to see if they understand the concept. You can always come back to the density idea later and let them know that this is what scientists think, too.

Student response: “My uncle has a boat. And when we go fishing, we catch lotsa fish, but my brother doesn’t like to fish, cause he thinks they’re gross.”

Very likely indicating the student is attempting to participate, but may not have anything to contribute to the topic or understand the focus of the discussion.

Possible teacher response: Active response to highlight the one piece of relevant content in the statement: “So you’re saying that boats float? Does anyone have any ideas on why boats float? Do boats ever sink? Why?”

Note: Sometimes a student response like this one needs to be gently redirected, otherwise the student may dominate the discussion while others become bored and distracted. If you think the student is off task and is merely seeking attention, then you can say “We are not talking about boats or fish right now, unless you want to relate them to floating and sinking.”

Swirling Colors Activity

Notes to “teacher:”

- How will you get the “students” engaged with the activity?
- How will you communicate the procedure to your “students?”
- How will you keep all the “students” involved in the activity and the discussion?
- How will you encourage careful observation?
- How will you encourage discussion and thinking?
- How will you create an environment in which your “students” will feel comfortable sharing ideas?

The following is a “bare bones” procedure list for the activity. It is up to you to improvise and make it a rich and thoughtful experience for your “students.”

TRY NOT TO RUSH THROUGH THIS PROCEDURE

Procedure

1. Student measures 4 teaspoons of salt into the cup labeled “salt.”
2. Student stirs the water until they can’t see the salt anymore.
3. Remove the stir stick from the water, and *don’t stir the cups any more*.
4. Students observe and discuss what happened.
5. Teacher adds a drop of food coloring to the *other* cup labeled, “plain.”
6. Students observe and discuss what happened.
7. Teacher adds a drop of food coloring to the cup labeled, “salt.”
8. Students observe and discuss what happened.
9. Discuss differences between how the food coloring moved in the plain water and the salt water cups.
10. Discuss possible explanations for what was observed.

Focus Topics for the Session:

- A. Types of **teacher** responses to **students**
- B. How **students** respond to **teacher** responses
- C. Timing of **teacher** responses
- D. Involving everyone in the discussion

Student Responses

Teacher: “What can you tell me about things that float without using tricks?”

Student Responses:

- “Spoons float.”
- “The mocus they’re moving. But then they stop. And when they stop, it floats.”
- “Light things float.”
- “Things that are less dense than water float.”
- “My uncle has a boat. And when we go fishing, we catch lotsa fish, but my brother doesn’t like to fish, ‘cause he thinks they’re gross.”

Discuss how you might respond to each of these student responses.

Quick Write Prompt

Summarize your thinking about responding to students during a discussion.

If you can, please include:

- How your ideas may have changed about teacher responses
- What do you think made your ideas change?
- How might you use this in your science teaching?

Strategy Checklist:

Circle & take notes on strategies you noticed during the lesson

Group attention-getting techniques

Student response strategies:

- Hand raising
- Hand signals
- Tell a neighbor
- Partner discussion, then large group discussion
- Quick-write assignment

Materials management strategies

Explanation of procedures

Positive learning environment

Strategies for dealing with disagreement

Teacher responses to student responses:

- Passive
- Active
- Empathic

Learning Cycle

Invitation

Exploration

Concept Introduction

Application

Wait time

Finding out what students think

Checking for understanding

Discussion away from distracting materials

Appropriate broad and narrow questions (jot down some examples)

Activities provide opportunities to discover concepts

Opportunities to see conflict in ideas

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