Science Instructional Strategies: A Look at the OGT

"Incorporating Real-World Connections into Science Instruction" Viewer's Guide

Viewer's Guide Table of Contents

ohioorc.org

Introduction

Webcast: *Incorporating Real-World Connections into Science Instruction*

Series: *Science Instructional Strategies: A Look at the OGT*
http://www.ohiorc.org/for/science/ogt/default.aspx

Panelists:

- Scott Barber, Science Teacher, Roehm Middle School
- Linda Pettit, Environmental Education Specialist, Franklin County Soil and Water Conservation District

Moderator:

Terry Shiverdecker, Science Content Specialist, Ohio Resource Center

Description:

This webcast explores using real-world connections in science instruction. Incorporating real-world connections in science instruction is a multifaceted topic that cannot be fully addressed in a single webcast. Yet the webcast and the companion materials provide sufficient information for science educators across the state to engage in thoughtful and productive conversations about ways they might more fully incorporate real-world connections into the science curriculum.

In this webcast we will:

- describe real-world connections
- discuss benefits of using real-world connection in the classroom
- provide examples of how real-world connections can be worked into instruction
- discuss how real-world connections fit into the learning cycle and inquiry-based instruction
- explain how making real-world connections helps prepare students for the OGT
- suggest some things teachers should consider as they begin making real-world connections
- list some local and regional resources

Companion Materials:

Feature Article:

Incorporating Real-World Connections into Science Instruction
http://www.ohiorc.org/for/science/ogt/article.aspx?articleId=65

Mini-Collections:

- Earth and Space Science Lessons with Real-World Connections
  http://www.ohiorc.org/bookmark/view_a_folder.aspx?uid=9681&folderID=18752

- Integrated Science Lessons with Real-World Connections
  http://www.ohiorc.org/bookmark/view_a_folder.aspx?uid=9681&folderID=18753

- Life Science Lessons with Real-World Connections
  http://www.ohiorc.org/bookmark/view_a_folder.aspx?uid=9681&folderID=18750

- Physical Science Lessons with Real-World Connections
  http://www.ohiorc.org/bookmark/view_a_folder.aspx?uid=9681&folderID=18748

Before, During, and After Viewing:
Suggestions for Viewing and Dialoguing About the Webcast

This webcast will afford greatest benefit to those who are able to view the webcast in groups. The following strategies and discussion tools are provided to enhance the viewing experience.

Before viewing:

Engage in a brief discussion with colleagues to determine prior knowledge about and strategies for making real-world connections. Each group member should also complete the "Before Viewing" column on the Agree-Disagree Chart prior to viewing the webcast.

While viewing:

Make notes about significant ideas and suggested strategies. For example, capture key messages of each panelist on chart paper or on the PMI chart in this document.

After viewing:

Discuss new information and ideas for changing curriculum or instruction gleaned from the panelists' discussion. Each group member should complete the "After Viewing" column on the Agree-Disagree Chart. You may want to use the discussion tools included in this document to guide your discussion.

Discussion Tool: Agree-Disagree Chart

(For use before and after viewing the webcast)

Directions:
Mark whether you agree or disagree with each statement in the left column before viewing the webcast.

After viewing the webcast, discuss each statement as a group. Identify whether you agree or disagree with each statement in the right column.

Before Viewing	Statement	After Viewing
Agree Disagree	Our science faculty regularly incorporates real-world connections into our teaching.	Agree Disagree
Agree Disagree	I am confident that the real-world connections I use are relevant to my students.	Agree Disagree
Agree Disagree	Our faculty makes good use of local, regional, and state resources to make science more relevant to our students.	Agree Disagree
Agree Disagree	Telling students about real-world connections or having class discussions about real-world connections is sufficient to make science relevant to students.	Agree Disagree

Discussion Tool: PMI (Plus, Minus, Interesting) Chart

(For use during the webcast)

The PMI chart is used by individuals or groups to reflect upon and generate discussion about the ideas and strategies shared by the panelists.

Directions: As you watch the webcast, note the key points and ideas shared by each panelist that should be discussed by the whole group.

- **Plus:** *Important points made with which you agree*
- **Minus:** *Important points made with which you do not agree*
- **Interesting Ideas:** *Important ideas and suggestions to consider*

Presenter	Pluses	Minuses	Interesting Ideas
Scott Barber			
Linda Pettit			

Reflection Questions and Discussion Starters

(For use after viewing the webcast)

What "new" ideas did you hear in the webcast? What ideas and strategies should be shared with and discussed by the science faculty?

What ideas are most valuable and relevant? What ideas may not be relevant to your science faculty at this time?

What information and data do you need? (E.g., examples of how different faculty members incorporate real-world connections, science faculty comfort level/expertise in making real-world connections, need for professional development in this area)

Discussion Tool: Taking Action

(For use by science faculties analyzing their own instructional strategies)

Specific science concepts and skills to investigate in our curriculum:
(E.g., is our current curriculum flexible enough to incorporate real-world connections? Do our current lessons and units make real-world connections?)

Instructional strategies that should receive increased focus:
(E.g., authentic inquiries into real-world issues…)

Professional development topics to focus on department-wide: (assessment of authentic investigations, structuring units to include real-world connections. . .)

Incorporating Real-World Connections into Science Instruction

www.ohiorc.org/for/science/ogt

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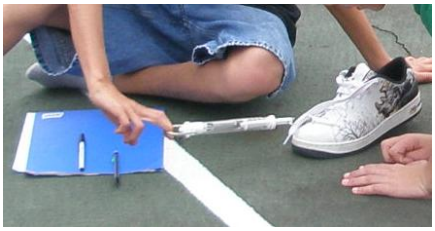
Kick Seining for Macroinvertebrates

Pollution Sensitive Water Penny Larva

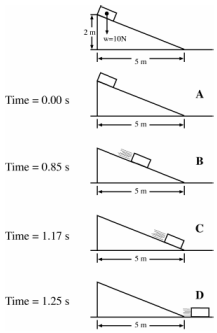
Somewhat Tolerant Dragonfly Nymph

Determining Coefficient of Friction



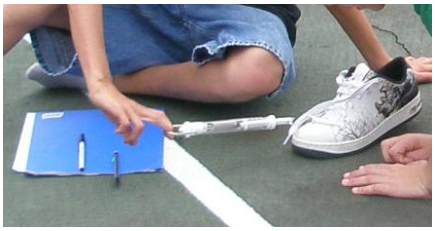
Lake Erie Fish Kill

Lake Erie Fish Kill



http://ims.ode.state.oh.us/ODE/IMS/Assessment/Content/CSC_AI_200503_GR10_06.pdf

Determining Coefficient of Friction



State & Local Agencies

Ohio Department of Natural Resources
http://www.ohiodnr.com/

ODNR, Soil & Water Conservation Districts
http://ohiodnr.com/tabid/8637/default.aspx

Ohio EPA
http://www.epa.state.oh.us/

Ohio Farm Bureau
http://ourohio.org/

www.ohiorc.org/for/science/ogt

www.ohiorc.org

Ohio Graduation Test for Science – March 2005
Annotated Item 6

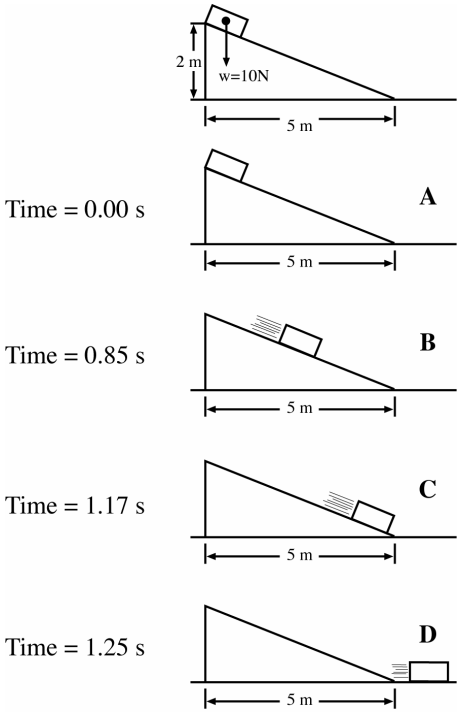
Standard and Benchmark Assessed:

Standard: Physical Sciences
Benchmark: D. Explain the movement of objects by applying Newton's three laws of motion.

Short Answer Question:

Inclined Plane Experiment

In doing the following inclined plane experiment in "ideal conditions," students assume that friction from the air, incline or floor is negligible. A stationary box at the top of a frictionless incline is released and is allowed to slide to the bottom. The figure below illustrates the box in four positions labeled A through D as it is sliding from the incline onto the level floor. As the box moves from the bottom of the incline to the floor, students assume that the box experiences no change in speed, only a change in direction.



6. Assume that the experiment will be repeated in less "ideal" conditions where the effects of friction on the motion of the box cannot be ignored. Predict the effect that significant friction would have on the acceleration of the box as it slides down the incline. Explain the cause of the predicted effect. Respond in the space provided in your **Answer Document**. (2 points)

Commentary:

This short answer question asks students to predict the effect that frictional force would have on the acceleration of the box as it slides down an inclined plane and to explain the cause of the predicted effect. Students must understand Newton's Second Law of Motion ($F_{net} = ma$) and

analyze the new information provided about the motion of the box in the inclined plane experiment. The mass of the box is assumed to be unchanged. The task describes that frictional effects cannot be ignored. Since the task requires a prediction of the effect on the *"acceleration of the box as it slides down the incline",* the response must provide evidence of a correct, valid inference that the box does not stop sliding or accelerating, but continues to accelerate down the incline. The acceleration of the box down the incline is caused by, and is in the same direction as, the effect of the gravitational force parallel to the inclined plane. The frictional force acts in the opposite direction. The net force (combined effect of the frictional and gravitational forces) causing the acceleration is less, compared to the original experiment without friction.

The response that earns 2 points must provide a correct prediction that the acceleration of the box down the incline would be less, or that the box would not speed up as quickly, under the new experimental conditions. The explanation of the cause shows evidence of understanding that a smaller net force is acting to accelerate the box down the incline.

The question is classified Communicating Understanding/Analyzing Scientific Information because the task requires students to analyze the investigative scenario under new conditions that go beyond the original, given experimental conditions. It also requires students to show their understanding (e.g., using written text and/or labeled drawings) of forces and motion in the scenario to provide a correct prediction and explanation of a cause and effect relationship.

Performance Data:

The percent of public school students earning each score point for question 6 on the March 2005 Ohio Graduation Test:

Percent at Each Score Point				
0	0.5	1	1.5	2
37%	12%	37%	5%	3%

Sample Response for Item 6 (Short Answer):

The acceleration would be less.

OR

The velocity or speed would not increase as quickly.

AND

This results from friction opposing the force along the direction of motion that the box experiences due to gravity while on the incline.

OR

The action of friction on the box as it moves down the incline results in a lower net force acting to accelerate the box.

Ohio Graduation Test for Science – March 2005
Annotated Item 6

Scoring Guidelines:

Score point	Description
2 points	The response correctly predicts the effect that friction would have on the acceleration of the box and explains the cause of this effect.
1 point	The response correctly predicts the effect that friction would have on the acceleration of the box. OR The response indicates that friction would oppose the force of gravity but does not explain the cause of this effect.
0 points	The response demonstrates no understanding of the task. The response may provide incorrect information or be irrelevant to the task. The response may repeat information from the passage or prompt, or state "I don't know."

Keywords: inclined plane, acceleration, net force, friction