



Can we enhance curriculum with cyberlearning resources?

Presented at Successful STEM Education
February 1, 2016

Jeremy Roschelle, Director
Center for Technology in Learning

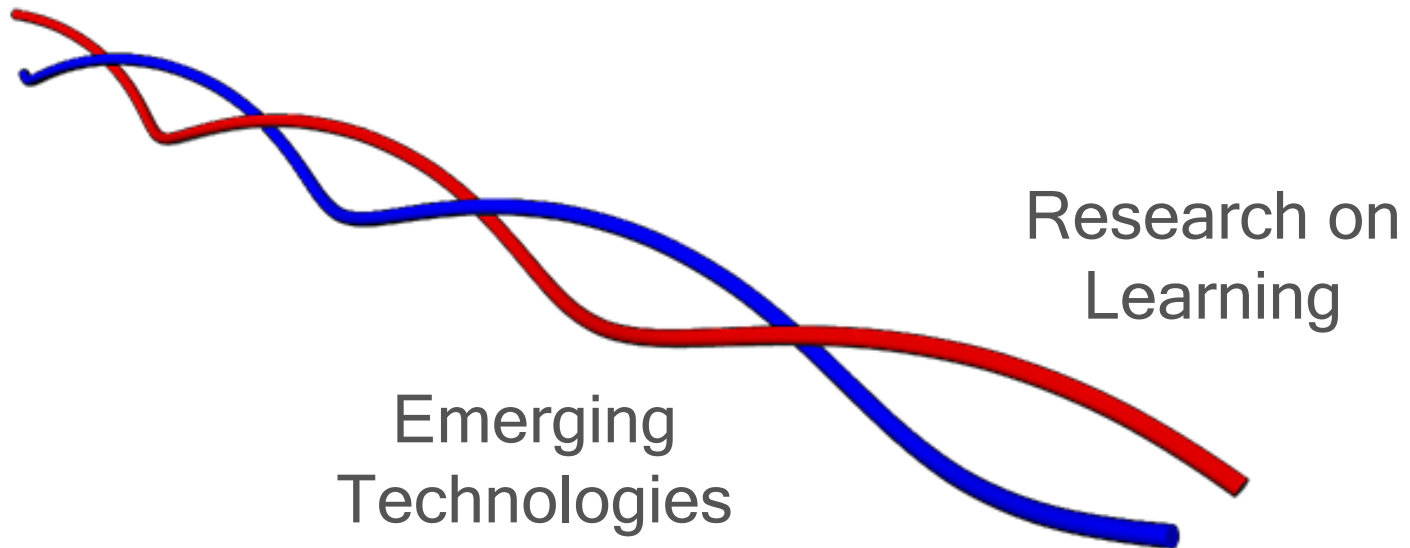


What is cyberlearning?

1. Jeremy Roschelle: SRI
Overview Cyberlearning
2. Kathy Perkins, University of Colorado, Boulder
PhET Sims
3. Jennie Chiu: University of Virginia
Engineering and Science Practices

What is Cyberlearning?

New technologies change what and how people learn. Informed by the learning sciences, cyberlearning is the use of new technology to create effective new learning experiences that were never possible or practical before.



Represents over 200 separately funded NSF projects

May 2-6, 2016 Menlo Park, California
Application Deadline:

cutting edge work by creating a 3-minute video. Visit the...



Broadening Participation and Brokering connections.



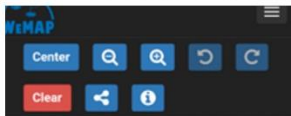
UNDERSTANDING UNIVERSAL DESIGN FOR LEARNING

UDL is a research-based framework intended to guide the design of learning technologies that are accessible...



CYBERLEARNING 2016: DESIGNING FOR DEEPER, BROADER, AND MORE EQUITABLE LEARNING

January 25-26, 2016 at the Westin Arlington Gateway, Arlington



ENABLING COLLABORATIVE SCIENCE LEARNING



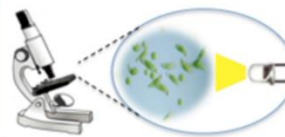
INTERACTIVE BIOTECHNOLOGY WITH INGMAR RIEDEL KRUSE

Thursday, November 5, 2015 from 12-1 pm Pacific Time / 3-4 pm Eastern Time If you...



CIRCL NEWSLETTER – ISSUE 13, SEPTEMBER 2015

CIRCL News It's back to school time, and at CIRCL, we're thinking about our A, B,...



MAKING MICROBIOLOGY INTERACTIVE AND AVAILABLE TO EVERYONE



HOW TO USE DIA2 TO



LEARNING

CIRCL NEWSLETTER –

CIRCLcenter.org

Innovating Pedagogy '15 *(50,000 downloads!)*

SRI Education



Ten Pedagogies

1. Crossover Learning
2. Learning through Argumentation
3. Incidental Learning
4. Context-based Learning
5. Computational Thinking

Innovating Pedagogy 2015

Exploring new forms of teaching, learning and assessment, to guide educators and policy makers

Mike Sharples, Anne Adams, Nonye Alozie, Rebecca Ferguson, Elizabeth FitzGerald, Mark Gaved, Patrick McAndrew, Barbara Means, Julie Remold, Bart Rienties, Jeremy Roschelle, Kea Vogt, Denise Whitelock, Louise Yarnall

Open University
Innovation Report 4



Innovating Pedagogy '15 *(50,000 downloads!)*

SRI Education



Ten Pedagogies

6. Remote Scientific Labs
7. Embodied Learning
8. Adaptive Teaching
9. Analytics of Emotion
10. Stealth Assessment

Innovating Pedagogy 2015

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Open University
Innovation Report 4





Photocredits: www.treehugger.com

Developed By
[David Chan](#)

Chemistry Teacher/Technology Coordinator
Evanston Township High School

Investigating the Safety of Nuclear Energy Using Real Radioactivity Data

STUDENT PAGE

iLab: Radioactivity iLab

In this lab, you can explore how radioactive radiation changes as a function of distance. This curriculum sets the Radioactivity iLab in the context of nuclear energy, and asks you to consider:

How safe is it to live next to a nuclear reactor?



OFFICE OF
Educational Technology

National Educational Technology Plan '16

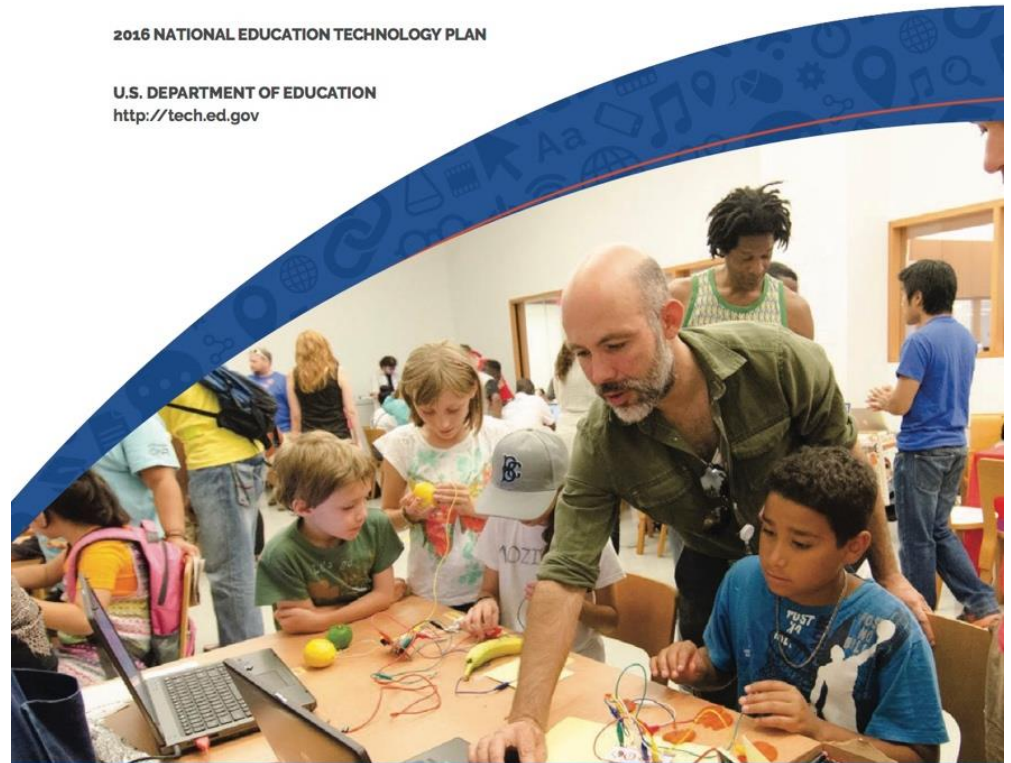
Includes section on Cyberlearning (p. 16)

Future Ready Learning

Reimagining the Role of Technology in Education

2016 NATIONAL EDUCATION TECHNOLOGY PLAN

U.S. DEPARTMENT OF EDUCATION
<http://tech.ed.gov>



PhET Interactive Simulations and the NGSS

Kathy Perkins

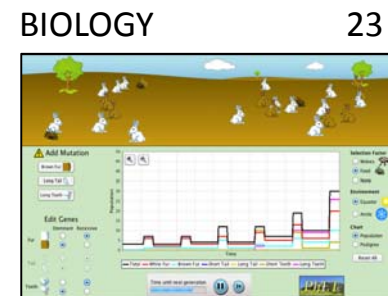
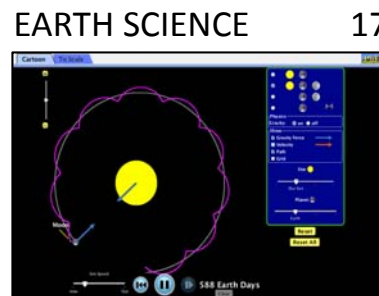
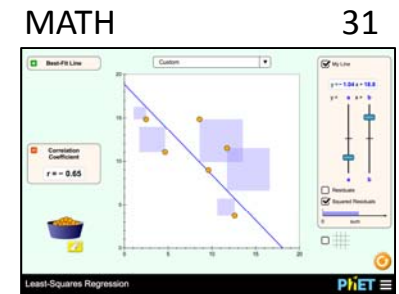
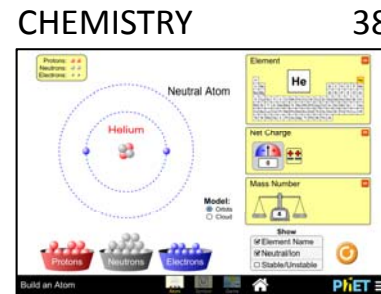
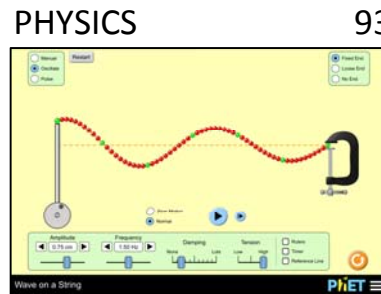
<http://phet.colorado.edu>

STEM Smart Conference

Feb 2, 2016

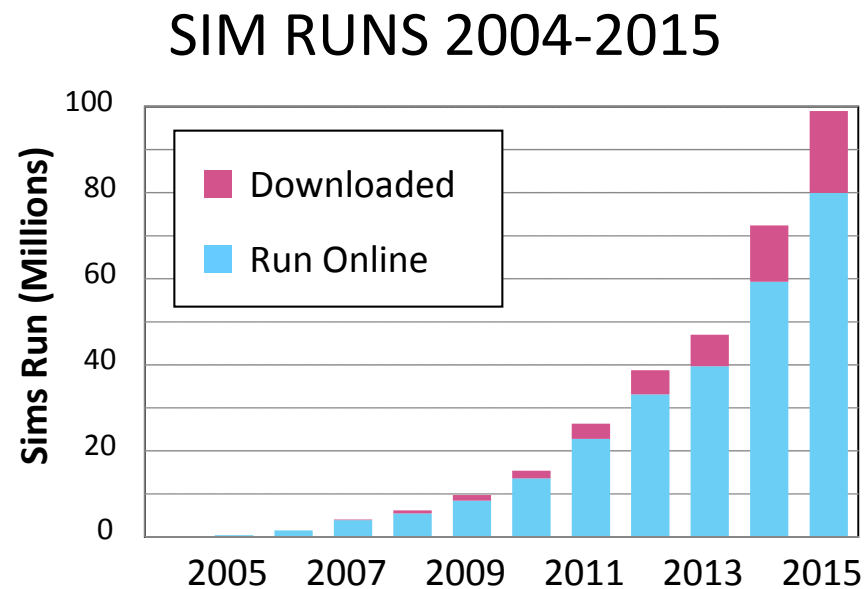
What is PhET?

- Suite of 130 **free** interactive science and math sims
- 75+ Languages
- Run online or download



What is PhET?

- Suite of 130 **free** interactive science and math sims
- 75+ Languages
- Run online or download



FREE at <http://phet.colorado.edu>

Our Goals

PhET seeks to make STEM learning more ...

ENGAGING

Interact and discover key ideas.

RELEVANT

Connect to everyday life.

ACCESSIBLE

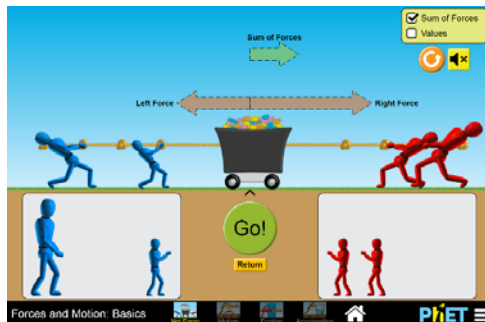
Intuitive and understandable.

EFFECTIVE

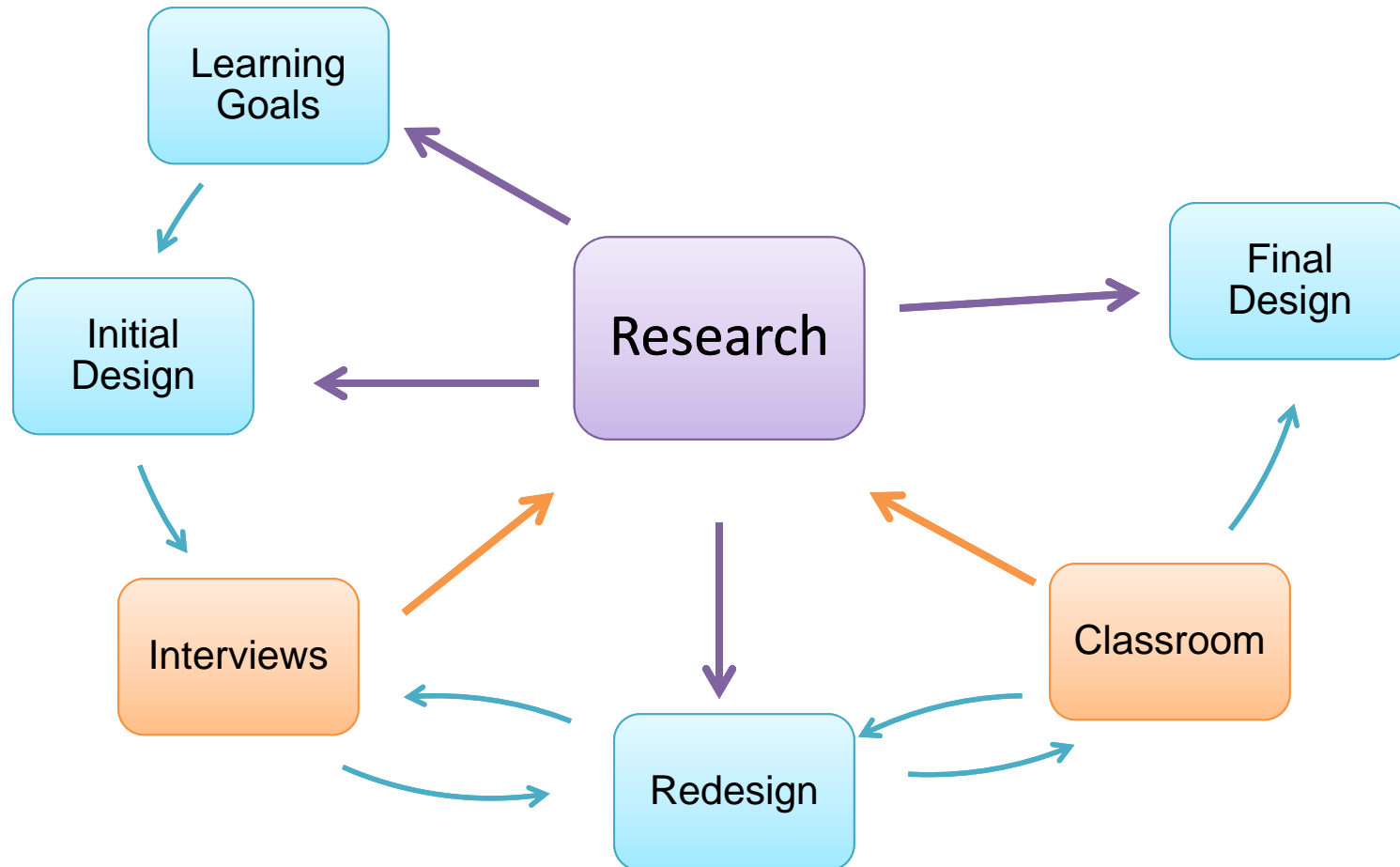
Use science and math practices.
Develop conceptual understanding.

PERSONALIZED

Students direct their learning.



PhET is Research-Based

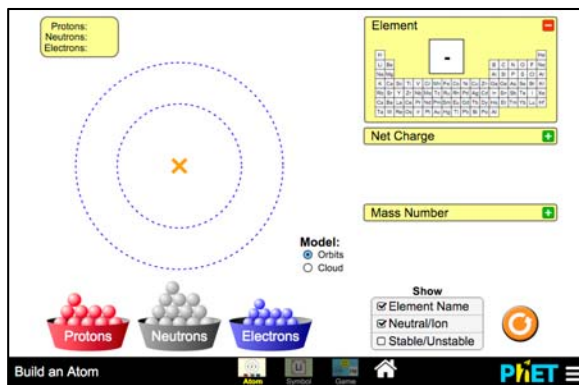


<http://phet.colorado.edu/en/research>

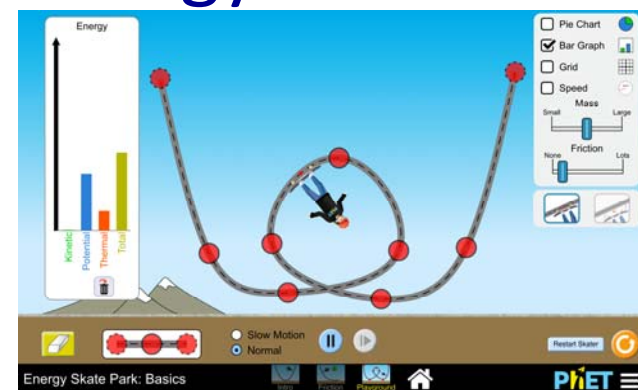
http://phet.colorado.edu/publications/phet_design_process.pdf

Sim tour

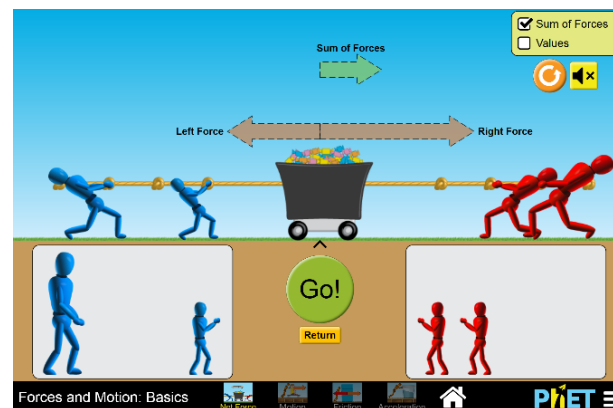
Build an Atom



Energy Skate Park



Forces and Motion



A flexible tool

Teachers use PhET sims in many ways



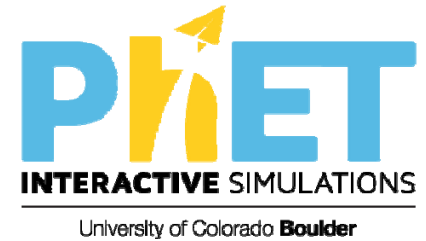
Lecture or lab demos

- Clicker questions
- Class discussion

Group / individual work

- In-class guided-inquiry
 - Lab or pre-lab activities
 - Homework
-
-

NGSS and Teaching with PhET



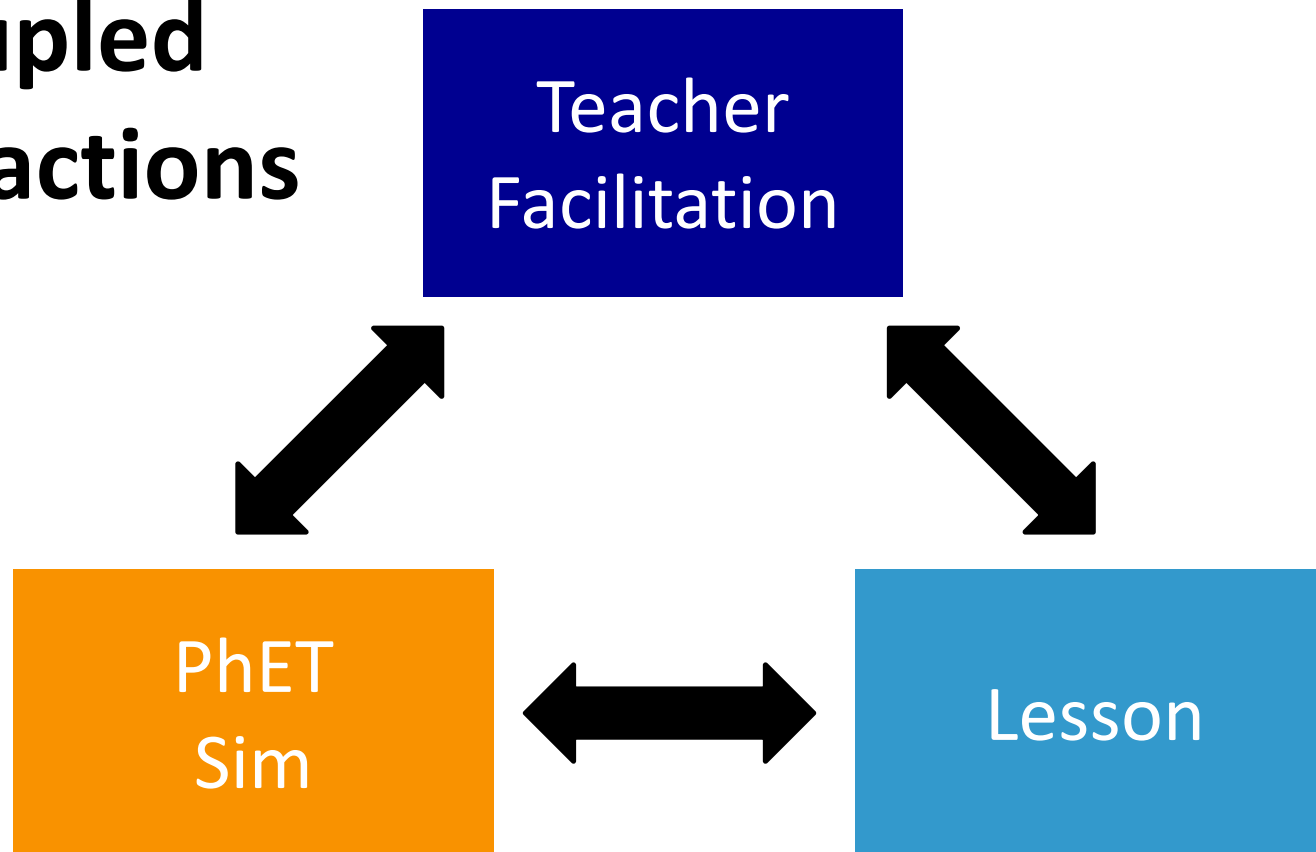
NGSS alignment involves....



... fits within the Driving Question or Problem

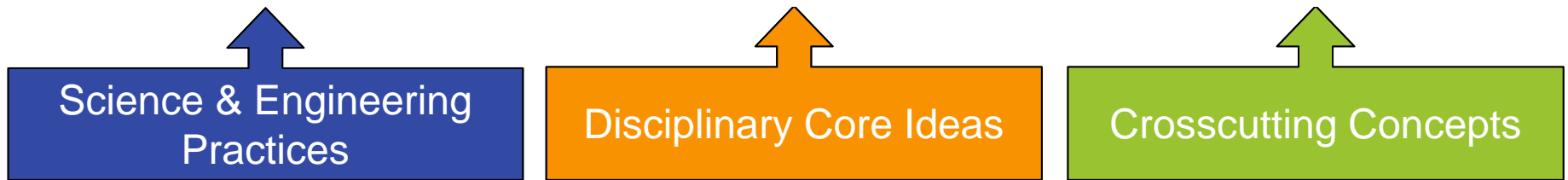
NGSS and Teaching with PhET

Coupled Interactions





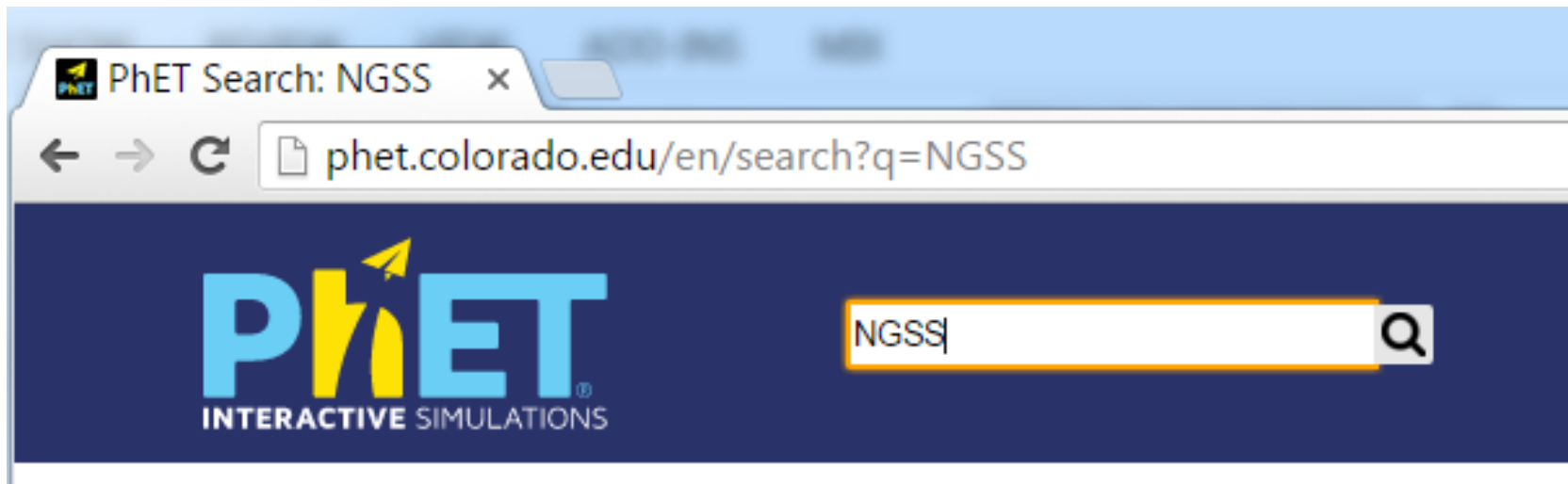
NEXT GENERATION SCIENCE STANDARDS



NGSS @ NSTA

<http://ngss.nsta.org>

Finding PhET NGSS-Ready Sims



Alignment of PhET sims with NGSS



[HS NGSS Alignment 10-7.docx - 65 kB](#)



[MS NGSS Alignment 10-12.docx - 65 kB](#)

[Download all files as a compressed .zip](#)

Focus in on NGSS Practices

1. Asking Questions and Defining Problems
 2. Developing and Using Models
 - 3. Planning and Carrying Out Investigations**
 - 4. Analyzing and Interpreting Data**
 5. Using Mathematics and Computational Thinking
 6. Constructing Explanations and Designing Solutions
 7. Engaging in Argument from Evidence
 8. Obtaining, Evaluating, and Communicating Information
-

Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

Performance Expectations

Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [MS-PS2-2](#)

▼ Clarification Statement and Assessment Boundary

Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.

Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

- Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2)

Connections to Nature of Science

Science Knowledge Is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2)

Disciplinary Core Ideas

PS2.A: Forces and Motion

- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)

Crosscutting Concepts

Stability and Change

- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2)

Students who demonstrate understanding can:

Performance Expectations

Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. MS-PS3-1

▼ Clarification Statement and Assessment Boundary

Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.

Assessment Boundary: none

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)

Crosscutting Concepts

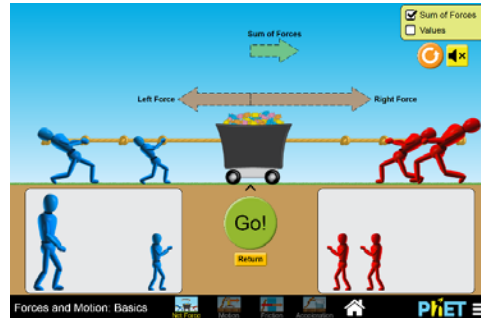
Scale, Proportion, and Quantity

- Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1)

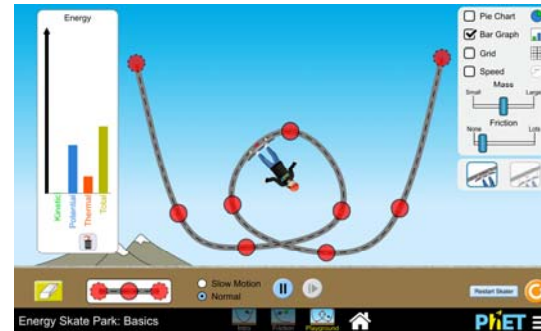
Mini-design: Prompts a practice

Think-pair-share

- Pick a sim: Forces and Motion

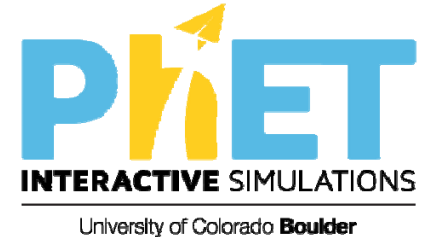


Energy Skate Park



- What types of questions could you use in your lesson that engages students in a science practice?

Mini-design: Prompts a practice



Examples

Explore the skater's motion, and her potential energy and kinetic energy. What do you notice?

Design an experiment to determine ...

Provide evidence from the sim to defend your claim

Teacher Resources

Simulations

► Teaching Resources

► **Tips for Using PhET**

[Browse Activities](#)

[Share your Activities](#)

[My Activities](#)

[Workshops](#)

[How to Run Simulations](#)

[Troubleshooting](#)

[FAQs](#)

[For Translators](#)

[Donate](#)

[Research](#)

[Licensing](#)

[About PhET](#)

Tips for Using PhET

PhET simulations are very flexible tools that can be used in many ways. Here, you will find videos and resources for learning about effective ways of integrating PhET simulations into your class.

A Brief Introduction to PhET:

An overview of the PhET Simulations ([Download Video](#))



Tips and Resources for Teaching with PhET

- [Planning to Use PhET](#)
- [Using PhET in Lecture: An Overview](#)
- [Interactive Lecture Demonstrations](#)
- [Using PhET with Clickers](#)
- [Designing PhET Activities for the K12 Classroom](#)
- [Facilitating PhET Activities for the K12 Classroom](#)
- [Take a Virtual PhET Workshop](#)

Guidance for using particular simulations:

- [Browse our activities for use with each simulation](#)
- [Find teacher tips for use with specific simulations on individual simulation pages \(where applicable\)](#)

Tips and Resources



[Planning to Use PhET](#)



[Using PhET in Lecture: An Overview](#)



[Interactive Lecture Demonstrations](#)



[Using PhET with Clickers](#)



[Designing Activities for K12](#)



[Facilitating Activities for K12](#)



[Take a Virtual PhET Workshop](#)

Next Generation PhET

- Coming soon in HTML5

Pendulum Lab

Charges & Fields

Neuron

States of Matter

Masses and Springs

Trig Tour

- More teacher resources

- Video primers for sims

- Updated Tips for Teachers

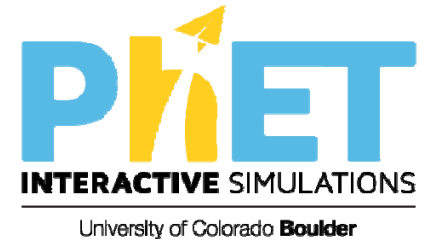
- Accessibly designed sims

- Keyboard Navigable

- Screen Reader Compatible

- Sonification

PhET is free thanks to our sponsors



Carl Wieman & Sarah Gilbert



PhET is supported by users like you!

WISE and WISEngineering Connections Between NGSS Content and Practices

Jennifer Chiu

jlchiu@virginia.edu

STEM Smart workshops are funded by the National Science Foundation grant #1449550. Any opinions, findings, and conclusions or recommendations at this event or in these materials are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

- Provide technology-enhanced 3D NGSS curricular resources to help connect practices with content
- Combine curricula, assessment, teacher tools
- Engineering DCIs and practices

Can we enhance our curriculum with cyberlearning resources? **YES**

Design Challenge

- Create a school garden
- Must grow some edible plants and be student maintained
- Total space = 20' x 20'
- Total budget = \$400
- Total time = 2 weeks



**What would
your next steps
be?**

NGSS Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Making NGSS Connections

WISE: Web-based Inquiry Science Environment:

<https://wise.berkeley.edu>

The screenshot shows the WISE v4 homepage. At the top left, the logo reads "WISE v4 web-based inquiry science environment". To the right is a login section with fields for "Username:" and "Password:", a "Sign In" button, and a link for "Forgot Username or Password?". Below the login section is a banner that says "Welcome! New to WISE? Sign up for free." with a "Create WISE Account" button.

The main content area is divided into two sections. On the left, a "Curriculum-Based" section features a diagram of the ocean floor with labels for "Ocean Trench", "Volcano", "Oceanic Crust", and "Oceanic Plate". A yellow callout box states: "In nature, the amount of CO₂ released is the SAME as the amount absorbed." Below the diagram, text explains: "Standards-based WISE projects are specifically tailored for classroom use, and revolve around key conceptual difficulties that students encounter in biology, chemistry, and physics. As a result, WISE projects offer a focused and inquiry-rich supplement to a teacher's core scope and sequence."

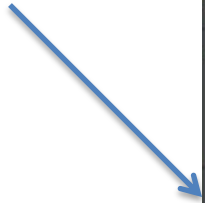
On the right, a "What's New?" section features two announcements. The first is "New Grading Tool" dated "Jan 13, 2015", with a description: "We have added a new and greatly improved grading tool to WISE. You will find a link to it for each project run you have created. We will continue to work on it and would appreciate any feedback you could provide to help us make it better." The second is "Welcome Back!" dated "Jan 6, 2015". Social media icons for Facebook and Twitter are at the bottom right of this section.

At the bottom of the page, there are buttons for "WISE Projects" and "Browse WISE Curricula +". A "WISE Features" button is also visible. The bottom edge of the page shows a navigation bar with labels like "CE", "CE", "CE", "GY", "RY", and "CS".

Supporting NGSS practices

Features to support NGSS DCI's and CC's

Inquiry Map



WISE v4 Full Screen Ideas (2) Add Idea + My Work Flagged Home / Sign Out

Chemical Reactions: How Can We Slow Climate Change?

Welcome Test User!
Expand All Collapse

1: What Causes Climate Change? +

2: Greenhouse Investigation -

- Step 2.1: What is the Greenhouse Effect?
- Step 2.2: Understanding the Greenhouse Model
- Step 2.3: Greenhouse Model**
- Step 2.4: Check Your Understanding
- Step 2.5: The Energy Balance
- Step 2.6: Add New Evidence to Your Basket
- Step 2.7: Predict the Effect of Adding CO₂?
- Step 2.8: Add Gases to the Model
- Step 2.9: Check Your Understanding
- Step 2.10: What is the Effect of CO₂?
- Step 2.11: Draw the Greenhouse Effect

Click "Watch a Sunray" to see what happens to solar radiation.
Watch a sunray several times.

- Does the same thing happen every time?
- How does energy from the sun change/transform?

Solar Radiation (SR) = Heat = Infrared Radiation (IR) =

speed ticks: 154
Setup Go Watch Sunray Unwatch

Embedded Simulations

Infrared radiation

Solar radiation

Greenhouse gas

Heat

Global Temperature

Celsius

Years

Years	Global Temperature (Celsius)
0.00	10.00
500	10.00
1.00k	10.00
1.50k	10.00
2.00k	10.00
2.50k	10.00
3.00k	10.00

powered by

Features to support NGSS DCI's and CC's

WISE v4

[Full Screen](#) | [Ideas \(2\)](#) | [Add Idea +](#) | [My Work](#) | [Flagged](#) | [Home / Sign Out](#)

**Chemical Reactions:
How Can We Slow
Climate Change?**

Welcome Test User!
[Expand All](#) [Collapse](#)

1: What Causes Climate Change? +

2: Greenhouse Investigation -

- Step 2.1: What is the Greenhouse Effect?
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- Step 2.10: What is the Effect of CO₂?
- Step 2.11: Draw the Greenhouse Effect

CHALLENGE QUESTION

QUESTION

Which of the following can happen to sunlight energy when it hits the earth's surface?

Check all that are true.


ANSWERS

- Reflected as Infrared radiation
- Transforms to heat energy
- Reflected as sunlight energy

Automatic
feedback

This is attempt #2

CHECK ANSWER
TRY AGAIN



Features to support NGSS DCI's and CC's

The screenshot displays the WISE v4 user interface. At the top, there is a navigation bar with the text "WISE v4" and several utility icons: "Full Screen", "Ideas (2)", "Add Idea +", and a menu icon. On the left side, a sidebar menu is titled "Chemical Reactions: How Can We Slow Climate Change?". Below this title, it says "Welcome Test User!" and "Expand All Collapse". The sidebar contains a list of steps: "1: What Causes Climate Change?", "2: Greenhouse Investigation", and "Step 2.1: What is the Greenhouse Effect?". The main content area is titled "CHALLENGE QUESTION" and contains a "QUESTION" section with the text: "Which of the following can happen to sunlight energy when it hits the earth's surface?". Below the question, it says "Check all that are true." and "ANSWERS". There are three radio button options: "Reflected as Infrared radiation" (checked), "Transforms to heat energy", and "Reflected as sunlight". A yellow highlight is over the text "Incorrect. Please revisit the model." next to the checked option. A modal dialog box is open in the foreground, displaying the message "Incorrect. Please revisit the model." and a "Take me there!" button. At the bottom right, the text "This is attempt #2" is partially visible.

Supporting NGSS practices

Asking questions

View

Press the "New trial" button when you are ready to set the dummy parameters and run a trial. When you are finished with this simulation, close this window.

New trial...

Dummy Position: 0.42 Dummy Velocity: -5 Dummy Time: 0.06

0 0.5-10 0 0 0.1

0.085

Play

WISE v4 Full Screen My Work Flagged Home / Sign Out

Airbags: Too Fast, Too Furious?

Welcome Test User!
Expand All Collapse

- 2: Study the airbag's motion +
- 3: Study the driver's motion +
- 4: Perform some experiments -
 - Step 4.1: 1: Your investigation questions
 - Step 4.2: 2: Generate some hypotheses
 - Step 4.3: 3: Experiment
 - Step 4.4: 4: What does the graph tell you?
 - Step 4.5: 5: Summarize your other findings
- 5: Analyzing graphs and designing safe cars +
- 6: Extra: Using computer simulations +

QUESTIONNAIRE

- Which do you think will be more useful in analyzing a crash, the POSITION-TIME graph or the VELOCITY-TIME graph? Explain.
- Why do you think shorter drivers are more at risk for harm from an airbag than taller drivers?
- Is a driver more likely to be harmed by an airbag in a high speed or low speed collision? Explain.
- How do you think a car's ability to crumple affects a driver's risk for harm from an airbag?

Supporting NGSS practices

Developing and using models

Click "Watch a Sunray" to see what happens to solar radiation.

Watch a sunray several times.

- Does the same thing happen every time?
- How does energy from the sun change/transform?

The screenshot displays the MySystem software interface. On the left, a simulation window shows a cross-section of the Earth's atmosphere and surface. Yellow arrows represent solar radiation entering from the top. Red arrows represent infrared radiation being emitted from the surface and absorbed by greenhouse gases in the atmosphere. A red area at the bottom represents heat being conducted into the ground. A speed slider is positioned above the simulation, with buttons for "Setup", "Go", "Watch Sunray", and "Unwatch".

On the right, the MySystem diagram creation tool is active. It features a sidebar with a list of objects: Sun, Carbon Dioxide, Glucose, Plant, Chloroplast, and Water. The main workspace contains a diagram with these objects and arrows indicating energy flow. A text box in the upper right corner provides instructions: "Create a MySystem diagram to explain to Mary how light energy is transformed into chemical energy. Be sure to include the following information as you LABEL ALL ARROWS: -Where energy comes from -How energy moves -Where energy goes -How energy changes/transforms. If there is no energy involved, choose Non-energy arrow."

Supporting NGSS practices

Analyzing and Interpreting Data

WISE v4 Full Screen My Work Flagged Home / Sign Out

Graphing Stories (without motion probes)

Welcome Test User!
[Expand All](#) [Collapse](#)

2: Retell the Story with Graphs

- Step 2.1: The Encounter
- Step 2.2: Create a data table
- Step 2.3: Graph the encounter
- Step 2.4: Watch the encounter
- Step 2.5: Match graphs with actions**
- Step 2.6: Last Leg of the Hike

3: Self-guided Critique +

4: Test Your Knowledge +

5: Drive Your Car +

6: Extra for Experts +

Match & Sequence

[Instructions](#)

Choices

Time (minutes)	Position (meters)
0	400
10	600
20	800
30	1000
40	1200

Time (minutes)	Position (meters)
0	0
10	100
20	200
30	300
40	400

Event 1: The girls leave their lunch spot at 3:00 and meet the bear 20 minutes later

Event 2: The girls sprint back to the lunch spot after seeing the bear and then wait there for ten minutes.

Event 3: The girls creep slowly back to where they saw the bear.

Submit Answer Attempts: 0

Supporting NGSS practices

Constructing Explanations

The screenshot shows the WISE v4 interface. The top navigation bar includes "Full Screen", "Ideas (2)", "Add Idea +", "My Work", "Flagged", and "Home / Sign Out". The main content area is titled "Chemical Reactions: How Can We Slow Climate Change?" and includes a sidebar with a list of steps. The current task is "Step 2.6: Add New Evidence to Your Basket". The task instructions are: "Based on the model, add some evidence to your basket about how energy from the sun warms the earth." Below the instructions is an "Idea Basket" section with an "Add Idea +" button. The basket contains two ideas:

Your Ideas	Source	Icon	Delete
This is great Edit	Everyday Observation		
Energy in = energy out Edit	Visualization or Model		

Below the table is a "Trash (0) (Click to show)" link.

Supporting NGSS practices

Constructing Explanations

The screenshot shows a web application titled "Explanation Builder". At the top, a navigation bar includes icons for "Ideas (2)", "Add Idea", "My Work", "Flagged", "Full Screen", and "Sign Out | Home".

The main content area has a yellow header with the instruction: "Look over your ideas. Which of them do you think you can use to explain why seasons happen? Drag and organize your ideas using the space below."

Below the instruction is a table with two columns: "Your Ideas" and "Flag".

Your Ideas	Flag
Earth is tilted on its axis	!
Planets move around the sun	

To the right of the table are two large columns: "HELPFUL" (blue) and "NOT HELPFUL" (light blue). A vertical toolbar with colored squares (blue, green, red, orange, purple, brown) is on the right side.

The "HELPFUL" column contains a blue box with the text "Earth is tilted on its axis".

The "NOT HELPFUL" column is empty.

Below these columns is a "NOT SURE" section (grey) containing a blue box with the text "Planets move around the sun".

At the bottom of the "NOT SURE" section is a text prompt: "How did you decide whether an idea would be helpful or not helpful to use?" followed by a text input area.

At the bottom left is a blue button labeled "ADD NEW IDEA +". At the bottom right is a blue button labeled "SAVE".

Engaging in argument from evidence

WISE v4 | Full Screen | Ideas (2) | Add Idea + | My Work | Flagged | Home / Sign Out

Chemical Reactions: How Can We Slow Climate Change?

Welcome Test User!
Expand All Collapse

- 1: What Causes Climate Change? +
- 2: Greenhouse Investigation +
- 3: Human Contribution +
- 4: Limiting Reactants +
- 5: Other Chemical Reactions +
- 6: Write Your Congressperson -
 - Step 6.1: What can we do?
 - Step 6.2: Research Introduction
 - Step 6.3: Conduct Some Research
 - Step 6.4: Organize Your Ideas**
 - Step 6.5: Write Your Letter to Congress
 - Step 6.6: How to Send Your Letter
- 7: Extra for experts +

EXPLANATION BUILDER

Before you write your letter, use the space below to organize the ideas you've collected to help make your argument stronger.

Your Ideas

This is great

Energy in = energy out

Add Idea +

How Climate Change Works

This is great

What Contributes to Climate Change

How to Slow Climate Change

Energy in = energy out

Obtaining, evaluating, communicating

Private Idea Basket

View: Private Idea Basket Public Idea Basket

[Add Idea](#)

Your Ideas	Origin	How do you know?	How certain	What is this idea about?	Delete
testing out (Public) Edit					
Oil is non polar (Public) Edit					

[Trash \(0\)](#) (Click to show)

WISE v4 Full Screen My Work Flagged Home / Sign Out

Population Biology Unit - Static

Welcome Test User!
Expand All Collapse

- Step 6.2: Exploration 1
- Step 6.3: E1: Open The Model
- Step 6.4: E1: Test Your Predictions
- Step 6.5: E1: Make a Claim
- Step 6.6: E1: Making Sense of Your Data
- Step 6.7: Exploration 2
- Step 6.8: E2: Making Sense of Your Data
- Step 6.9: Exploration 3
- Step 6.10: E3: Conduct Your Investigation
- Step 6.11: E3: Class Gallery**
- Step 6.12: Discoveries

7: Design a Population +

Class Gallery

As a presenter	As an audience member
<p>Press update list to see the results of all your classmates' published experiments.</p> <p>Prepare to present your results to the class.</p>	<p>While you are listening to others present, think of questions that you can ask and ideas you can link in. Some suggestions include:</p> <ul style="list-style-type: none"> Questions that would help clarify your understanding of the argument being. Similarities or differences between the evidence presented by different people. Insights into discoveries the class is making about the lesson question, "How Can We Describe Population Size Changes In Ecosystem?"

Gallery of Work: [Refresh](#)

export_interface/6164

User: testuser-final

Description: 300 bugs & 75 birds at start

Teacher Supports

- Student Monitors/progress
- Automatic scoring of student work

WISE 4.0 the web-based inquiry science environment
BETA **TEACHER DASHBOARD** *LibbyGerard*
 HOME PROJECTS MANAGEMENT HELP Admin Home Page Sign Out

Grade Student Work GRADING

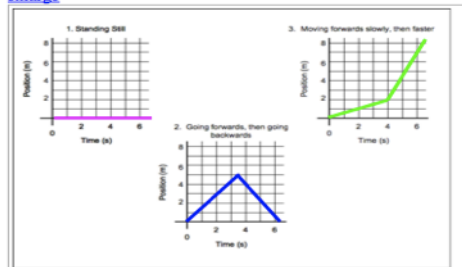
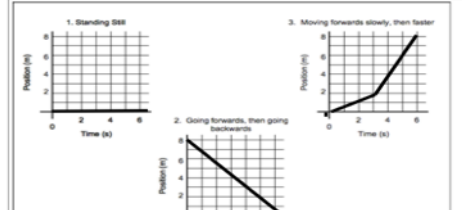
GRAPHING STORIES (Project Run ID: 490) [Change Project Run](#)

[Grade By Step](#) [Grade By Team](#) [Export Latest Student Work](#) [Export All Student Work](#) [Check for New Student Work](#) [SAVE CHANGES](#)

GRADE BY STEP (select a step below):

All Periods P1 P2 P3 P5 P6

	Point Value EDITABLE	Items to Review	Avg Class Score (scored items only)	% of Students Who Have Completed This Step
A1. Assessment 1				
1.1 Check Your Understanding 1 [HtmlNode]				
1.2 The Race (Partner 1) 1 (AssessmentListNode)	0	81	na	100%
1.3 Friends' House (Partner 1) 1 (AssessmentListNode)	0	80	na	98%
1.4 The Race (Partner 2) 1 (AssessmentListNode)	0	78	na	96%
1.5 Friends' House (Partner 2) 1 (AssessmentListNode)	0	74	na	91%
1.6 The Race (Partner 3) 1 (AssessmentListNode)	0	41	na	50%
1.7 Friends' House (Partner 3) 1 (AssessmentListNode)	0	24	na	29%

STUDENT WORK	TEACHER COMMENT / SCORE
<p>enlarge</p>  <p>Description: Enter text here....</p>	<p>Score: <input type="text" value="3"/> / 3</p> <p>Comment:</p> <p><i>Last Annotation: Fri Oct 22 2010 23:54:09 GMT-0700 (PST)</i></p>
<p>enlarge</p> 	<p>Score: <input type="text" value="2"/> / 3</p> <p>Comment:</p> <p><i>Last Annotation: Fri Oct 22 2010 23:54:14 GMT-0700 (PST)</i></p>

Features to support teachers

- Scoring of student work
- Feedback/displaying student work

<p>Brianna Sanchez (BriannaS1029)</p> <p>marissa molina (marissam122)</p> <p>[Period 1]</p> <p>Hide/Show Revisions</p>	<p>1. there graph is different because the y axis has different numbers and they both start at different places. Antonios y axis starts by 10s. and vijays starts by 200s.</p> <p>2. the highest point on each graph represent , the days they took and how far they traveled</p> <p><i>Timestamp: Wed Oct 20 2010 09:10:41 GMT-0700 (PST)</i></p>	<p>Score: <input type="text" value="2"/> / 4</p> <p>Comment: Open Premade Comments</p> <p>You are not reading the question correctly. Please review and revise your answer.</p> <p><input type="checkbox"/> Flag</p>
<p>Brianna Sanchez (BriannaS1029)</p> <p>marissa molina (marissam122)</p> <p>Revision 2</p>	<p>1. there graph is different because they both started at different places at the camp.</p> <p>2. For antonio his highest point on the graph on the 8th day was 55kilometers. then vijays highest point was on the 5th day and was 1,100 meters.</p> <p><i>Timestamp: Tue Oct 19 2010 08:51:37 GMT-0700 (PST)</i></p>	<p>GRAPHING STORIES (Project Run ID: 490) Change Project Run</p> <p>Grade by Step Grade by Team Export Latest Student Work Export All Student Work Check for New Student Work SAVE CHANGES</p> <p>2.5 WHAT'S THE DIFFERENCE? YOUR THOUGHTS Previous Step Change Step Next Step</p> <p>Question: Hide/Show the Question</p> <p><input checked="" type="radio"/> All Periods <input type="radio"/> P1 <input type="radio"/> P2 <input type="radio"/> P3 <input type="radio"/> P5 <input type="radio"/> P6</p> <p><input checked="" type="checkbox"/> Hide Personal Info <input checked="" type="checkbox"/> Show Flagged Items Only <input type="checkbox"/> Enlarge Student Work Text <input type="checkbox"/> Show All Revisions</p>
<p>Brianna Sanchez (BriannaS1029)</p> <p>marissa molina (marissam122)</p> <p>Revision 1</p>	<p>1. The graphs look different because Vijays is going faster 2. The highest point on Antonio's graph shows that on the 8th day he ran a total of 55kilometers. The highest point on Vijay's graph showsont the 5th day he ran a total of 1,100</p> <p><i>Timestamp: Mon Oct 18 2010 09:24:08 GMT-0700 (PST)</i></p>	<p>STUDENT WORK</p> <p>1. The graphs look different because Antonio is using kilometers and Vijay is using meters. Vijays y axis is labeled Elevation of Campsite and goes up by 200 meters. Antonios y axis is labeled total distance traveled and goes up by 10 kilometers. 2. The highest point on Antonio's graph shows 55. It represents 55 kilometers traveled in 8 days.The highest point on Vijay's graph shows 1,100. It represents 1,100 meters at 5 days.</p> <p><i>Timestamp: Tue Oct 19 2010 14:18:07 GMT-0700 (PST)</i></p> <p>1. The graphs look different because one of the graphs is measured in kilometers, and the other one is measure in meters. also, they took different trips and so there are different conclusions in time, and distance. Antonio's graph is measured in distance, and Vijay's graph is measured with elevation. 2. The highest point on Antonio's graph shows...about 55 kilometers. The highest point on Vijay's graph shows...800 meters, because it had a severe drop from 4 to 6, and so it is lower than it was.</p> <p>Vijay and Antonio were on the same camping trip, but took different trip routes. One of them measured the height of the campground, and the other one went on a trip uphill. also, Antonio's graph is measured in Kilometers, and Vijay's graph is measured in meters.</p>

Customization

- Authoring and research tools

WISE 4 ^{Beta 2.2} Authoring Tool
 Instructions | Exit to Home | Open Project | Create Project | Copy Project | Save Project | Manage Art/Files | Edit Info | Preview Project | EXTRAS

Project Title: Edit ID: 402 Simple Mode Toggle

Number Steps By: Step Term: Edit Logging Level:

Select All Select None Add Activity Add Step Move Duplicate Mirror Delete Hide Steps

Project Sequence (Active Activities & Steps)

Activity 1: 14 Steps

Step 1.1: Icon: Max Score: Edit

Step 1.2: Icon:

Step 1.3: Icon:

Step 1.4: Icon:

Step 1.5: Icon:

Step 1.6: Icon:

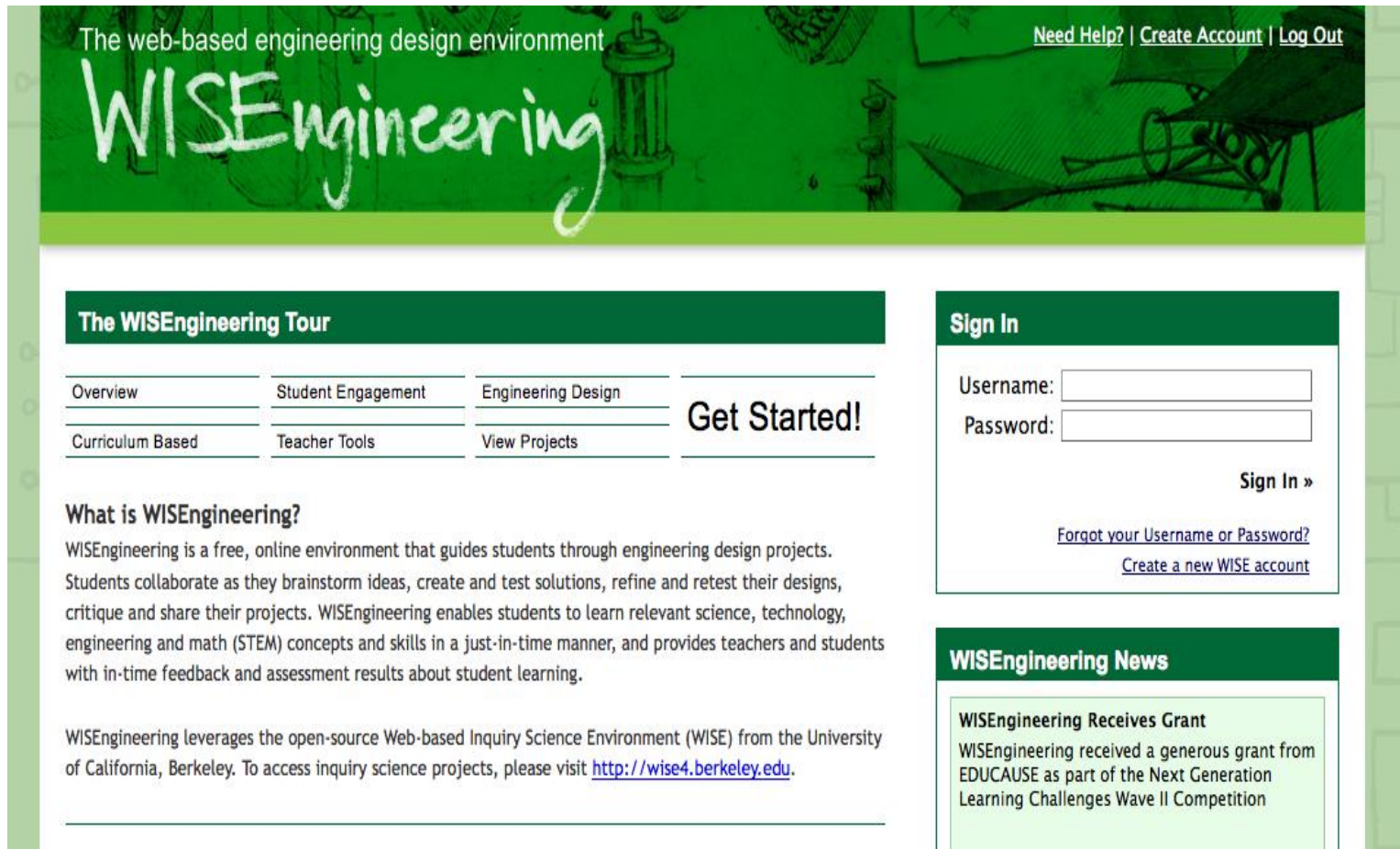
Step 1.7: Icon:

Step 1.8: Icon:

#	Step Title	Step Type	Step Prompt	Node Id	Start Time	End Time	Time Spent	Classmate I	Receiving Ti	Student Wo	Student Wo	Student Wo	Student Wo	Student Wo
1	Workgroup	Wise Id 1	Wise Id 2	Wise Id 3	Teacher Log	Class Period	Start Date	End Date						
2	24399	9975		JennieChiu	1		2010-11-17	2010-11-15	17:39:58.0					
3														
4	1.1.1	Introduc Html	N/A	node_0.ht	2010-11-17	2010-11-17	10	N/A	N/A	N/A				
5	2.1.1	Introduc Html	N/A	node_0.ht	2010-11-17	2010-11-17	1	N/A	N/A	N/A				
6	3.1.2	Prior Ex AssessmentList	Please let u	node_14.al	2010-11-17	2010-11-17	7	N/A	N/A	Yes	No	No		
7	4.1.3	Pretest AssessmentList		node_3.al	2010-11-17	2010-11-17	21	N/A	N/A	(b) The num	False	The mass o	(d) Both (a)	less than 2
8	5.1.4	Self-Rat AssessmentList		node_2.al	2010-11-17	2010-11-17	6	N/A	N/A	(2) Somewhat Poor				
9	6.1.5	Visualiz Html	N/A	node_5.ht	2010-11-17	2010-11-17	18	N/A	N/A	N/A				
10	7.1.5	Visualiz Html	N/A	node_5.ht	2010-11-17	2010-11-17	1	N/A	N/A	N/A				
11	8.1.6	Text Ver Html	N/A	node_19.ht	2010-11-17	2010-11-17	1	N/A	N/A	N/A				
12	9.1.7	Self-Rat AssessmentList		node_6.al	2010-11-17	2010-11-17	7	N/A	N/A	(2) Somewhat Poor				
13	10.1.8	Generat OpenResponse	Please write	node_7.or	2010-11-17	2010-11-17	10	N/A	N/A	<p>I like dogs</p>				
14	11.1.6	Text Ver Html	N/A	node_19.ht	2010-11-17	2010-11-17	1	N/A	N/A	N/A				
15	12.1.8	Generat OpenResponse	Please write	node_7.or	2010-11-17	2010-11-17	7	N/A	N/A	<p>I like dogs and cats</p>				
16	13.1.10	Drawin Html	N/A	node_18.ht	2010-11-17	2010-11-17	3	N/A	N/A	N/A				
17	14.1.11	Posttes AssessmentList		node_13.al	2010-11-17	2010-11-17	17	N/A	N/A	(e) Each of True		Matter is coi	(b) Breaking	28.0 gram
18	15.1.12	Self-Re AssessmentList		node_12.al	2010-11-17	2010-11-17	6	N/A	N/A	(5) Very Good				
19	16.1.13	Expert Html	N/A	node_15.ht	2010-11-17	2010-11-17	1	N/A	N/A	N/A				
20	17.1.14	Self-Re AssessmentList		node_16.al	2010-11-17	2010-11-17	11	N/A	N/A	(4) Good				
21	18.1.2	Prior Ex AssessmentList	Please let u	node_14.al	2010-11-17	2010-11-17	2	N/A	N/A	Yes	No	No		
22	19.1.4	Self-Rat AssessmentList		node_2.al	2010-11-17	2010-11-17	4	N/A	N/A	(2) Somewhat Poor				
23	20.1.7	Self-Rat AssessmentList		node_6.al	2010-11-17	2010-11-17	4	N/A	N/A	(2) Somewhat Poor				

- Defining problems, designing solutions?
- NGSS means also teaching engineering!

www.wisengineering.org



The web-based engineering design environment

[Need Help?](#) | [Create Account](#) | [Log Out](#)

WISEngineering

The WISEngineering Tour

Overview	Student Engagement	Engineering Design
Curriculum Based	Teacher Tools	View Projects

Get Started!

What is WISEngineering?

WISEngineering is a free, online environment that guides students through engineering design projects. Students collaborate as they brainstorm ideas, create and test solutions, refine and retest their designs, critique and share their projects. WISEngineering enables students to learn relevant science, technology, engineering and math (STEM) concepts and skills in a just-in-time manner, and provides teachers and students with in-time feedback and assessment results about student learning.

WISEngineering leverages the open-source Web-based Inquiry Science Environment (WISE) from the University of California, Berkeley. To access inquiry science projects, please visit <http://wise4.berkeley.edu>.

Sign In

Username:

Password:

[Sign In »](#)

[Forgot your Username or Password?](#)
[Create a new WISE account](#)

WISEngineering News

WISEngineering Receives Grant

WISEngineering received a generous grant from EDUCAUSE as part of the Next Generation Learning Challenges Wave II Competition

Supporting Engineering Design

WISEngineering Full Screen My Work Flagged Home / Sign Out

Hydroelectric Generators

Welcome Test User!
[Expand All](#) [Collapse](#)

1: Hydroelectric Generator Challenge

- Step 1.1: Design Challenge
- Step 1.2: Specifications and Constraints

2: Develop Knowledge

- Step 2.1: Motor as Generator
- Step 2.2: Energy Transformation and Transfer
- Step 2.3: Research Real-World Examples





3: Ideate Solutions +

4: Build Prototype +

5: Test and Evaluate +

Design Challenge

We all use electricity at home, at school, and elsewhere. Electric power stations transform various kinds of energy into electricity. There are many different kinds of power stations (click on the pictures to learn more).

 Coal-powered Steam	 Nuclear-powered Steam	 Hydroelectric (water-driven)	 Wind
---	--	---	---

Your challenge is to design a water-driven electric generator that converts mechanical energy to electrical energy given the materials provided to you.

Project goals are to: (1) Output the largest amount of electricity, as measured by average maximum voltage. (2) Demonstrate your model and describe how it works, paying special attention to energy transformations. Your generator must be water-powered.

You will be provided with an electric motor and some materials to construct your generator in class. You have up to one and a half class periods to complete the challenge.

Defining problems

The screenshot displays the WISEngineering BETA interface. The top navigation bar includes 'Specifications and', 'Design Journal', 'Flagged', 'Design Portfolio', 'Full Screen', and 'Sign Out | Home'. The left sidebar shows the 'Community Building Challenge' with a welcome message and a list of steps: 'Step 1.1: Introduction', 'Step 1.2: Specifications and Constraints' (highlighted), 'Develop Knowledge', 'Ideate Solutions', 'Build Prototype', 'Evaluate Design', 'Final Solution', and 'Reflection Questions'. The main content area is titled 'QUESTIONNAIRE' and 'QUESTION'. It features a green header 'Specifications and Constraints' and text explaining that specifications and constraints are needed to design a solution. It defines specifications as requirements and constraints as limitations. A circular 'Design Cycle' diagram is shown, with 'Specifications and Constraints' highlighted in yellow. Below the text are two numbered questions with text input fields: '1. List all the specifications:' and '2. List all the constraints:'. A 'SUBMIT THE QUESTIONNAIRE' button is at the bottom.

Specifications and

Design Journal Flagged Design Portfolio Full Screen Sign Out | Home

WISEngineering BETA

Community Building Challenge
Welcome!
Happy Student (Happy50101)
3/12/2012

Expand All Collapse All

Community Garden Challenge

Step 1.1: Introduction

Step 1.2: Specifications and Constraints

Develop Knowledge

Ideate Solutions

Build Prototype

Evaluate Design

Final Solution

Reflection Questions

QUESTIONNAIRE

QUESTION

Specifications and Constraints

To design a solution to our challenge, we need to know the specifications and constraints.

Specifications are what your solution must do. They are the requirements.

Constraints are things that limit your solution. For example, a constraint may be how much you can spend or how much time you have to complete the challenge.

Where are the specifications and constraints for this challenge?
Hint: You may need to go back to the [Introduction](#).

1. List all the specifications:

The specifications of this challenge are...

2. List all the constraints:

The constraints of this challenge are...

SUBMIT THE QUESTIONNAIRE

Developing and using models

The screenshot displays the WISEngineering BETA interface, which is used for developing and using models. The interface is divided into several sections:

- Top Bar:** Includes navigation options like "Design Journal", "Flagged", "Design Portfolio", "Full Screen", and "Sign Out | Home".
- Left Panel:** Contains a "Community Building Challenge" sidebar with a list of steps: "Step 4.1 My Community Buildings", "Step 4.2 Find Examples", "Step 4.3 Ideate Community Buildings", "Step 4.4 Design Sketch #1" (highlighted), "Step 4.5 Justifying Design #1", "Step 4.6 Design Sketch #2", "Step 4.7 Justifying Design #2", "Build Prototype", "New Requirements", "Developing More Knowledge", "Refine Design", "Evaluate Design", "Final Solution", and "Extension Questions".
- Central Canvas:** Shows a 2D line drawing of a building structure, consisting of a cylindrical base and a rectangular structure with a peaked roof.
- Right Panel:** Displays a "Post Designs" window for "Student 2" posted by Happy50101 on 2012-03-12. It shows a 3D model of the building structure on a blue grid. The model is a rectangular prism with a peaked roof, colored in a dark blue/grey. The 3D view includes a coordinate system (X, Y, Z) and a status bar at the bottom indicating: "Total Surface Area = 229.26", "Total Volume = 160.92 and Cost: \$43.50".

Using mathematics and computational thinking

WISE v4 Full Screen My Work Flagged Journal Design Wall Scratch Home / Sign Out

Dance Party!

Welcome Test User!

Design Challenge **Design Solution**

Collaboration Refine Design Specifications Constraints Systems Thinking Test and Evaluate Design Develop Knowledge Build Prototype Ideate Solutions Optimization Tradeoffs Creativity

Design Cycle

Everything from cell phones, videogames, and even your electricity depends on software engineering. [Software Engineers](#) make a difference by designing programs that tell computers what to do, resulting in videogames, cell phones, and even how power gets to your house or school.

Your challenge is to work as a software engineer to make a program for a dance party. You are in a programming environment called Scratch. Your program needs to:

- Have one dancer do at least two dance moves
- Play two different instruments as part of the music
- Have your dancer say something by programming a speech bubble

Dance Party!

- Step 1.1: Dancing Challenge
- Step 1.2: Design Challenge
- Step 1.3: Specifications and Constraints
- Step 1.4: Develop Knowledge
- Step 1.5: Design Decisions
- Step 1.6: Constructing Your Design

Scratch Project Editor: Motion, Looks, Sound, Pen, Data, Events, Control, Sensing, Operators, More Blocks. Sprites: Stage, Hippo, Penguin.

Planning and carrying out investigations

WISE v4 Full Screen My Work Flagged Journal Design Wall Scratch Home / Sign Out

Optimum Potato Chip

Welcome Test User!

Design Challenge

Collaboration

Design Solution

Optimization Tradeoffs

Creativity

Step 1.1: Your Challenge

What Makes a Good Chip?

Testing 1,2,3

Step 3.1: Testing instructions

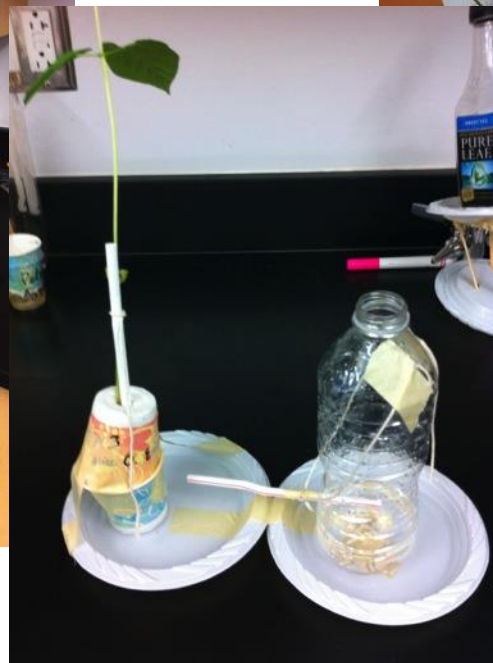
Chip A **Chip B** **Chip C** **Chip D**

You will be testing four different potato chips: Chips A,B,C, and D. It is essential to make sure that the chips are about the same size when testing for each quality. When comparing different chips, you want to make sure the test is "fair".

You will be ranking these chips from 1 to 4 (1= the worst, 2 = a little better, 3 = pretty good, 4 = the best) based upon your preference. Each chip must be ranked a different number.

You will test all four potato chips for one quality, before moving to the next quality.

Designing solutions



Engaging in argument from evidence

Community Garden

Welcome Test User!
Expand All Collapse

- 1: Community Garden Challenge
 - Step 1.1: Introduction
 - Step 1.2: Design Challenge
 - Step 1.3: Specifications and Constraints
 - Step 1.4: Design Journal
- 2: Develop Knowledge: KSB 1 +
- 3: New Challenge Information +
- 4: Develop More Knowledge +
- 5: Ideate Solutions +
- 6: Build Prototype +
- 7: Evaluate Design +
- 8: Final Solution +

Community Garden Design Challenge

A local company has just agreed to donate some of its field area to design a community garden. The company is looking for young engineers and mathematicians who can help design the garden. Students at your school, as well as 50 others, have been selected to submit a potential design.



Your challenge is to design a model of the garden using 3D pop-ups to represent the vegetables. The company is looking for a design that will produce the greatest amount of vegetables at the lowest cost to feed those in need in the community.

Your model must be a **3D, pop-up model**, must be **no larger than 5400 square cm**. There must be **at least 20 plants** and **no more than 32 plants** in the garden, and must contain **corn, tomatoes, squash, zucchini and carrots**. Your budget is **\$50** from the Community Garden fund to purchase the plants, and you have **6 class periods** to complete the challenge.

- Currently have Common Core mathematics (TEM), NGSS Science units (STE), Informal activities with tablet computers
- Working on integrating math and science in schools

WISEngineering

- Engineering is applying science to real-world problems – science teachers already do this well
- Potentially very motivating for students
- Difficult to assess, implement

Questions and Discussion

Thank you!

WISE and WISEngineering teachers

Marcia Linn, M. David Burghardt

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Thanks!

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@Roschelle63

- *Come visit us at CIRCLcenter.org*
- *Download Innovating Pedagogy '15*
- *Download NETP '16*