



## Dr. Ethan Danahy

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# Creating Inclusive Learning through Collaborative Tools and Supports

Assistive Technologies for Learning:  
Broadening Participation in STEM



# Relevant NSF Funded Research

*InterLACE: Interactive Learning and Collaboration Environment, DRL (DR K-12), 2011 to 2016*

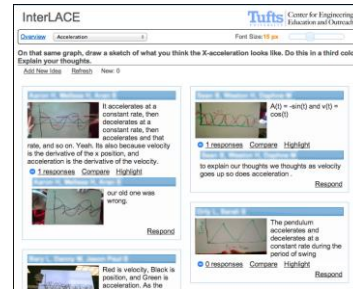
*Improving STEM Learning through Interactive RoboBooks, HRD (RDE), 2009 to 2011*

*Using Wide-Spread Collaboration to Motivate Innovation and Creativity, IIS (ITR-CreativeIT), 2008 to 2011*

# Research: Educational Technologies



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Design and development of new hardware, software, interfaces, and environments for supporting innovative teaching and learning in K-12 and university classrooms.



Center for Engineering  
Education and Outreach

<http://www.ceeo.tufts.edu>

challenge you will be using the **Engineering Process** to design and build something that assist someone in a wheelchair do something that is difficult for them.

Click on **Need/problem** to begin.

ive straight

ard for a certain  
w far it moves.

our robot's  
o relate the distance  
was travelling.

other distance and see if your  
may need to revise your model  
accurate.

a competition in class. There will  
a certain distance apart from each  
ance to run your robot, so you must  
tions before running your robot.



Hint for the model...

Remember that  
the velocity of  
your bot is  
defined as the  
distance travelled  
divided by the

Step 6: Observe which robot came the closest. The winner gets a prize.

Acknowledgements

[3 of 11]

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Going the Distance

1. Overview/Rubric  
2. Instructions  
3. Pre-Challenge Questions  
4. Program Code  
5. Post-Challenge Questions  
6. Summary

### Pre-Challenge Questions (part 1 of 4)

Explain how you predicted the distance that your robot would travel. Use words, image, or a movie.

Interactive digital workbook environment




The collage displays a variety of digital resources for a robotics project. Key elements include:

- Design Rules:** A window titled "Design Rules" with a yellow background and a small robot icon.
- Jack and Mike Personal:** An introduction page for "Jack and Mike Personal" with a photo of two students and a "Go to the next page" button.
- Physics Lesson 4: Crash Test:** A document titled "Physics Lesson 4: Crash Test" with a "Develop Your Hypothesis" section. It lists four hypotheses:
  - Hypothesis 1: does less damage than
  - Hypothesis 2: does equal damage to
  - Hypothesis 3: does more damage than
  - Hypothesis 4: does equal damage to
- Develop Your Hypothesis:** A document titled "Develop Your Hypothesis" with a "Select one of the following possible outcomes. Which is your hypothesis?" section. It lists four hypotheses:
  - Hypothesis 1: does less damage than
  - Hypothesis 2: does equal damage to
  - Hypothesis 3: does more damage than
  - Hypothesis 4: does equal damage to
- Robotics:** A document titled "Robotics" with a "Spatula design" section. It includes a "Robotics" logo and a "Spatula design" section.
- LabVIEW 2009:** A document titled "LabVIEW 2009" with a "Getting Started" section. It includes a "Getting Started" section and a "Getting Started" section.
- Going the Distance - Journal:** A document titled "Going the Distance - Journal" with a "Journal" section. It includes a "Journal" section and a "Journal" section.
- Front Panel:** A document titled "Front Panel" with a "Front Panel" section. It includes a "Front Panel" section and a "Front Panel" section.
- Block Diagram:** A document titled "Block Diagram" with a "Block Diagram" section. It includes a "Block Diagram" section and a "Block Diagram" section.
- Getting Started - LabVIEW:** A document titled "Getting Started - LabVIEW" with a "Getting Started" section. It includes a "Getting Started" section and a "Getting Started" section.




# Universal Design for Learning (UDL)

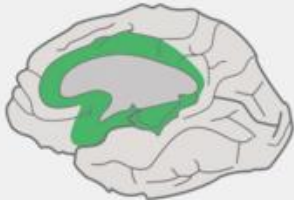
← → ↻ 🏠 [www.cast.org/our-work/about-udl.html](http://www.cast.org/our-work/about-udl.html) » ☰

**CAST** ABOUT CAST ▶ **OUR WORK** ▶ WORK WITH US ▶ WHAT'S NEW   

## Universal Design for Learning Guidelines

[GO TO THE UDL GUIDELINES](#) 


AFFECTIVE NETWORKS:  
THE **WHY** OF LEARNING



**Engagement**

For purposeful, motivated learners, stimulate interest and motivation for learning.

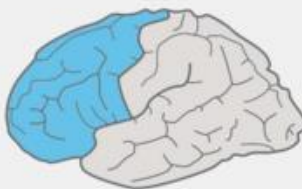
RECOGNITION NETWORKS:  
THE **WHAT** OF LEARNING



**Representation**

For resourceful, knowledgeable learners, present information and content in different ways.

STRATEGIC NETWORKS:  
THE **HOW** OF LEARNING



**Action & Expression**

For strategic, goal-directed learners, differentiate the ways that students can express what they know.

Robobooks: More Than a Trillion

Welcome Patti (Log out)

What's a mole?

Welcome

What's a mole?

Watch these videos to get an idea of how big a mole is then type or record your response to the question below.

How many?

Counting molecules & atoms

Making sense of it

Review my work

What did you think?

What example of how large or small a mole surprised you the most?

record type

Add a note

Save

Vocabulary supports (text-to-speech, glossary, in-line definitions)

Self-checks and peer assessment/evaluation

Just-in-time adaptive help

Highlighting key concepts and ideas

Alternate means of expression (text, images, movies, etc)

Support of background knowledge (readings, examples, audio, video)

Journal & lab notebook (sentence starters, documentation tools)

Concept maps/graphic organizers (for activity progression and content)

Summaries/views of student work

“Chunking” work in smaller parts

ROBOBOOKS

Condition 1 Question: Input Picture

Timer: 4:39

1. What's the acceleration of the ball for this ramp?  
2. Does the ball show increasing, decreasing, or zero acceleration?

Hint  
Use the formula:  $a = (v_2 - v_1)/t$ , where acceleration (a) is the rate of change of velocity over time.

Time	A (sec)	B (sec)	AB (sec)
Trial 1	0.043	0.084	0.236
Trial 2	0.047	0.088	0.233
Trial 3	0.045	0.092	0.220
Trial 4	0.046	0.093	0.230
Trial 5	0.046	0.085	0.210
Avg Time	0.047	0.088	0.226
Velocity	1.12	0.538	meters/sec

0

Back

ROBOBOOKS

Acceleration

Chapters

1. Day 1: Welcome Back  
Pre-Test  
2. Horizontal Acceleration  
Positive  
Negative  
Zero  
Check In  
Stop Motion  
Save Day 1  
3. Day 2: Ramp Activity  
Condition 1  
Condition 2  
Condition 3  
Compare Conditions  
4. Acceleration and Gravity  
Free Fall  
Ball Drop  
Check In  
5. Post-Test  
Robobook Evaluation  
6. Save and Close

Zero Acceleration

Acceleration can be positive, negative, or zero.

Objects at rest or moving with constant speed have zero acceleration.

View the movie on the right. The red dots show the position of the car after each second passes.

Notice how the distances between the red dots stay the same as time goes by.

Take Away

The object has constant speed over time, which is zero acceleration.

10/18

Josh and Ninos Pterodactyl - Your Animal

Your Animal

Describe unique characteristics of your animal and add pictures of the animal below.

What's your animal's name?  
Gorbetroph

Our cyber pterodactyl can viciously flap its wings almost to the point of take off, while screaming its mating call ferociously. It is also eloquently decorated with real

1/4/9

ROBOBOOKS

Diagramming a Circuit

Build a circuit that lights a bulb and includes a switch. Take a photograph and include it below.

Draw a diagram of your circuit. Take a photograph and include it above.

6/12

Physics Book

High Acceleration

High acceleration is like low acceleration, except the object that is starting off slow gains speed much more quickly.

Import, into the top space, your "low acceleration" data from the previous experiment. Then generate some "high acceleration" data with the PhysBUG and import it to the second graph.

How would you compare the two graphs? How can you tell which is which?

Low Acceleration Graph

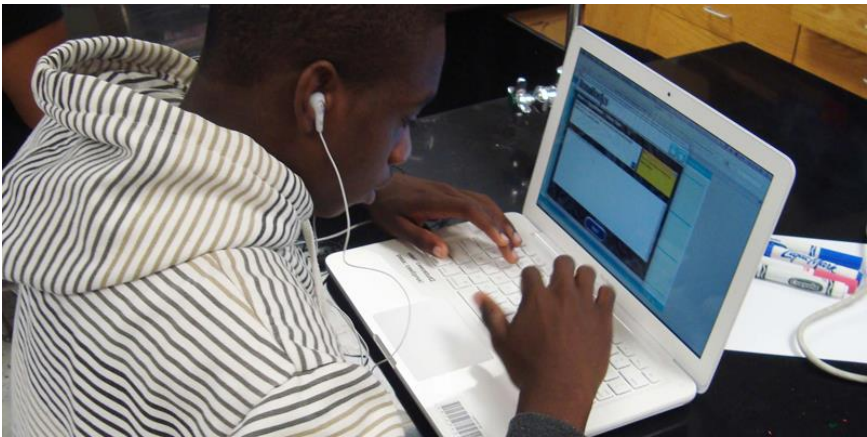
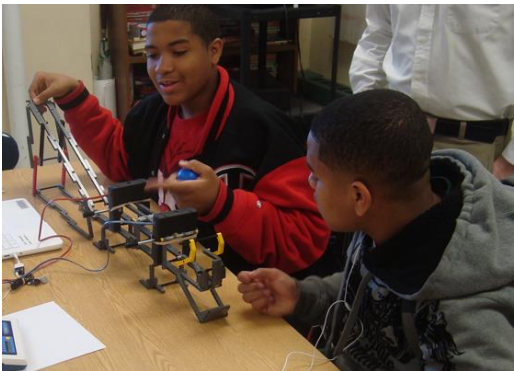
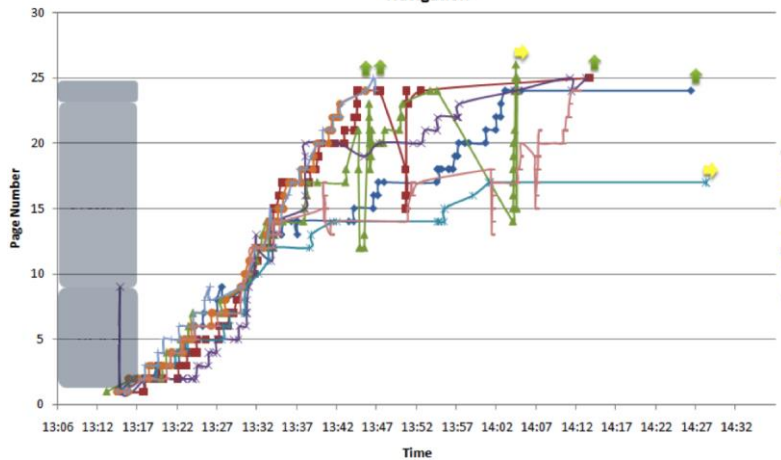
High Acceleration Graph

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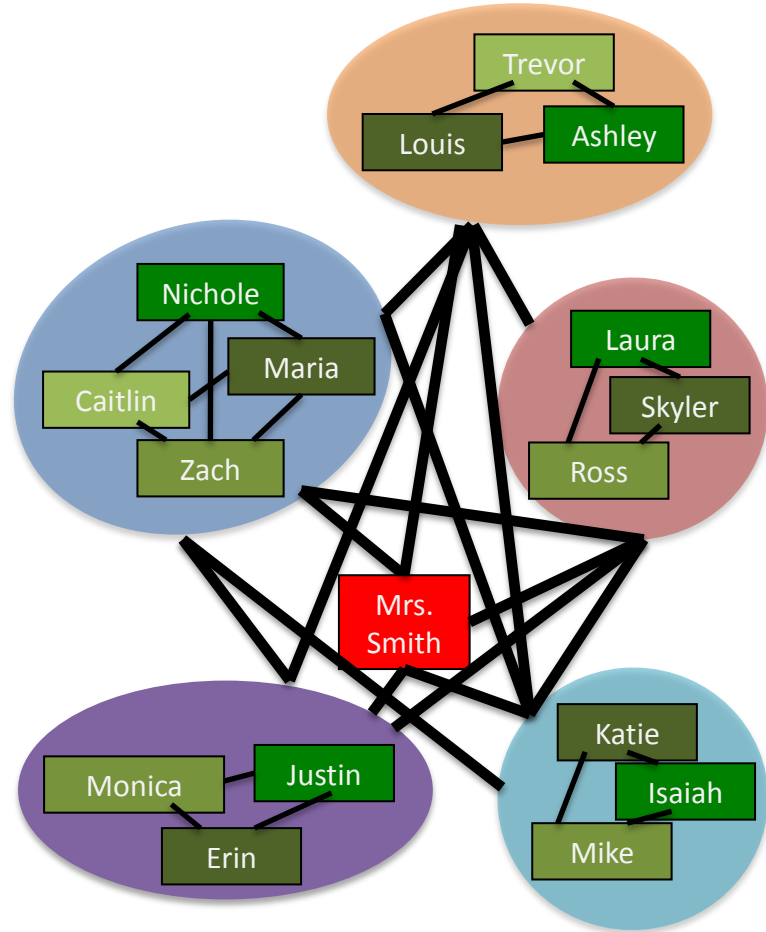
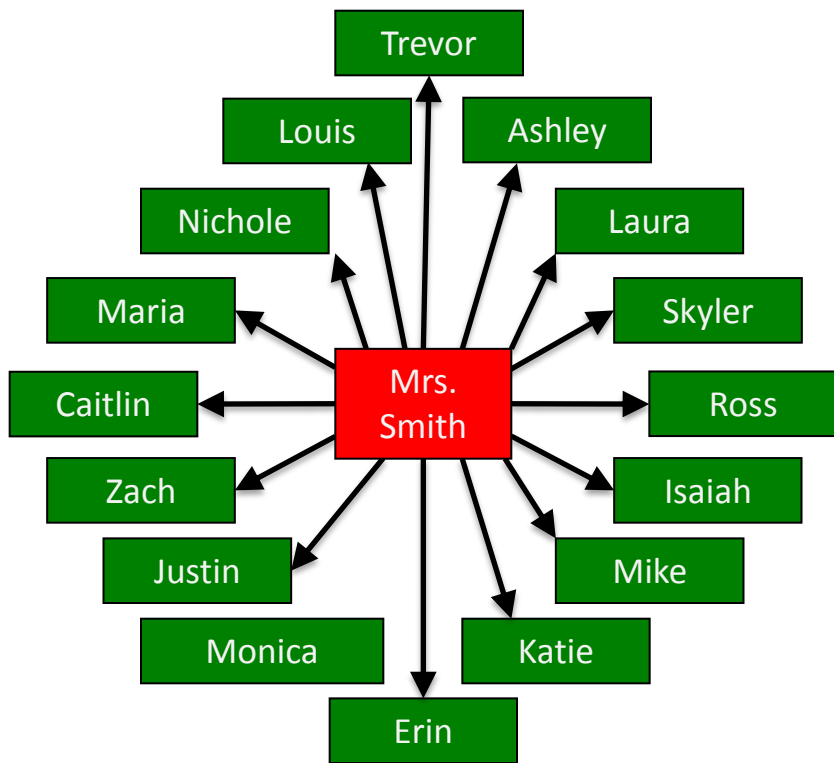


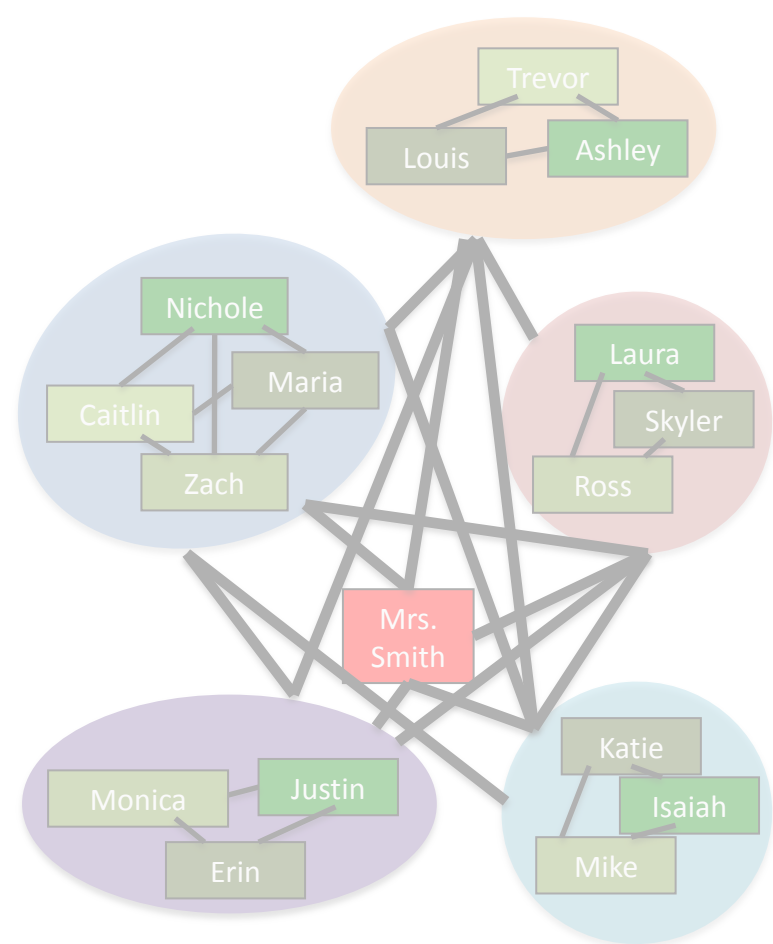
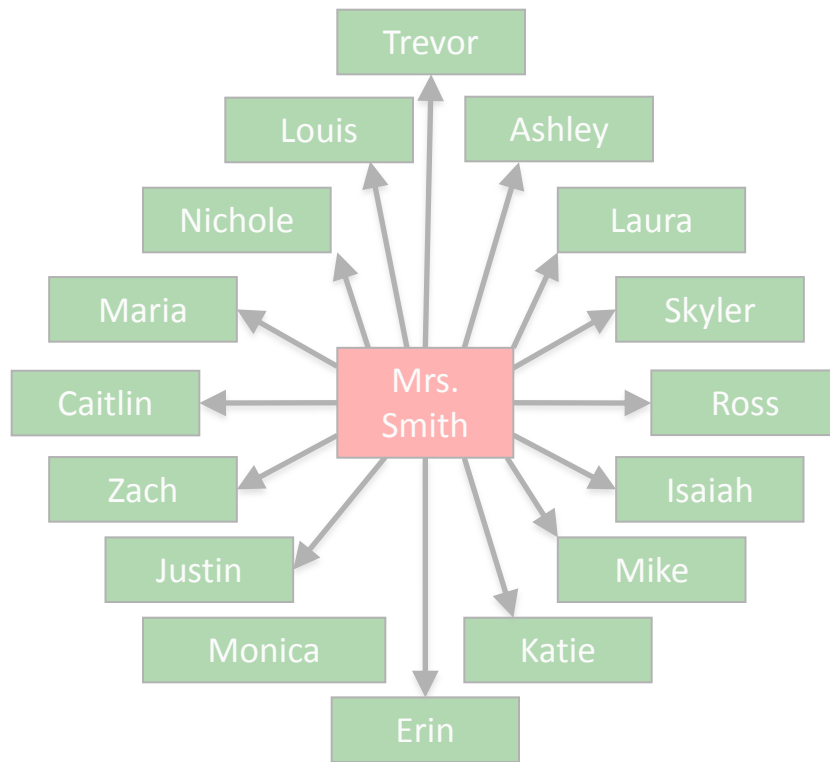


Navigation









# InterLACE: Interactive Learning and Collaboration Environment

**InterLACE** - Center for Engineering Education and Research

Make a data table of your results, with period in one column and the independent variable (such as length, mass, angle, gravity, friction) in the other column. You can create your data table by hand and upload a photo. OR you could make your data table in EXCEL or another spreadsheet program and upload either a JPEG or PNG file using the Browse feature of InterLACE. Make sure your data table has a title, labels, and units. If you notice any trends in the data, comment on them.

**New Ideas**

- Hypothesis**: Period appears to increase at a regular rate with length. *Aug 18 7:30 pm*
- Discussion**: I looked at the change in period based on three different factors: length, mass, and friction. According to my data, as length decreases, the period does too. Also, change in mass has no effect on the period unless there is friction acting on the pendulum. *Aug 18 7:30 pm*
- Discussion**: The increase in period was pretty much linear with the increase in length. For the most part, period increased roughly half a second per half-meter increase in length. *Aug 18 7:30 pm*
- Discussion**: The period seems to increase at a constant rate with respect to the length. *Aug 18 7:30 pm*
- Discussion**: Also the title of my table is: The Effect of Different Factors Acting on the Period. *Aug 18 7:30 pm*
- Discussion**: The first column is length of pendulum (m), and the second is period (s). *Aug 18 7:30 pm*

**Length (m) | Period (s)**: As length increases,

**Visual Classrooms** - Teacher Dashboard - About - Mr. James

### Teacher Dashboard

**Recent Sessions** [New Session](#)

Activity	Group	Contrib	Posts	New
Newton's Third Law	College Prep Physics - Period 7	SmGrp	12	2
Relational Databases	College Prep Physics - Period 7	Indiv	26	0
Whats a Database?	College Prep Physics - Period 7	Indiv	0	0
DELAB - Debriefing	College Prep Physics - Period 7	Indiv	3	0
DELAB - Class Day	College Prep Physics - Period 7	SmGrp	11	0

**Recent Posts**

- Mr. James** 10/23/2015 1:27 PM  
Draw The Graph in Newton's Third Law
- James H. Michael P** 10/23/2015 12:18 PM  
It goes up
- Howard J. Latisha G** 10/23/2015 10:37 AM  
Video and Hypothesis in Newton's Third Law  
We realized that the relationship was more complex than initially thought. The relationship between the mass of the 2 objects is the key

**Manage**

[Sessions](#) [Activities](#) [Collections](#) [Groups](#)

**Browse**



**Visual Classrooms**

<http://VisualClassrooms.com>



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- Interactive, Customizable Tools
- Supports with Universal Design for Learning (UDL) principles
- Broadening Participation through Inclusive Access
- Collaborative Learning via Shared Persistent Digital Spaces

## For more information:



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