Teacher Guide

Inquiry Cubes

Lesson Summary: Asking questions, recognizing limits, and applying logic to solve puzzles are key scientific, inquiry, and life skills. Students practice observation and questioning skills using inquiry puzzle cubes.

Grade Level 5-12

Lesson Length
1-2 class periods

Standards Alignment

Next Generation Science Standards

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
- MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- **Framework for K-12 Science Education**: Science & Engineering Practices 1,3,4,6,8

Minnesota Science Standards – Alignment Matrix www.brainu.org/resources/MNSTDS

National Science Standards – Project 2061: Atlas of Science Literacy reference

a) Scientific inquiry: Evidence and reasoning – lines of reasoning and observations and evidence (p. 17, Atlas Vol. 1)

Research on student learning: "When asked to use evidence to judge a theory, students of all ages may make only theory-based responses with no reference made to the presented evidence. Sometimes this appears to be because the available evidence conflicts with the students' beliefs." (p.16, Atlas Vol. 1)

Objectives—Students will be able to

- practice observation and questioning skills using the Inquiry cubes.
- cooperatively work in groups to *solve* the puzzle according to guidelines given by the instructor.

Assessment Options

- Informally assess group cooperation and ability to work together.
- Direct students to reflect on the activity in their science notebook.

Teacher Notes — There are two different patterns for cubes; a numbered cube and a brain structure/function one. Students will need basic brain structure/function background knowledge to solve the second puzzle.

The object of the activity is not to solve the puzzles but to practice inquiry skills and to discuss them and their relevance to science processes—making inferences. Students really don't need to ever see the *solution*. Optional: instructor can intentionally leave the 6th side completely blank. Make sure this is consistent on all cubes.

Materials (for each group of students)

- one inquiry cube
- blank/scratch paper
- colored pencils

Engage – Discuss/Define Inquiry: How do we "do science"?

1. Generate a list of questions we might ask or observations we might make of an object, i.e. color, size, shape, smell, density, etc.
2. Place an object such as a large foam dice cube where everyone may see it. Ask the class to describe the object, i.e. cube, 4x4 inches, has dots on it, etc.
3. Ask students what they think the remaining side looks like. Is it the same as the others? Is it different? If so, how and/or why?
4. Place an Inquiry Cube on each group's workstation. Instruct the students that they are NOT to pick up the cube from the table at anytime. **Note**: You may want to place the same side down for all groups.

Explore – Solving the puzzle

1. Once all groups have a cube and have been told not to pick it up at any time, give further instructions.
2. Each group should work together to make inferences about the unseen side.
3. They may use scratch paper to draw their ideas for what the bottom of the cube looks like.
4. As individual groups come up with ideas, move around the room and answer questions.

Explain – Discussion once all groups have a solution to the puzzle

1. Invite groups to write or draw their solutions on the board.
2. Ask how they came to their decisions.
3. Ask if there are any differences in the solutions and why that might be. See if the groups can come to a consensus on what they think the answer is.
4. Discuss the cues and/or strategies the group used to come to this decision.
5. Ask how this process is similar to what we do in a science lab or classroom.

Expand – Extension to lesson

1. After students have had brain structure and function background, repeat the activity using the second set of inquiry cubes.
2. Discuss which activity was easier: the first or second activity? Why? As students do other inquiry activities between solving these two cube sets, they will build a set of problem-solving strategies that should make solving the second cube set easier.