

# Determining Learning Objectives from Multidimensional Standards and Students' Prior Knowledge

## Overview

The 5E-SESE project combines the 5E model (Bybee et al., 2006) of inquiry-based science instruction and Universal Design for Learning (UDL, CAST 2008) for multidimensional science instruction for students who participate in their state's alternate assessment. 5E-SESE lesson plans include planning activities for the five inquiry phases in the 5E model:

### Engage

access prior knowledge and make predictions

### Explore

collect data and investigate predictions

### Explain

synthesize information learned and apply new knowledge

### Elaborate

extend science learning

### Evaluate

demonstrate learning

Before planning instruction, teachers must establish learning goals for a lesson or unit. What should a teacher do when students have different background knowledge and understandings of science? Individual learning objectives among students might vary, but all students in a classroom can learn inquiry-based science.



## Determine class-wide learning goals and student learning objectives

1. Review both grade-level content standards and grade-level expectations for students who participate in their state's alternate assessment.
  - » Alternate or extended grade-level expectations can have multiple learning objectives to access science content.
2. Determine a science learning goal for the class based on ideas you want students to know and understand.
3. Consider students' existing science knowledge and prior instruction related to the science concepts being taught to choose student learning objectives.
4. Plan ways to differentiate activities in each 5E phase within the larger lesson to ensure students receive instruction that targets their learning objectives.

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# Four steps to differentiate learning objectives for individual students

- 1. Review both the grade-level content standard and the grade-level expectations for students who participate in their state's alternate assessment.**
  - NGSS performance expectation: **5-LS1-1**: "Support an argument that plants get the materials they need for growth chiefly from air and water"
  - Extended grade-level expectation: "Provide evidence that plants need air and water to grow."
    - » Provide evidence that plants grow (less complex)
    - » Distinguish things that grow from things that don't grow (least complex)
    - » \*Note: This state has two lower levels of complexity to provide more options for instructional match
- 2. Determine a shared goal for the class that reflects the highest targeted grade-level expectation for your students.**
  - Use data from planting seeds in varying conditions (e.g., in dry soil, wet soil, and water) to show that plants need air and water (but not necessarily soil) to grow. This goal aligns to the extended grade-level expectation.
- 3. Consider students' existing science knowledge and prior instruction related to the science concepts being taught to choose student learning objectives.**
  - The learning objective builds on previous learning and reflects an appropriate instructional challenge (e.g., the learning objective should not repeat previous learning but represent a next step, or working toward the grade-level expectation). Because Science and Engineering Practices have connections to ELA and mathematics, consider what students already know in science, ELA, and mathematics when identifying a learning objective. Keep in mind the expectations that students are working toward within the class-wide goal.

Student	Prior knowledge in science	Prior knowledge in ELA and mathematics	Learning Objective
Jose	Can distinguish things that grow from things that don't grow	Identifies words in familiar texts to answer a question, uses nonstandard units of measurement to measure and weigh materials	Provide evidence that plants grow. <i>Working to: Provide evidence that plants need air and water to grow.</i>
Emma	Can distinguish things that grow from things that don't grow	Still practicing using text to evaluate a claim in ELA; has some experience measuring objects in math with standard units of measurement	Provide evidence that plants grow. <i>Working to: Provide evidence that plants need air and water to grow.</i>
Molly	Has background knowledge about how plants grow; has supported claims with evidence in less complex topics	Uses evidence from familiar stories and informational text to support a claim; collects data with numbers and a ruler	Provide evidence that plants need air and water to grow. <i>At target: Provide evidence that plants need air and water to grow.</i>

- 4. Plan ways to differentiate activities in 5E phases.**
  - All students are actively completing activities within an inquiry cycle, even if they are working toward different learning objectives. Teachers teach the whole-class learning goal and differentiate activities for students to align to their learning objective within the larger lesson. For example, class-wide Explore phase activities may include measuring the weight and height of plants in different stages of growth in different conditions (e.g., in a pot with soil in a room with light, wet paper towel in a room with light, in a wet paper town in a dark room). Jose uses nonstandard units of measurement, and Emma uses a ruler and scale. Molly uses a ruler and scale to measure the weight and length of different plants. In the Explain phase, class-wide activities include drawing a conclusion from data recorded in an organizer. Jose and Emma compare their measurements of plants at different stages of growth and learn that roots and leaves got longer and the plant weighed more, showing that plants grow. Molly completes a graphic organizer to compare the growth of plants in different conditions (e.g., in a lit room in a pot with soil, in a lit room in a wet paper towel, in a dark room in a wet paper town) to demonstrate that plants need air and water, but not soil, to grow.