



Mystery boxes for grades 3-5

Author: Sharon Janulaw

*Please note that these procedures have been modified from [Mystery Boxes: Uncertainty & Collaboration](#) by Jean Beard so that the lesson can be used effectively with students in grades 3-5. For concepts and information on how to prepare the mystery boxes, please access the original lesson.

Overview: *Mystery boxes* have been successfully used with third, fourth, and fifth grade students in this modified version to introduce the nature and process of science. Teachers at these grade levels should focus on students understanding that science is uncertain and that scientists base their conclusions on available evidence. Additional evidence may strengthen their explanations or cause revision of those explanations.

Lesson concepts:

- Scientists pose, test, and revise hypotheses based on evidence.
- Science explains the natural world using evidence from the natural world.
- Science does not prove or conclude; science is always a work in progress.

Grade span: 3-5

Materials: See [Mystery Boxes: Uncertainty & Collaboration](http://www.indiana.edu/~ensiweb/lessons/mys.box.html) (<http://www.indiana.edu/~ensiweb/lessons/mys.box.html>)

Each "Mystery Box" is a rigid, permanently sealed, opaque, rectangular box with one or two glued-in partitions, ramps, etc., and a rolling sphere (e.g. a marble or steel ball). A class set of boxes should have groups of 4 to 6 boxes with the same interior contents and arrangement, with common labels or colors. Keep barrier layouts simple. It's OK if a barrier here and there comes loose (these are "mutations").

The original model was plastic boxes for 24 glass microscope slides) with wooden barriers glued in and glass marbles. Wooden replicas of this size are the author's favorite, but they are not available commercially.

Smaller, 1" x 1" x 2" plastic boxes with plastic and wood barriers and ball bearings were used quite successfully in ENSI and SENSI demonstration lessons. The boxes were obtained from a plastics store in Northern California. There are 8 colors available, but that is no longer the case. The only opaque boxes available from this source are black and white, which isn't fully opaque to bright light. (Let us know at ENSIweb if you find an acceptable box source.)

Time: One class period

Grouping: Pairs and whole group

Teaching tips: When using *Mystery Boxes* with third, fourth or fifth grade students, teachers need to be aware of students' abilities to observe and describe objects. Third (or fourth or fifth) graders may have had experiences and practice using words to describe the size, shape, color, texture, etc. of an object. This should enable them to provide more accurate descriptions of the

boxes. If the students have not had the opportunity to learn to use descriptive words, they will have difficulty verbalizing their observations. They may say the box is pretty, which is how they feel about it rather than a description of what they observe using their senses. Students need to be taught this foundational skill before working with *Mystery Boxes*.

Third grade students seem to be more open to not looking inside the *Mystery Boxes* than fourth or fifth grade students. Third graders accept not knowing for sure, but deciding on their best idea based upon the evidence they have. When the nature of science is discussed and students are given examples of scientists knowing about things (such as black holes and dinosaurs) without having actually seen them, they seem able to understand that scientists make conclusions based on the evidence they have and scientists may revise their conclusions based on new evidence. The older the students, the more they want to know the one and only "right answer."

Procedure:

1. Tell students to think about the word observation and ask them to talk with their neighbor about what we do when we make an observation. Have pairs share with the class their description of what it means to make an observation. Guide students by modeling how to make an observation, if necessary. Their description should include using our senses to describe the size, shape, color, texture, smell, sound, etc. of an object.
2. Tell students they will each be given a box, which they will leave on the table and only use their sense of sight to begin making their observations. (Students at the same table should have boxes with different numbers on them.) Record their observations on a chart. (These should be observations rather than opinions: "The box is white" rather than "The box is pretty.")
3. Tell students that when they are finished talking, they will have a chance to pick up the box that is in front of them. Tell them they can look closely at the box, feel the box, smell the box, and listen to the box. The Rule is: The box needs to stay closed.
4. After students have had a minute or two to make further observations, ask them to share their observations. Record their ideas. (They should be describing size, shape, texture, what they hear, etc.)
5. Tell students that their next task is to think about what the inside of the box looks like. They can imagine that they are standing above the box looking down at it. If they could see through the top, what would the inside look like? Tell them they need to move the box slowly to listen to what is happening inside the box. Are there any obstructions? Then they should draw what they think the inside looks like on their paper. When they have drawn the inside on their paper, they should come to the board and draw their drawing of the inside of the box on the board. (Prepare the board by writing the number of each box in a separate area on the board and drawing enough boxes under the number to equal the number of students who have that numbered box.)
6. When all students have drawn the inside of their box on the board, have students look at the data, (that is, the drawings), and tell what they notice.
7. Ask how confident they feel about their drawing. Ask them to think about what scientists do when they want more information about their ideas. Tell students (if this isn't mentioned) that one thing scientists do is collaborate with other scientists.
8. Ask students what would help them feel more confident.
9. Based on their suggestion (if possible), get them into groups for further information gathering, comparisons, and analysis. Ask the group to work together to come up with an agreement about what the inside of the box looks like. Tell them that when they have come to an agreement about the inside of the box, the group needs to send one person to the board to draw what they agreed upon. Their representative should draw it under the initial boxes and leave their first drawings on the board.

Wrap-up and reflection

10. When each group has drawn its agreed upon inside configuration, have a class discussion about the procedures that the group used. Have someone from each group describe the process that their group went through to arrive at its agreed upon drawing. Guide them to tell what they *did*, not what they decided. This will not be easy for them. (They might share that they traded boxes, compared impressions, told and showed others how to investigate a box and what to look/listen for. You may want to describe several interactions you observed while they were working.)
11. Ask students how confident they feel about their drawings now. Ask what makes them feel that way. Discuss how what they have done is similar to how scientists work. There are many things scientists know about without ever having seen them. We know about black holes, the inside of the Earth, etc. based upon data scientists have collected without ever having seen these things. Talk about science being uncertain and that ideas in science can change when we get more information.

Collect the boxes when the discussion about their investigative techniques and their relationship to how scientists work is finished.

12. Students will usually want to know if their drawing is right. Talk about the process we used: gathering data through our senses and making a logical conclusion based upon that data. Help students to realize that, in science, we will never know the totally real answer to any scientific question, but we often come close enough for practical purposes and future exploration.