DEVELOPING AN ASTRONOMY EDUCATION ACTIVITY

BACKWARDS DESIGN APPROACH
Instead of first coming up with what the teacher and students will do, and then deciding what the goals of the activity are, you'll write a more effective activity if you do things backwards.

- Decide overall goals and state why they are important for students to learn.
- Decide on specific learning objectives which are specific statements of what students will learn, ideally in terms of how they will demonstrate that learning (e.g. Students can describe the features of the Moon surface using a model).
- Design your activity. Use an inquiry-based approach (e.g. 5E model) if appropriate.
- Test activity with your students and evaluate how well they have achieved your goals. A rubric can be a useful tool. Revise the activity if needed.

DEFINING GOALS
- Define target audience: students’ age range, educational levels.
- Determine what background concepts and skills are needed for students to understand the activity. If students already know these concepts, include in your activity methods for the students to revise these concepts.
- To determine required background concepts, teachers use their knowledge about their student’s understanding and what students have been taught at a certain age.
- There are 3 types of learning goals to consider. These goals concern with what students will know, do and feel through doing the activity (More on next page).

5E MODEL FOR INQUIRY-BASED ACTIVITY

ENGAGEMENT: Present an interesting fact about the topic, or present the topic as a question needing answers. Elicit curiosity and prior knowledge.

EXPLORATION: Activities that use prior knowledge to generate new ideas and explore answers to the question in Engagement.

EXPLANATION & ELABORATION: Explain concepts and conduct extra activities to deepen and broaden understanding.

EVALUATION: At the end of the cycle or continuously feed in at each of the 4 steps: Engagement, Exploration, Explanation and Elaboration.

Current science understanding of audience

Required background concept

Define target audience

Design your activity

Evaluate if goals & objectives are achieved
DEFINING GOALS

SCIENTIFIC CONTENT
What concepts do you want students to know and understand?

SCIENTIFIC PRACTICES
What do you want your students to be able to do and what skills do you want them to develop? These aspects are important in helping all students think scientifically about the world, whether or not they pursue careers in science. Below are broad categories for you to consider:
• Asking questions
• Developing and using models
• Planning and carrying out investigations
• Analysing and interpreting data
• Using mathematics and computational thinking
• Constructing explanations
• Engaging in argument from evidence
• Communicating information

SCIENTIFIC ATTITUDES
Education activities can affect how students feel about science and education. Consider how students could be:
• Inspired to pursue their education
• Inspired to study science further
• Inspired to become an astronomer
• Connected to their culture’s astronomical discoveries, more curious and interested in observing the world around them
• Empowered to ask “Why?” about science observations, and beyond, in their lives
• Empowered to figure things out for themselves
• Connected to (and respectful of) people from very different backgrounds than themselves
• Provide a perspective from the smallness of the planet and the vastness of the cosmos

OPEN-ACCESS EDUCATIONAL RESOURCES:
• astroedu.iau.org
• space-awareness.org
• unawe.org/resources
• lco.global/education/
• spacescoop.org/en/

LEVELS OF INQUIRY

Teachers can gradually release the responsibility of learning to their students. As students go up the levels of inquiry, they become more able to carry out their own independent inquiry, and the role of the teacher becomes less instructive, but more enabling.

At the initial level of inquiry (Confirmation), the teacher directs every aspect. Depending on the student’s ability, educational level, previous experience with the content and concepts, the level of inquiry of an activity can be adjusted to higher levels where the students are in control.

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>NATURE OF INQUIRY</th>
<th>ENGAGEMENT (QUESTION)</th>
<th>EXPLORATION (METHOD)</th>
<th>EXPLANATION (ANSWER)</th>
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<td>Open-ended</td>
<td>Student</td>
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DEFINING OBJECTIVES

Define objectives with observable actions that students need to do to show understanding.
• List
• Define
• Match
• Label
• Explain
• Recognize
• Describe
• Identify
• Locate
• Solve
• Apply
• Analyze
• Distinguish
• Compare
• Construct
• Design

More on learning objectives: edutechwiki.unige.ch/en/Learning_objective

Adapted from Teaching Inquiry with Mysteries Incorporated