



Making Models Exhibit

Exhibit Goals

1. Highlight the presence and value of models in museums, in other educational settings, and in our everyday lives;
2. Familiarize visitors with several types of models that are essential elements of science and engineering:
 - physical models,
 - conceptual models,
 - mathematical models and
 - computer simulations; and
3. Provide visitors with practice in four specific science thinking skills associated with making and using models including the following:
 - recognizing the similarity between models and the things they represent;
 - assessing the strengths and limitations of models in explaining and predicting the behavior of the objects or phenomena they represent;
 - using models to raise questions, communicate ideas, and test hypotheses in many different contexts; and
 - creating their own models to explain things they cannot observe directly.

Exhibit Activities

Introduction to Models

The Heart of the Matter (11B 6–8: 3a)[†]
What is a Model? (11B 6–8: 3a)
Which Model is Best? (11B K–2: 1)
Bison Diorama (11B K–2: 2)
This is a Model of... (11B K–2: 2)

Using Models

Packaging (11B 3–5: 1)
Fish Farming (11B 6–8: 2 & 9–12: 2,
8E 9–12: 1)
Flying over the Atomic Landscape
(11B 6–8: 1)
Me vs. Us (7D K–2: 1 & 6–8: 2)

Creating Models

Can You Make a Model Of...
(11B 6–8: 3b)
What Time is It? (11B 6–8: 3b)
Where Am I? (11B 6–8: 3b)
The Blaschka Legacy (11B 6–8: 1)

Creating Mental Models

Mystery Scene (11B 9–12: 3)
Mystery Object (11B 9–12: 3)
The Mystery of Building the Pyramids
(11B 9–12: 3)

Recognize and Assess Models

Models at Work (11B 3–5: 2)
Models at Play (11B 3–5: 2)
Models that Teach (11B 3–5: 2)
Models that Explain (11B 3–5: 2)

[†] Refers to chapter and section of Benchmark for Science Literacy. See reverse side for these standards.

Making Models Exhibit

Standards from: *Benchmarks for Science Literacy*, by AAAS (1993) Oxford University Press

11. Common Themes

B. Models

K-2: 1 Many of the toys children play with are like real things only in some ways. They are not the same size, are missing many details, or are not able to do all of the same things.

- **Which Model is Best?**

K-2: 2 A model of something is different from the real thing but can be used to learn something about the real thing.

- **This is a Model of...**
- **Bison Diorama**

3-5: 1 Seeing how a model works after changes are made to it may suggest how the real thing would work if the same were done to it.

- **Packaging**

3-5: 2 Geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and stories can be used to represent objects, events, and processes in the real world, although such representations can never be exact in every detail.

- **Models at Work**
- **Models at Play**
- **Models that Teach**
- **Models that Explain**

6-8: 1 Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too vast to be changed deliberately, or that are potentially dangerous.

- **Flying over the Atomic Landscape**
- **The Blaschka Legacy**

6-8: 2 Mathematical models can be displayed on a computer and then modified to see what happens.

- **Fish Farming**

6-8: 3a Different models can be used to represent the same thing. What kind of a model to use and how complex it should be depends on its purpose.

- **The Heart of the Matter**
- **What is a Model?**

6-8: 3b The usefulness of a model may be limited if it is too simple or if it is needlessly complicated. Choosing a useful model is one of the instances in

which intuition and creativity come into play in science, mathematics, and engineering.

- **Can You Make a Model Of...**
- **What Time is It?**
- **Where Am I?**

9-12: 2 Computers have greatly improved the power and use of mathematical models by performing computations that are very long, very complicated, or repetitive. Therefore computers can show the consequences of applying complex rules or of changing the rules. The graphic capabilities of computers make them useful in the design and testing of devices and structures and in the simulation of complicated processes.

- **Fish Farming**

9-12: 3 The usefulness of a model can be tested by comparing its predictions to actual observations in the real world. But a close match does not necessarily mean that the model is the only "true" model or the only one that would work.

- **The Mystery of Building the Pyramids**
- **Mystery Scene**
- **Mystery Object**

7. Human Society

D. Social Trade-Offs

K-2: 1 Getting something one wants may mean giving up something in return.

- **Me vs. Us: Take It or Leave It**

6-8: 2 One common aspect of all social tradeoffs pits personal benefit and the rights of the individual, on one side, against the social good and the rights of society, on the other.

- **Me vs. Us**

8. The Designed World

E. Information Processing

9-12: 1 Computer modeling explores the logical consequences of a set of instructions and a set of data. The instructions and data input of a computer model try to represent the real world so the computer can show what would actually happen.

In this way, computers assist people in making decisions by simulating the consequences of different possible decisions.

- **Fish Farming**

K-2: 3 One way to describe something is to say how it is like something else.

9-12: 1 The basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same ways as the objects or processes under investigation. A mathematical model may give insight about how something really works or may fit observations very well without any intuitive meaning.

2. The Nature of Mathematics

A. Patterns and Relationships

3-5: 2 Mathematical ideas can be represented concretely, graphically, and symbolically.

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