

# Developing and Using Models Design Pattern

## Focal Knowledge, Skills, and Abilities (FKSAs)

FKSA 1.	Ability to construct a model and use the model to explain a phenomenon related to a disciplinary core idea.
FKSA 2.	Ability to construct a model and use the model to make a prediction about a phenomenon related to a disciplinary core idea.
FKSA 3.	Ability to evaluate the quality of the model for explaining a phenomenon related to a core idea.
FKSA 4.	Ability to use a given model to make a prediction about a phenomenon related to a core idea.

## Possible Observations

FKSA 1.	<p><b>PO 1.</b> Given a brief real-world scenario describing an observable phenomenon, student applies scientific concepts appropriately to construct a model (using drawings and words) that explains why the phenomenon occurs.</p> <p><i>Physical science example: Given a representation of water molecules in solid form, student accurately constructs a representation of water molecules in liquid form and explains why water as a liquid can flow and change its shape to fit a container.</i></p>
FKSA 3.	<p><b>PO 3.</b> Given a model, student accurately describes similarities and differences between the model and a phenomenon</p> <p><i>Earth science example: Student identifies accurate similarities and differences between a cracked egg model and a scientist's model of Earth's surface/interior/geologic processes.</i></p>

## Characteristic Task Features

<i>Characteristic Task Feature 1</i>	All items must prompt students to make connections between observed phenomenon or evidence and reasoning underlying the observation/evidence.
<i>Characteristic Task Feature 2</i>	All phenomena for which a model is developed must be observable (e.g., difference in temperature as a substance is heated, an erupting volcano) or fit available evidence.
<i>Characteristic Task Feature 3</i>	Models provided in stimulus materials must illustrate a process or why a phenomenon exists (e.g., image of volcanoes over hot spot must include hot spot and direction of plate movement).
<i>Characteristic Task Feature 4</i>	All items must elicit core ideas as defined in the <i>Framework for K-12 Science Education</i> (NRC, 2012).

## Variable Task Features

<i>Variable Task Feature 1</i>	Drawing required: none vs. add to existing picture vs. construct model from scratch
<i>Variable Task Feature 2</i>	Complexity of scientific concept(s) to be modeled
<i>Variable Task Feature 3</i>	Format of "real-world" phenomenon presented: image, data, text, combination
<i>Variable Task Feature 4</i>	Core idea targeted in model: physical science core idea vs. Earth science core idea
<i>Variable Task Feature 5</i>	Function of the model: To explain a mechanism underlying a phenomenon, To predict future outcomes, To describe a phenomenon, To generate data to inform how the world works
<i>Variable Task Feature 6</i>	Scale of mechanistic relationships in model: Observable-Macro, Unobservable-Micro, Unobservable-Macro