Session 5: Question Lab

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Session 5: Question Lab

Overview

The *Question Lab* can be one of the most exciting and rewarding sessions of the *Communicating Science* course, because the course participants have the opportunity to interact directly with young students. The goal for participants is to attempt to put theory into practice in a safe environment—to apply their questioning plans in a real-life teaching context.

— If the invited students are children, participants get an added benefit in that some college students have not had much opportunity to be around much younger students, and may be a little nervous about how to work with and talk with them. Course participants quickly learn whether or not their questioning strategies are effective—the students let them know by the ways they respond.

— Through working with young students, participants also learn the importance of being flexible and realistic with their instructional plans.

— In addition to interacting directly with the students, in this session course participants have the opportunity to watch an instructor (one of the course presenters or someone of your choice) model how to lead a discussion with students.

The suggested Sink-Float activity is an excellent platform for this purpose. Some brief scientific background is provided on the next two pages.

The opportunity to see ideas about teaching and learning put into practice can be quite powerful. Just by watching how eager and excited children get about simple materials and discoveries—and seeing how hard it is for them to wait to be called upon when they raise their hands—can be an eye-opener for some course participants.

Background Information for Presenter

Possible Concepts to Focus on During the Sink/Float Activity

There are a number of concepts and ideas that may come out of a discussion of the sink/float activity with visiting students. In order to assist in making the discussions as fruitful as possible, we've provided a large number of conceptual goals and possible lines of questioning to guide the discussion, ranging from extremely simple to quite complex. Be sure to read through them to foresee some of the possible pathways for discussion. Choose one or more that you think will be appropriate for the visiting students, depending on whether they are elementary school children or university students.

The main science concepts that tend to emerge from this activity involve understandings about ***density*** and ***buoyancy***. *Surface tension* can also influence their investigation results, and may also be a topic for discussion. Each of these concepts can be approached from an observable "macroscopic" level, or a more theoretical "microscopic" level dealing with the particulate nature of matter. Therefore, depending on the background and experience of the visiting students, the discussions can be approached at different levels of complexity and detail. Elementary school students tend to grapple with these concepts primarily on an observational level, starting with more basic observations and ideas, but they can often raise questions about the theoretical constructs as well. A few "sub-concepts" or "precursor concepts" for each of these topics are outlined below to illustrate how to build upon foundational ideas.

It's important, however, to acknowledge that these ideas are quite challenging, and to keep your expectations reasonable. During the session, elementary school students may have rich investigations and discussions on sinking and floating, but it's highly unlikely that they will leave the room understanding density. More likely, they will have made observations that add to their growing mental frameworks on this topic, and will have acquired a bit more experience and information that will help them understand the concept more fully in the future.

Older students may also approach these concepts from a macroscopic level, but with the added benefit of a larger conceptual framework and more exposure to generalized inferences. They may be able to gain a better understanding of more complex ideas through their discussions. Keep in mind, though, that older students with significant science background and opportunities to learn may *seem* to understand these concepts on a more theoretical level, but may still be limited in their understanding of molecules and how the molecular arrangement affects density and/or buoyancy. They may also be able to repeat formulas and definitions for density and buoyancy, without fully understanding the concepts.

Concepts Involving *Density*

Density: a property of a substance that can be used to predict whether it will sink or float.

Density Concept 1: **Some materials tend to float, other materials tend to sink.**

Density Concept 2: **You can predict whether or not something floats or sinks based on the material it is made of, as opposed to the size of the object.**

Density Concept 3: **If the average density of an object is less than the density of water, it will float. If the average density of an object is more than the density of water, it will sink.**

Density Concept 4: **Materials made up of molecules more tightly packed than those in water are more dense, and will sink. Materials made up of molecules more loosely packed than those in water are less dense, and will float**

Concepts Involving *Buoyancy*

Buoyancy: the upward forces involved in keeping something afloat

Buoyancy Concept 1: **Objects float when water pushes up on them and keeps them from sinking. Sometimes packing them into a smaller, more compacted shape can cause them to sink, and flattening them can cause them to float.**

Buoyancy Concept 2: **An object floats if it pushes aside or *displaces* a certain amount of water to support its weight. An object sinks if the water that is displaced is less than the weight of the object.**

Buoyancy Concept 3: **The upward force of a liquid on an object placed in the liquid is called buoyancy. For an object to float, the buoyancy force directed upwards must be equal to the downward force of gravity on the object, i.e., its weight.**

Buoyancy Concept 4: **Increasing the amount of surface area of an object that is in contact with a liquid increases the liquid's ability to support the object, by increasing the amount of buoyant force that can be applied.**

Materials and Preparation

Materials Needed

For the class:
— one name-tag for each student and participant.
— dark-colored broad-tipped felt markers for making name-tags

For the Sink/Float Activity:
— same materials as for the previous session (see Materials and Preparation for Session 4, *Questioning Strategies*)

For the model discussion:

— one large transparent container, such as an aquarium. A plastic container is better than glass, because heavy objects dropped in the water could break the glass, unless you gently lower them in the water with your hands. (Note: the *Cambro 22SFSCW 22 Quart Square Food Storage Container – Clear* works well)

— A collection of rocks made of similar materials, but of many different weights, from grains of sand and pebbles to about 5 pounds.

— A collection of pieces of wax of many different sizes, from tiny pieces to about 2 pounds. (note: you can make the smaller pieces by breaking up a larger piece)

— A few different sets of *pairs* of objects made of the same material, with one of the objects being heavy (about 2–5 pounds) and the other being so light its weight is hard to even feel (like a tiny pebble). Multiple sets of each type will allow multiple teams of students to use them in their investigations. For example"

- wood (e.g., small log and sliver of wood or piece of toothpick)
- metal (e.g., large steel bolt and BB or tiny washer)

Note: It's important that both objects in each pair of objects behave the same way in water (sink or float). Test your objects in advance. If you use a material like plastic, of which there are some types which float, and some that sink, make sure that both objects in your pair are made from the same kind of plastic, or at least behave the same way in water.

Preparation Before the Session

For the Sink/Float stations:

1. **Calculate materials needed.** Make sure that you have enough materials to set up as many stations as will be needed to accommodate one or two course participants working along with a few invited students at each work table.

2. **Gather additional materials for investigations.** So that students can test both large and small samples of different types of materials, gather together materials on separate trays: on one tray place the rocks of different sizes you gathered (including sand grains), on another place the wax of different sizes. On other trays place wood, metal and whatever else you gathered.

3. **Prepare questions for discussion.** Read through the Sink/Float discussion suggestions for sample questions and to decide which level of concept development you will attempt to pursue with the visiting students.

> ***Note on selecting the model discussion leader:*** Since two parts of this class are designed as an opportunity for the course participants to witness and critique discussion-leading strategies, you'll need to have someone who is skilled and experienced at leading discussions with the age-level of students involved. This could be you but if this is not your strength, we suggest bringing in a guest teacher to do the modeling. Keep in mind, however, that no teacher is perfect and that, when analyzed, every teaching situation has room for improvement. That's one of the important lessons communicated in this session!
>
> Regardless of who is doing the model teaching, it's of course, important to think through concepts you wish to highlight, and guide the students toward, as well as what kinds of ideas and responses you might expect from the students. For this particular discussion, it's also important to think about what discussion strategies to model for course participants. We've provided some examples in the script to assist in facilitating the discussions. The model teacher should review these prior to the session. There are additional notes to refer to in the Background for Presenter section.

4. **Review discussion leading techniques.** Read through the "Discussion Leading Strategies" sheet to remind yourself of the important techniques that you will be demonstrating.

Preparation on the Day of the Session

For the Sink Float Activity:

1. Set out materials for the Sink/Float stations. Gather materials for groups of four to six as described in the Materials and Preparation section of the *Questioning Strategies* session.

2. Fill the dish tubs with water.

3. Set transparent water container and sink/float objects at front. Set up the transparent container of water and some sink/float objects where everyone can see them. Set your trays of rocks, wax, wood, steel etc. in this same area.

4. Assign a number to each table. For each table, assign a number for the table, write this number on a piece of paper or sign, and set this paper on the table so the number can be easily seen.

5. Number and set out name-tags. Write numbers on name-tags to indicate which table students should go to as they enter.

6. Set out name-tag instructions and pens. Make a large sign with the following instructions on it, and set it next to the name-tags, along with some broad-tipped, dark-colored felt markers.

— Write your first name on a name-tag using big letters.

— Go sit at the table that matches the number on your name-tag.

Instructor's Guide

Session Objectives

In this session participants:

— experience the challenge and appreciate the importance of employing both planned and improvised questions.
— practice the use of different discussion-facilitating strategies including the discussion map, questioning directed toward specific concept understandings, and open-ended discussion of student discoveries;
— observe modeling of different discussion-facilitating strategies: including the discussion map, questioning directed toward specific concept understandings, and open-ended discussion of student discoveries.
— gain a sense of the diversity in student developmental levels, science backgrounds, and learning styles.
— observe classroom management approaches used with students.

Time Frame

Total Workshop: 2 hours

Tape Recorder Activity (10 min.)
Sink/Float Activity (35 min.)
Sink/Float Debrief Discussion with students (25 min.)
Additional Sink Float Investigations (20 min.)
Wrap-up Discussion (25 min.)
Reflecting on the Session (5 min.)

Session Activities at a Glance

Introductory Tape Recorder Activity

The session begins with a "tape recorder" activity that serves the main purpose of initiating interaction between course participants and the students, but also gets them to focus, and think about some of the subject matter in the subsequent activities. Participants also get a chance to find out a little about what their student knows about solids, liquids, and gases. Course participants pair up with visiting students and take turns telling everything they can think of about the given topics. The person not talking is the "tape recorder," and their job is to listen attentively, and then attempt to repeat all that the other person said.

Sink/Float Activity

Course participants use the question plans crafted during the previous session to guide students in an investigation of which objects sink and which float in water.

Model Discussion with Students

The children then gather in the front of the room and sit facing the model teacher with the group of course participants seated behind them. The teacher leads the students through a discussion of the activity while demonstrating effective discussion-leading techniques for the participants to observe. The goals of the discussion for the visiting students are: to encourage them to share their ideas and discoveries so far, to seek evidence to answer their questions, and to leave them with ideas and questions for further sink/float investigations.

Additional Sink/Float Investigations

The visiting students return to their tables and the class participants guide them through more investigations as they try to answer questions that arose from the discussion.

Wrap-up Discussion

After the visiting students leave, the course participants debrief the whole experience in both small and large group discussions.

Reflecting on the Session

Finally, the participants write about how the session has influenced their ideas on questioning and teaching.

Starting the Class

1. Seat participants in working groups. Ask course participants to sit at the activity tables with the same group they worked with in the previous session. Let them know that a few visiting students will be joining their teams—remind them to welcome them, and engage them in conversation as they arrive.

2. Seat visiting students at tables. As the students arrive, ask them to make a name-tag, with their first name in large letters. Explain that the number that's pre-written on their name-tag assigns them to a table. Have them find the table with that number and join that group.

3. Signal for attention from whole group. Once all the students are seated, use some sort of signal to get the attention of the whole group. Ideally, this should be done by modeling a student-appropriate strategy, such as hand clapping rhythms or quiet hand signals. Continue to use this attention-getting strategy throughout the lesson.

Tape Recorder Activity (10 minutes)

1. Introduce activity. Let everyone know they'll be starting off with a quick activity called "tape recorders" to get to know each other. One person in each pair will be the "talker," the other the "tape recorder." Later, they'll switch roles.

> ***Note**: Ideally this activity should involve teams of two, with one student and one course participant in each pair. If you do not have enough students, then you could have teams of three or more, but with only the student and one of the course participants actually doing the activity. The others would be mainly observers..*

2. Explain roles. Explain that the "talkers" role will be to say all they can think of about the topic you give them, until you say, "stop." The "tape recorders" job will be to listen to everything the "talker" says until you say, "stop," then they should try to repeat back as much of what the "talker" said as possible, as if they were a tape recorder.

3. Have participants begin. Say that the course participants will be the first "talkers," and students the first "tape recorders." Give course participants a few seconds to check in with their students and make sure they understand their role.

4. Introduce first topic. Tell course participants that when you say, "record" they are to share experiences in science they remember from their time in elementary school. Repeat the topic, then announce, "tape recorders—ready—record," then say, "talkers—start talking."

5. Students repeat back what participants said. After a couple of minutes, announce, "stop." When all have stopped, tell them to "rewind" (some

instructors have fun making rewinding tape noises here) and have students "play back" what they heard.

6. Students and participants switch roles. After a couple of minutes gain the attention of all groups, and tell them they will now switch roles. The students will be the "talkers" and the course participants will be the "tape recorders."

7. Students talk to participants. Tell the "talkers" that they will tell all they can think of about solids, liquids, and gases. Repeat the topic, and make sure everyone is clear on their role. Repeat the topic again, then announce, "tape recorders ready—record," and "talkers start talking."

8. Repeat process for playing back recording. Have them talk for a couple of minutes. Then again announce, "stop," then "rewind" and "play."

Conducting Sink/Float Activity (35 minutes)

1. Introduce Sink/Float activity. Regain the attention of the whole group and tell them that the visiting students will be doing a science activity led by the course participants.

2. Provide last-minute instructions. Remind course participants to have students work with one object at a time, and not rush through the activity. Explain that when they've finished with their predictions, they can come up and get a tub of water for their investigations.

3. Participants guide students in Sink/Float activity. Have the course participants begin working with the students at their tables, using the questions they've prepared beforehand. They should continue engaging the visiting students until you call time.

Discussing Sink/ Float Activity (25 minutes)

1. Gather students for discussion. Have visiting students move to an area away from the work tables, where the course participants can watch you lead the discussion. It works well to have the students sitting in a close group at the front of the room with the course participants sitting behind the group.

2. Set transparent water container and sink/float objects at front. Set up the transparent container of water and some sink/float objects where everyone can see them. Use these throughout the discussion by periodically having students come up and show others what they're talking about. If your group disagrees about a particular object, or are unsure, test it together. Before testing objects, have the students predict what will happen using partner shares (telling a person near them) or hand signals (thumb down for sink, thumb up for float, thumb to the side for unsure).

*Note: Doing occasional tests of objects in the tank in front of the group helps keep the students interested, settles disagreements, and keeps the discussion focused on **evidence** from their investigations. Periodic predictions with partner-shares or hand signals helps keep everyone engaged and focused on what is being tested.*

Note: If you are using a glass container, be sure not to drop heavy objects in it. Instead, use your hands to gently lower heavy objects to the bottom of the container.

3. Lead discussion about discoveries. Model how to lead an open-ended discussion with the visiting students. Focus on trying to encourage them to make sense of and synthesize what they've learned from the sink/float activity. Encourage students to speak loudly when it's their turn, and if they do not, repeat what they've said loud enough for course participants to hear. You may want to use a general discussion map format to lead the discussion about what they discovered about sinking and floating objects.

4. See notes for leading a content-driven discussion. If you want to focus further on specific concepts related to understanding density, you may want to refer to the following examples of possible discussions that could be pursued. With elementary school students a combination of discussions #1, #2, or #3 often works well. Discussion #4 is more appropriate for middle school or higher. If you're working with older students, they may also refer to concepts related to surface tension and or buoyancy.

***NOTE:** Due to the nature of an open-ended discussion, it's not possible to predict exactly where the conversation will lead. It's important to have goals for the discussion, but it's just as important to be flexible, to listen to students' thinking, to stop or redirect questions before students get frustrated or bored, and to be ready to head in a completely different direction, if necessary. For a more focused and productive discussion, you may also want to plan some specific science concepts to address in your discussion. See the notes below for more information about various science topics related to the activity that might be appropriate for your students.*

5. Write statements with investigation potential on board. During the discussion, if students make statements, such as, "pointy things sink, but things that are spread out float," write them on the board if they seem like ideas students might be able to investigate in their follow-up investigations to see if they are accurate.

Discussion Example #1: Which Kinds of Materials Tend to Float or Sink?

1. Ask a broad question about floating and sinking objects. Direct attention to the tray of sink/float objects at the front of the room. Challenge them to make a statement about what kinds of things float or sink without "tricks." For young students, ask, "Can you make a statement like—all yellow things float?" Then add, "That's a silly example, because we know that all yellow things don't float. But can you think of an accurate statement like that, but that isn't silly?" Here are examples of some possible student responses:

Heavy things sink
Metal things sink.
Plastic things float.
Big things sink.
Small things float.
Things with air in them float.

> ***Note:*** *The reason we used the phrase "without tricks" for this discussion is because a floater can be made into to sink by putting something on top of it, or a sinker made to float by placing it on something that floats, and so on. With young students, we've referred to these as "tricks." For this to be a focused discussion the "tricks" would distract. There may well be other hands-on situations, however, when a teacher might encourage such inventive tricks, asking, for example, "Can you find a way to make that sinker float?"*

2. Ask students for evidence or examples. With each response, either ask the student(s) to demonstrate examples of their statement with the provided materials, or go ahead and show them yourself using the materials.

3. Ask about alternative ideas. After a few corroborating examples, ask if any students can demonstrate an example that doesn't fit the statement. For example, if a student says "plastic things float," ask if anyone found any plastic that didn't float. Or you can show how a plastic spoon, a plastic container, and a plastic toy all float, but then demonstrate a sinking piece of plastic. You can then help them modify the statement to make it more accurately reflect your data, for example, "most of the plastics we tested float."

4. Encourage students to summarize their conclusions from the discussion. Ask, "So what can we now say about the types of objects that float." [e.g., things made of certain kinds of plastic, and of wood, float.] In the same way, you may want to move on to discussing the kinds of things that sink. With very young children it may be sufficiently challenging for them to conclude that some materials tend to float and others to sink.

Discussion Example #2:

Do heavy things sink and light things float?

1. Write question on board. Write the following question on the board, and ask it aloud:

Do heavy things sink and light things float?

2. Challenge students to use examples from their investigations to help answer the question. With each testable example they bring up, have other students predict what will happen, test it together, then help them use the results to try to answer the question. For example, if a student says, "I tested a rock, and it sank. Rocks are heavy, and heavy things sink," ask the child to demonstrate with a rock, ask others who tested other rocks to either report what happened or to show with their rocks what happened.

3. Challenge students to use examples from their lives to help answer the question. Encourage students to think of examples they have observed in their lives, though they may not be testable in the classroom. For example, a student may say, "ships are heavy, but they float."

4. Introduce testing a rock and a piece of sand. Now show students a rock and a tiny piece of sand and explain that they are both made from the same material. Before testing them, allow some students to compare the weight of the two, to verify that one is "heavy," and the other is "light."

5. Ask for predictions. Ask students to predict to a partner whether each will sink or float, knowing that they are both made of the same material, but one is heavy and one is very light. Have students explain their thinking to a partner and then have a few students share out their explanations for their predictions.

6. Do the sink/float test with rock and sand. One at a time test the rock first, and then the sand grain, and let them notice that they both sink. Ask if it's true that heavy things sink. Ask if it's true that light things float.

Note: *When some students say, "heavy things sink and light things float," they may actually be referring to the fact that more dense materials sink, and less dense materials float. Make sure to ask probing questions to try to reveal students' thinking.*

Discussion Example #3: Can you tell if something will sink or float by knowing what material it is made of?

1. Write question on board. Write the following question on the board, and ask it aloud:

> **Can you tell if something will sink or float by knowing what material it is made of?**

2. Challenge students to use examples from their investigations and their lives to help answer the question. As before, with each testable example, have other students predict what will happen, test it together, then help them use the results to try to answer the question. Encourage them to also use examples they've observed in their lives, but that may not be testable in the classroom, to help answer the question.

3. Predict if tiny and large pieces of wax will sink or float. Show students a small piece of wax and ask them to predict whether they think it will sink or float. Test it in water for them, and point out that it floats. Now show them a large piece of wax (for example, a large candle). This time allow a few students to hold it and feel its weight before predicting.

4. Do the sink/float test with large, tiny, and other sizes of wax. Test the large piece of wax, and point out that it floats. (This will probably be surprising to younger students.) Hold up other pieces of wax of different sizes and ask for quick predictions about sinking and floating, and test each one. Tell them that even a piece of wax the size of a house (or larger) would float, even though they can't test it here.

5. Bring them back to main question. Ask if they could tell if the objects would sink or float by knowing what material they were made of (wax).

6. Ask if knowing something is made of rock material helps predict if it will sink or float, then test them. Show students rocks of different weights, and ask students if they think they could predict if they will sink or float by knowing what material they are made of (rock). Ask for their predictions, and quickly test them.

> ***Note**: There are some rocks, such as pumice, that do float, which may confuse the issue with children. If students mention these examples, acknowledge them, and help them to adjust their statements to include this information. For example, write "Most rocks sink, but not all rocks." This is also true for crayon wax, e.g., some crayons sink, and some float. If this seems confusing to students, point out that there can be different types of crayons.*

7. Extend concept to other materials. Ask students if they tested any other objects that were made of the same material, but were different weights (i.e., objects made from wood or plastic). Ask them if the different size objects behaved the same, as far as floating and sinking in water.

Discussion Example #4:

What is it about a material's make-up that causes it to float or sink?

1. Have students generate explanations about sinking. Ask students what they think it is about a rock that makes it sink? Accept several responses and encourage them to share their reasoning. If they say that a rock is heavy, you can ask if they think a tiny piece of sand is heavy.

2. Discuss various explanations for floating. What is it about wax that makes it float? Take several responses. If they focus on its weight, you can ask if a large piece of wax is very light.

3. Point out properties of Styrofoam and wood. Ask—What is it about Styrofoam or wood that makes them float? Students may say these materials have more air in them. If so, point out examples that support the idea, such as the air spaces in Styrofoam or in a sealed container. You may also point out a material like wax, which seems to contradict the "contains air" hypothesis, and ask them what else could explain how wax behaves.

4. Discuss arrangement of particles or molecules. Ask students how they think the particles or molecules that make up a substance might affect its floating or sinking properties. Students may say that materials that sink are more tightly packed together, or that the molecules in the substance are closer together. They may say that closer-packed substances are more dense.

5. Raise the idea of density, as appropriate. Be careful not to give out vocabulary or ideas students are not yet ready for. However, if they do use the term "density," be sure to ask them to describe what they mean by the word. If they are expressing a fairly concrete understanding of the concept, then you may want to introduce density as a scientific term related to how molecules are arranged in a substance.

6. Encourage students to summarize their conclusions from the discussion. Have students try to create statements that describe what molecules have to do with whether an object floats or sinks. They may say—Materials made up of molecules that are more tightly packed than those in water are more dense, and will sink. Materials made up of molecules that are more loosely packed than those in water are less dense, and will float.

Additional Sink/Float Investigations (20 minutes)

1. Introduce further investigations. While students are still seated at the discussion area, let them know that they'll have another chance to explore some of their questions about floating and sinking. Back at their tables they will try to test their ideas using the same or new materials.

2. Describe available materials. Say that you have some large and small pieces of wood, wax, steel, and rock to use in their tests, and show them these materials. They must first describe their investigation to the adults at their table and then they will gather any materials they need. Have an adult class participant from each table come to retrieve the materials as requested by the visiting students.

3. Assist as they investigate. Circulate to all the groups, ask questions, lend a hand, make suggestions, and enforce classroom rules.

4. Conclude sink/float investigations. Provide the class with a 5-minute warning before they have to conclude their investigations. At the designated stopping time, use a signal to get their attention. You may also want to give instructions for cleaning up materials.

5. Excuse visiting students. Thank the visiting students (and any chaperones who accompanied them) for their participation and have them leave the room.

Wrapping Up the Session (25 minutes)

Debriefing the Experience with Students

1. Display "Discussion Prompts about Experiences with Invited Students" slide. Have partners share their ideas and observations with each other. After a few minutes, have the partners share their reflections with the group sitting at their tables.

Discussion Prompts About Experiences with Invited Students

1. Describe the interactions with students that went well. What is your evidence that they went well?
2. What kinds of questions proved to be most successful? What is your evidence that they were successful?
3. Describe interactions that *didn't* go well, and what kinds of questions were *not* successful. What is your evidence?
4. What would you like to do differently next time?
5. In what ways do you think this experience will be different in the classroom? What do you think you will have to do differently?
6. What did you learn from this experience?
7. What do you think your students took away from the experience? How do you know?

2. Lead a whole group discussion. Ask participants to share what they discussed in small groups. Be sure to ask them how their plans went, and if they had to improvise and/or diverge from them.

Debriefing the Modeled Discussions

Note: *It can put some course participants in a slightly awkward position to ask them to critique the model teacher's performance, and they may be reluctant to say much. This discussion is much easier if the person who did the model teaching is able (and willing) to share self-critiques, including ideas about how they could have been more effective.*

1. Describe challenges. Point out that the whole group discussion was an unusually challenging situation for the instructor. If you had a variety of ages of children in your group, point out that some of the activities and discussion may have seemed inappropriate for some of the students. Explain that at various times, the discussion was geared to different levels of students to try and keep everyone involved.

2. Lead whole group discussion. Ask participants to share any part of the modeled discussion they found particularly interesting. During the discussion, you may decide to use the discussion map as a format to help expand on the participants' ideas.

Discussion Map:

- *Ask a broad question*
- *Ask for evidence or explanation*
- *Ask for alternative opinions or ideas*
- *Ask a question leading back to the topic*

4. Focus on teaching strategies used. Ask what teaching strategies they noticed being modeled, including attention-getting, discipline-related, and discussion-leading strategies. If they don't bring them up, point out any discussion strategies that were modeled (discussion map, specific concept questioning, and/or concept discussion based on asking what students discovered).

5. Discuss how strategies impacted discussion. Ask how they think these strategies affected the discussion and the students' participation.

6. Offer feedback. Ask the person who did the model teaching to share any part of the discussion where they wished they had dealt with a situation differently. Invite the students to offer their ideas about alternate choices as well.

Reflecting on the Session

1. Participants reflect on what they have learned from the session. Display the Quick Write slide, and ask them to write for a few minutes on the topic.

Write about how the session has influenced your ideas on questioning and teaching.

2. Preview topic for next session. Tell participants that in the next session they'll have an opportunity to witness additional model teaching, and to learn more about how best to respond to a variety of student responses.

Presentation Slides

— Discussion Prompts

— Quick Write

Discussion Prompts

1. Describe the interactions with students that went well. What is your evidence that they went well?
2. What kinds of questions proved to be most successful? What is your evidence that they were successful?
3. Describe interactions that *didn't* go well, and what kinds of questions were *not* successful. What is your evidence?
4. What would you like to do differently next time?
5. In what ways do you think this experience will be different in the classroom? What do you think you will have to do differently?
6. What did you learn from this experience?
7. What do you think your students took from the experience? How do you know?

Quick Write

Write about how the session has influenced your ideas on questioning and teaching.