

PALEO SLEUTHS

— DIGGING DEEPER —

What's In the Box?

Introductory Inquiry Activity for Grades 4-8



This is an introductory inquiry activity where students carry out investigations, record data, and ask questions to build relationships between evidence and explanations. This activity can be used to build background knowledge about science and engineering investigative processes.

Teacher Background Information

1. Activity length: 50-60 minutes
2. Grades 4 - 8 can experience this activity. Some extensions for Grades 6 - 8 have been noted.
3. This activity introduces the 5 E Instructional Model:
 - Engage - create curiosity, access prior knowledge, ask open-ended questions
 - Explore - examine thinking and understanding, test predictions and hypothesis
 - Explain - share possible solutions, explain evidence, develop new understandings
 - Elaborate - add new information and build new explanations, propose solutions
 - Evaluate - answer open-ended questions, demonstrate and communicate understanding
4. This activity uses a science and engineering format found in *A Vision and Plan for Science Teaching and Learning, An Educator's Guide to a Framework for K-12 Science Education, Next Generation Science Standards, and State Science Standards* which involves Gathering, Reasoning, and Communicating.
 - Gathering - defining a problem, asking questions, using models to organize data
 - Reasoning - evaluating data, constructing ideas using math to solve a problem, using evidence as support for or against an explanation
 - Communicating - using written or oral forms to explain how evidence supports the reason

Teacher Materials:

- 8-10 candy boxes (found at any hobby store, inexpensive)
- Clear packing tape
- Objects to put inside boxes (different shaped wooden blocks plus duplicate blocks and extra blocks)
- Marker

Extension for Grades 6-8

- Gram scales (compare mass of hidden object in box with objects from tray in an empty box)
- Rulers available
- Extra clear packing tape
- Empty candy boxes (used for comparison and further investigation)

Teacher Procedures:

1. Place one object inside each box.
2. Keep a duplicate object in a separate container plus extra objects to add to the container. Set this tray of objects aside for later investigation in the activity.

For this activity, various shapes and sizes of wooden blocks were used, however any objects can be used.



3. Number each box and take a picture of each object with the box.
4. Wrap clear packaging tape around the box so that no one can open the box or remove the tape.
5. Group students in teams of 2-4.
6. Give each group a box. **(Engage)**
7. Observe student engagement in this activity, guiding them to make observations, collect data, ask questions, and investigate further. Students share initial thoughts about what is in the box.

(Explore, Explain)

8. After a period of time, approximately 20 minutes, add clues to guide their inquiry: **(Elaborate)**
 - Show the tray of objects, original 8 - 10 objects plus more objects/blocks that were set aside, to compare and contrast sounds, size, and mass.
 - Grade 6 - 8: Add gram scales, extra empty boxes, tape as needed by groups to assist in the investigation.
9. Students continue investigating the boxes, gathering data, supporting reasons with evidence.
10. Students are given 15-20 minutes with new information to gather their data, state a reason for what's in the box that includes evidence from their investigation. **(Evaluate)**
 - In written or oral forms, groups communicate what they believe to be in the box, evaluate their reason and state evidence for their explanation.
 - Groups communicate their reason during class supported by evidence the same day or the next day.
 - Wait until the next day to reveal to the class what's in the box, displaying the initial pictures.
11. Discuss with students the 5 E's they use as they work through this activity.
12. Discuss how students use gathering, reasoning, and communicating to assist them in determining what is in the box.

Nebraska Science Standards

SC K-12.1 Comprehensive Science Standard – Inquiry, the Nature of Science, and Technology

- Students will combine scientific processes and knowledge with scientific reasoning and critical thinking to ask questions about phenomena and propose explanations based on gathered evidence.
- Grade 3 - 5: SC5.1.1 Students will plan and conduct investigations that lead to the development of explanations.
- Grade 6 - 8: SC8.1.1 Students will design and conduct investigations that will lead to descriptions of relationships between evidence and explanations.
- Grade 9 - 12: SC12.1.1 Students will design and conduct investigations that lead to the use of logic and evidence in the formulation of scientific explanations and models.

Activity Resources:

Book: *A Vision and Plan for Science Teaching and Learning, An Educator's Guide to a Framework for K-12 Science Education, Next Generation Science Standards, and State Science Standards* by Brett Moulding, Rodger W. Bybee, and Nicole Paulson

What's In the Box?

Activity

What's in the box? Curious? How would you discover what is in a box when you can't see inside and you can't open the box to find out? What methods will you use? By using your sense of inquiry, you will carry out investigations, record data, and ask questions to build relationships between the evidence you gather and an explanation you formulate for: **What's in the box?**

Objectives:

Students will

- Gather: make observations, collect data, ask questions, organize and evaluate information.
- Reason: construct an explanation, support explanations with evidence.
- Communicate: written and/or oral forms to explain how evidence supports the reason.

Materials:

8-10 taped and numbered boxes with objects inside, 1 box per group

Gram scales (optional)

Rulers available

Empty boxes

Student Procedures:

Engage:

1. Each group investigates a box with an object inside.

Explore, Explain:

2. Groups:
 - Gather: make observations, collect data, ask questions, organize and evaluate information.
 - What questions do you have about what is inside the box?
 - What methods have you used to determine what is in the box?
 - What data have you collected and how have you organized the data?
 - What does the data reveal to you about the box?
 - Reason: construct an explanation and produce evidence to support explanations.
 - What have you decided is in the box?
 - What evidence do you have to support your reason about the object in the box?
 - Communicate: share written and/or oral forms supporting reason with evidence.
 - What did you state about the object in the box?
 - What other questions do you still have about the object in the box?

Elaborate

3. After approximately 20 minutes, the teacher adds some clues in guiding the inquiry:
 - A tray of objects will be displayed to help the investigation of the box.
 - What new data will you collect about the box from the objects in the tray?
 - What new evidence have you collected to help you determine what is in the box?
4. Groups continue investigating the boxes, 15-20 minutes, gathering data, supporting reasons with evidence.

Evaluate

5. Groups communicate with their classmates, in written or oral form, what they believe to be in the box by sharing their reason with supporting evidence for their explanation.

Reveal: Groups find out what is in the box the next day.