



<http://corwin-connect.com/2017/01/encourage-growth-mindset-preschool/>

# Modeling a Maker-Space Mindset

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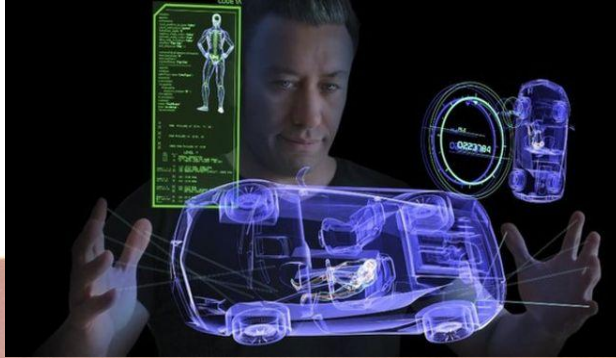
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*The Steward School*

NCTM Conference  
April 25-28, 2018

# Introductions

[http://ichef.bbci.co.uk/news/660/media/images/77220000/jpg\\_77220842\\_77220838.jpg](http://ichef.bbci.co.uk/news/660/media/images/77220000/jpg_77220842_77220838.jpg)



found in [www.automobile-catalog.com](http://www.automobile-catalog.com)



<http://home.howstuffworks.com/washer.htm>

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## Some goals we are striving for... (AKA, This Is A Journey!)

- Raise the bar for all: low floor-high ceiling
- Observe, modify, and re-evaluate cycle
- Personalize and offer choice
- Encourage math talk
- Choose meaningful and open ended tasks
- Allow for productive struggle
- Give way to asking, “what if...”



<http://www.gettingsmart.com/2014/05/houston-isd-talent-pipeline-flows-ways/>

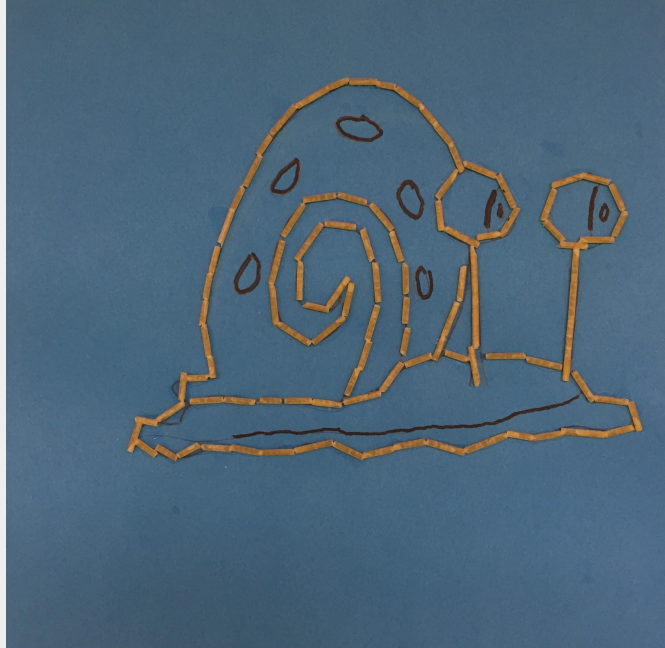


<https://myplasticfreelife.com/plastic-challenge>

Is there a way to...

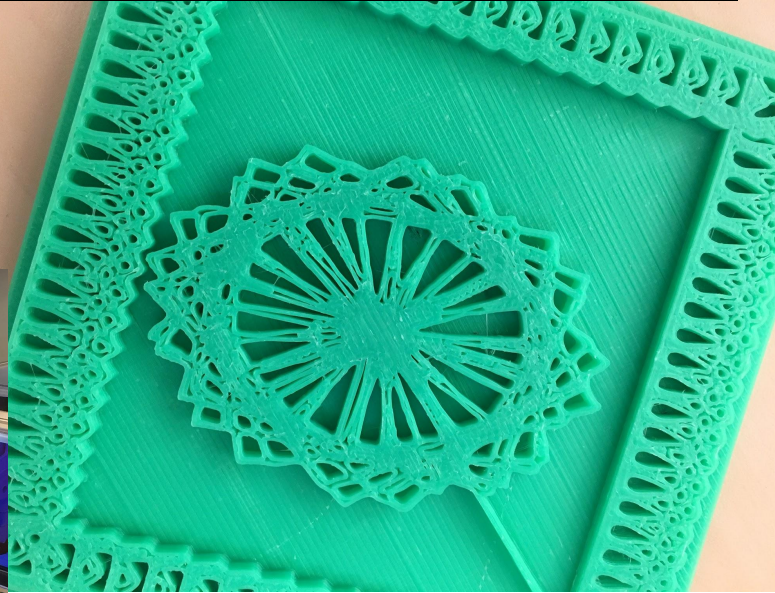
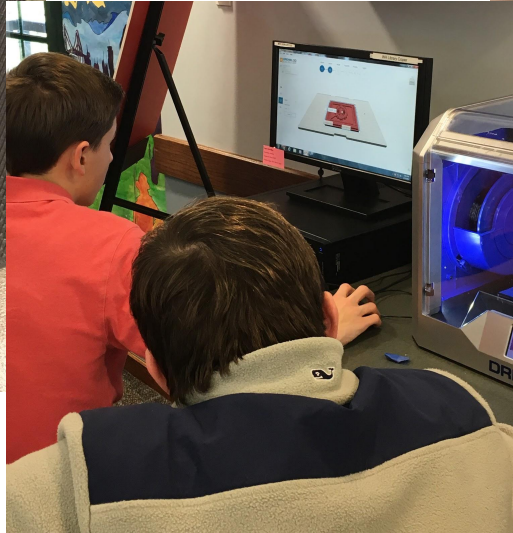
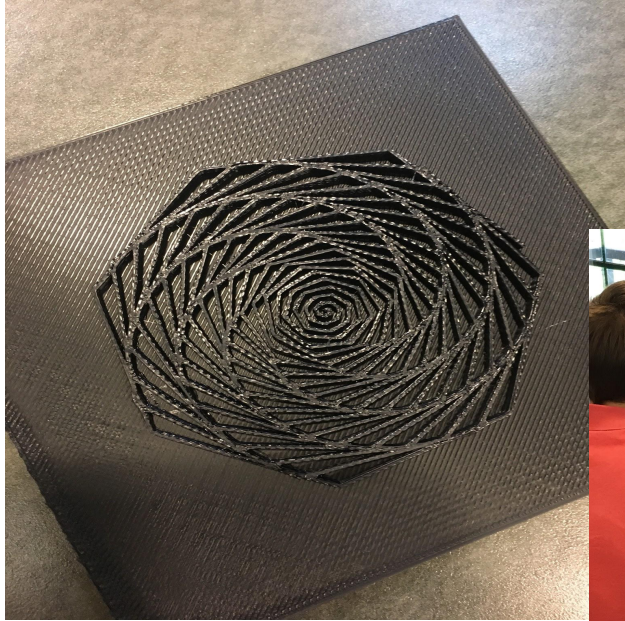
- Visualize it?
- Design think or model it?
- Make it?
- Do it?



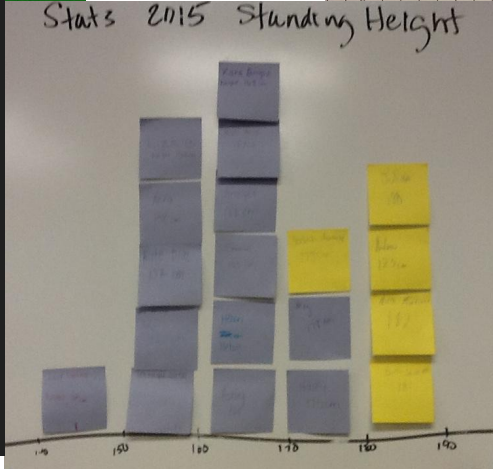
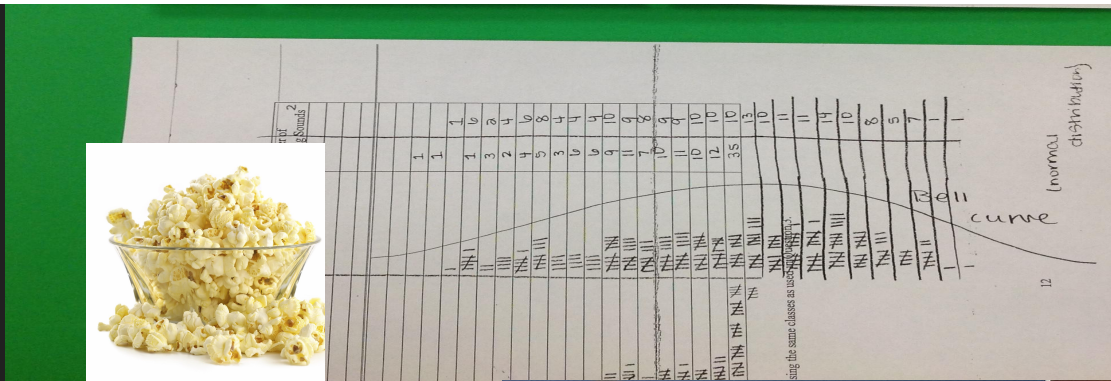


# First Thoughts: Visualizing Math

# Visualizing Math - Geometry and Algebra Tiles

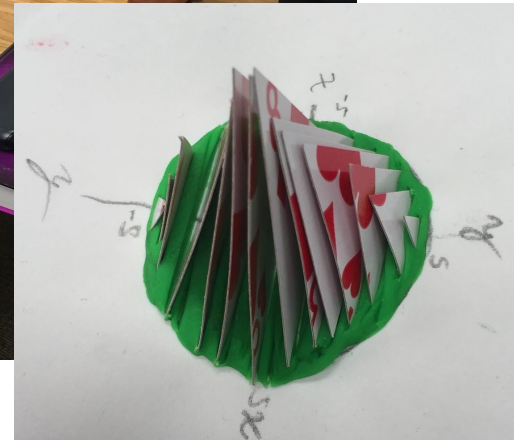
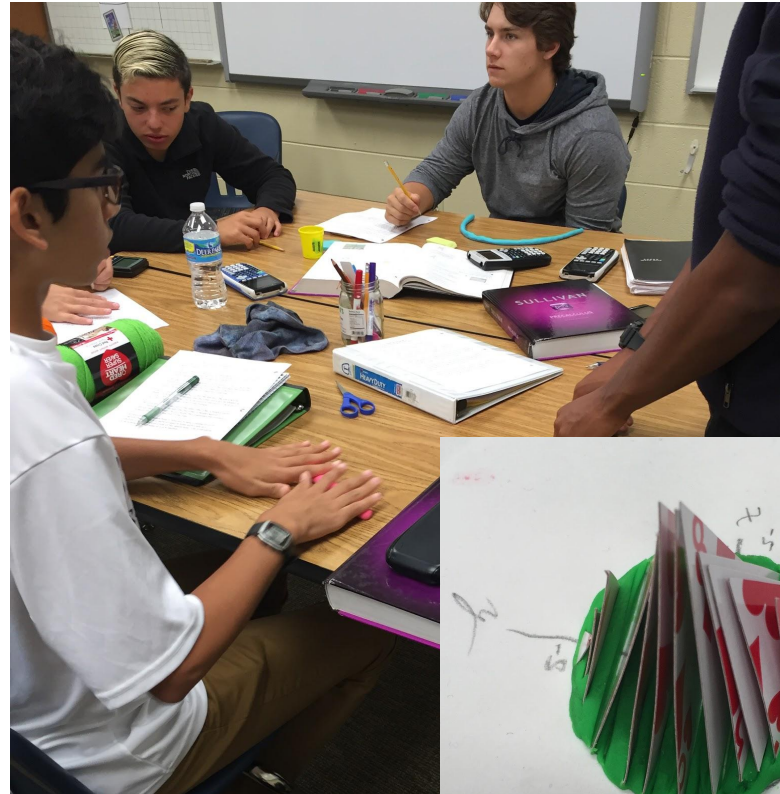


# Visualizing Math: creating our own data





# Visualizing Math: Building with Paper and Play Dough



No one uses Stairs.

People aren't the problem..

Can't redesign elevator fun

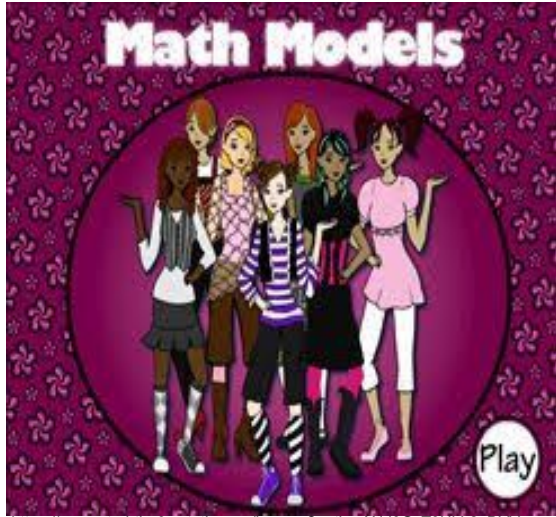
Elevators fill up everytime

~~Elevators go to every floor.~~

## Design Thinking and Math Modeling

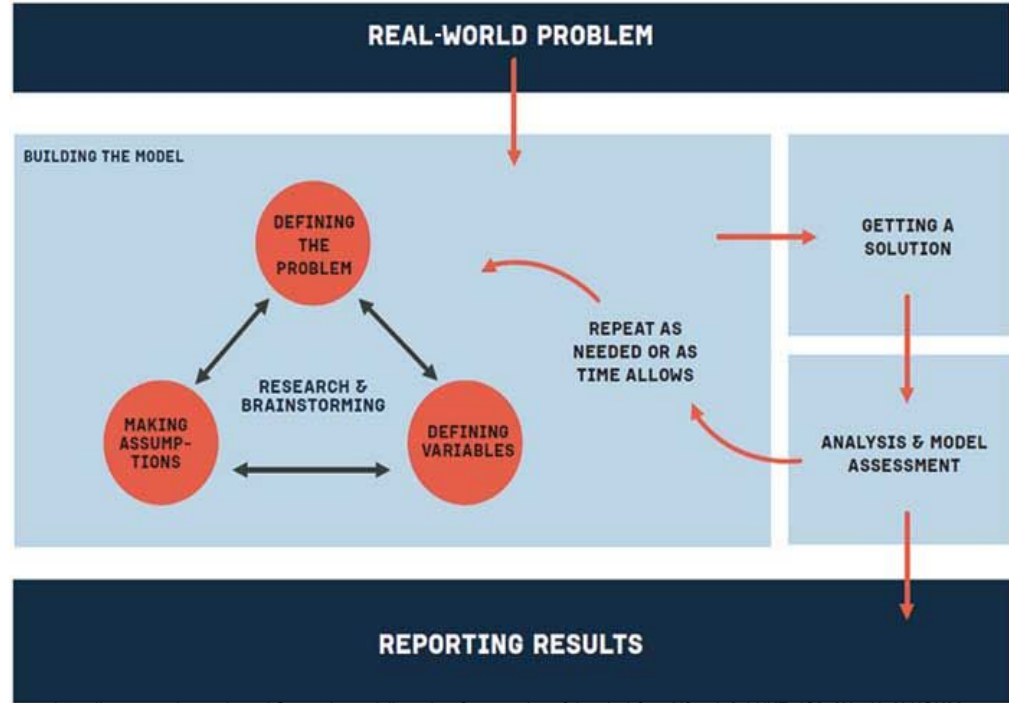


# Design Thinking in Math: Math Modeling



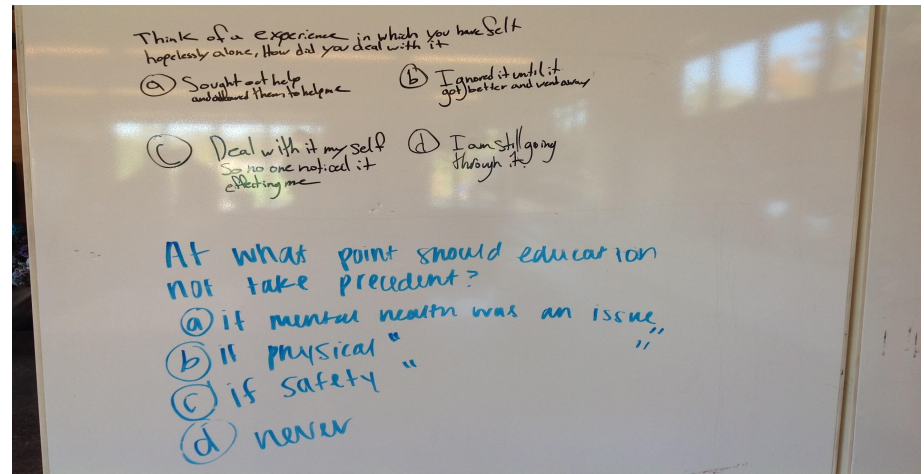
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VS.



[https://www.google.com/search?q=math+modeling+class&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjC0o3NvqHaAhUQU98KHWSVDPUQ\\_AUICygC&biw=1536&bih=760#imgdii=MWJwKpacVReDwM:&imgcr=ubaj75VZY0LtQM](https://www.google.com/search?q=math+modeling+class&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjC0o3NvqHaAhUQU98KHWSVDPUQ_AUICygC&biw=1536&bih=760#imgdii=MWJwKpacVReDwM:&imgcr=ubaj75VZY0LtQM)

# Design Thinking: A Long Walk to Water



# Is it worth the drive across town for less expensive gas?



**Big Idea:** Create a mathematical model that can be used to help understand what conditions make the drive more or less worthwhile.

**Focus:** variables and assumptions. What quantitative data would you want to collect and what assumptions you would want to make?

**Extension:** What community connections could you make as a part of this exercise?

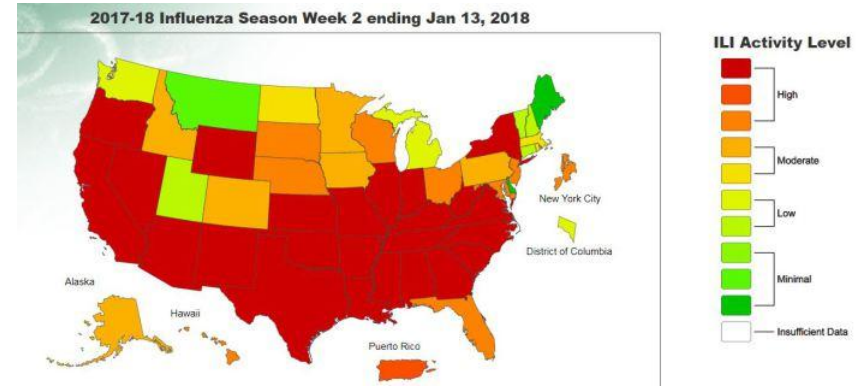
# Close or Continue? A Modeling Question from Flu

The 2018 flu season has been noteworthy in its impact on communities including schools.

Assume the role of an administrator in your school system. Develop a mathematical model(s) that triggers appropriate measures to contain the flu.

For this exercise let us focus on variables and assumptions. What quantitative data would you want to collect and what assumptions you would want to make?

What community connections could you make as a part of this exercise?



[www.tlnt.com/this-flu-is-a-killer-dont-let-anyone-come-to-work-sick](http://www.tlnt.com/this-flu-is-a-killer-dont-let-anyone-come-to-work-sick)

# An Uplifting Problem (by John Walton and Bob Davidson)



<http://www.comap.com/Free/GAIMME>



Solving Real Problems with Mathematics,  
Volume 2

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# Making Math:

## Maker Space and Coding

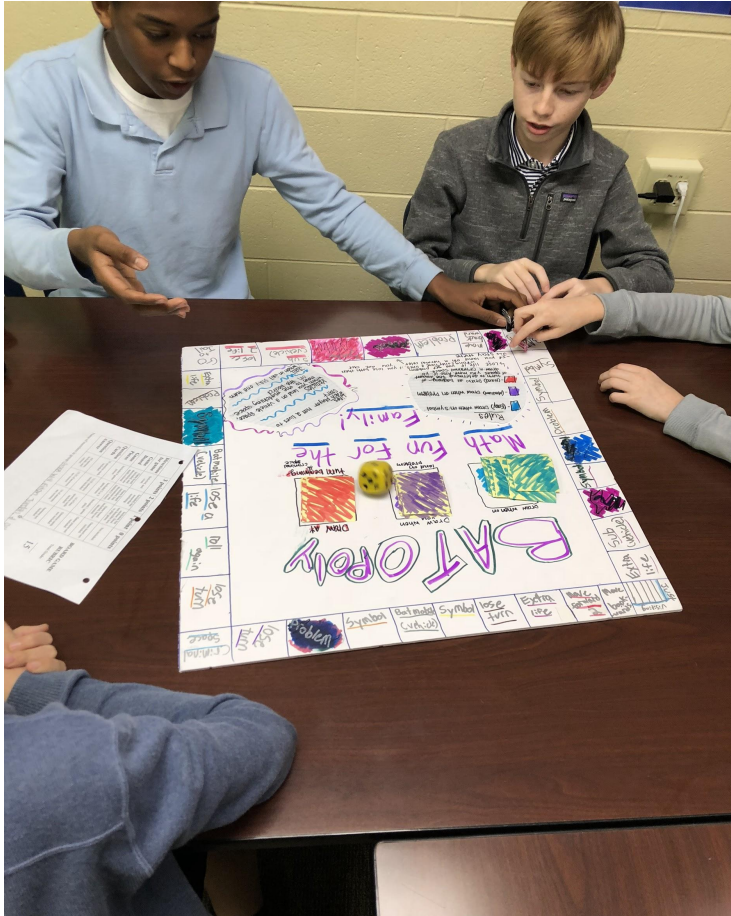


# Making Math:

## Maker Space and Coding



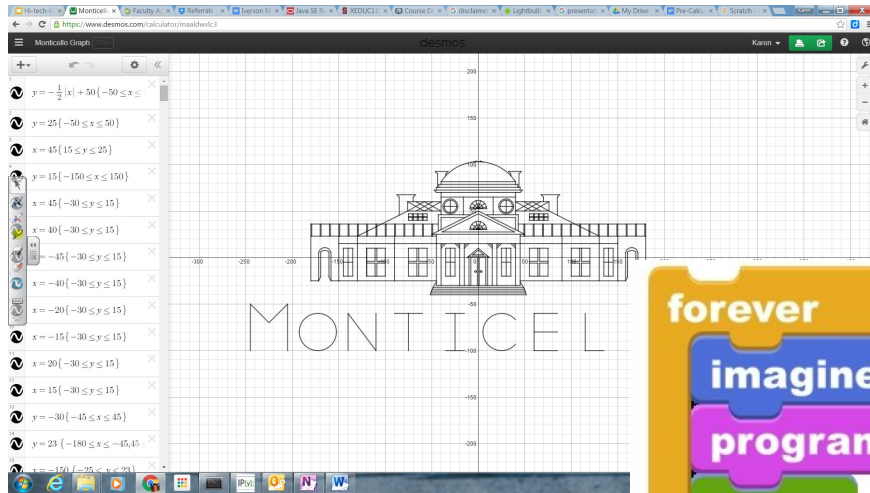
# Making Games

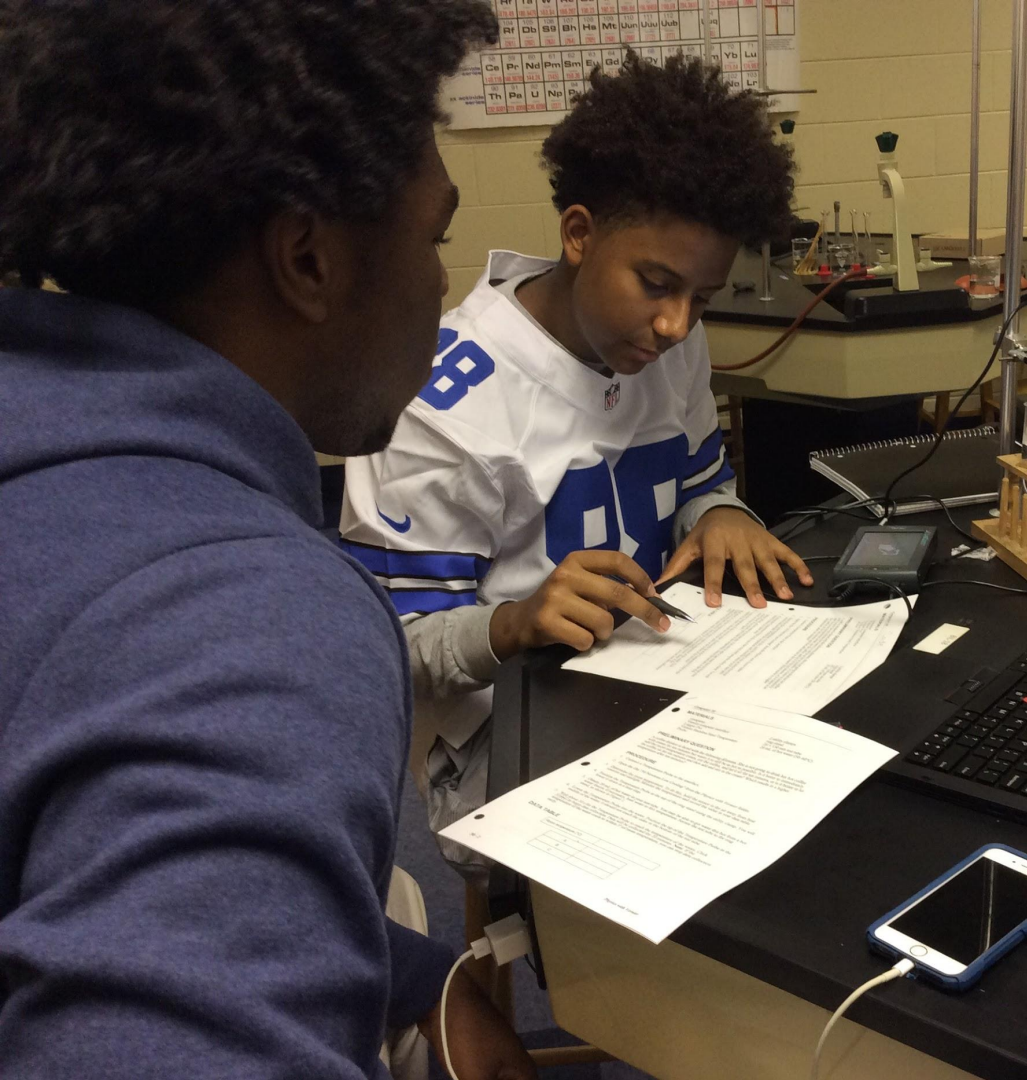




# Making with Technology

(function family graphing, creating surveys, geometry projects, quadratics coding challenge)

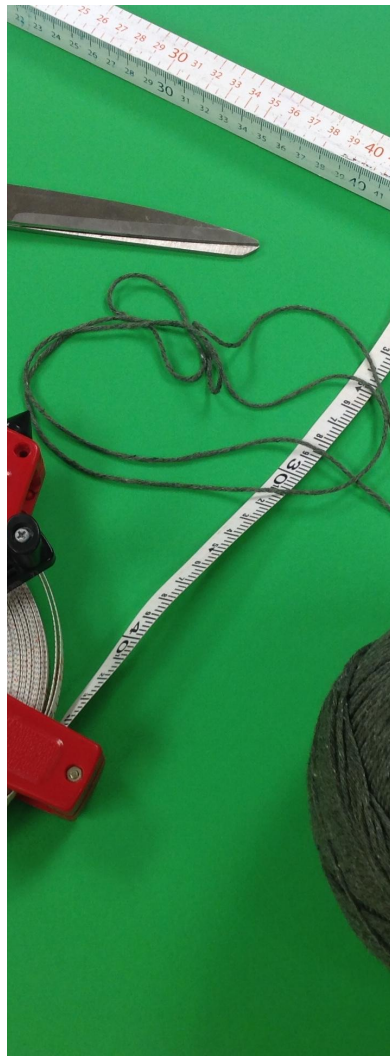




# Doing Math

## A FUNCTION ACTIVITY





# Doing Math: A Slope Activity



# Doing Trigonometry

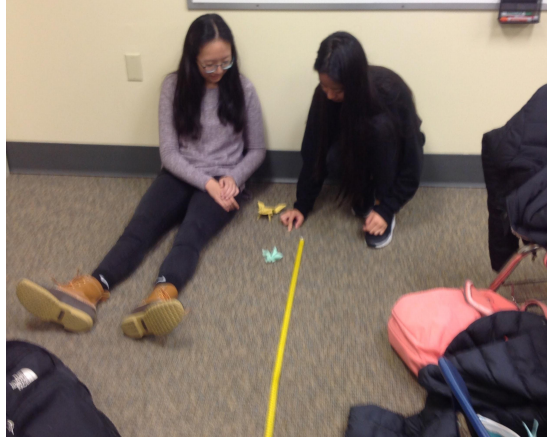
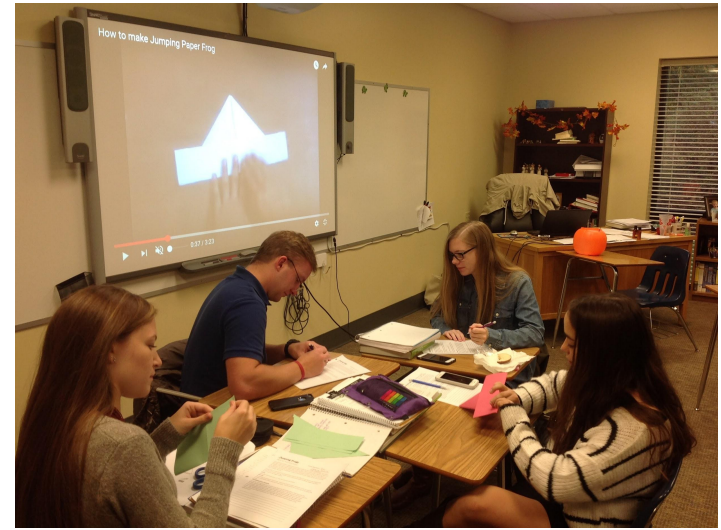
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<http://www.telegraph.co.uk/news/picturegalleries/earth/40579056/in-pictures-jumping-red-eyed-tree-frogs-of-Costa-Rica-by-Nicolas-Reusens.html>

## Doing Math: A Design Activity





# Connections to modeling objectives:

## Common Core goals of Modeling Practices

- Identifying variables in the situation and selecting those that represent essential features
- Formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables
- Analyzing and performing operations on these relationships to draw conclusions
- Interpreting the results of the mathematics in terms of the original situation
- Validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable
- Reporting on the conclusions and the reasoning behind them.



# Questions



**GAIMME:** [http://www.siam.org/reports/gaimme-full\\_color\\_for\\_online\\_viewing.pdf](http://www.siam.org/reports/gaimme-full_color_for_online_viewing.pdf)

**COMAP:** <http://www.comap.com/highschool/contests/himcm/index.html>

**GAISE:**

<http://www.amstat.org/asa/education/Guidelines-for-Assessment-and-Instruction-in-Statistics-Education-Reports.aspx>

**American Statistical Association - resources for educators:** <http://www.amstat.org/education/stew/index.cfm>

**Desmos “Bundles”:** <https://teacher.desmos.com>

**Interactive Python Anywhere on the Web:** <https://trinket.io/python> and <http://www.codeskulptor.or>

**Doing Math with Python by Amit Saha**

**Geogebra:** <https://www.geogebra>

**MIT App Inventor:** <http://appinventor.mit.edu/explore/>

**Scratch Programming:** <https://scratch.mit.edu/org>

**VideoNot.es:** <http://www.videonot.es/>



# Resources

Makey-Makey resources: <http://www.makeymakey.com/>

Physics/math lesson <http://makeymakey.com/lessons/distance-rate-time-lesson/>

Word problem posters <http://makeymakey.com/lessons/interactive-word-problem-lesson/>

Colleen Graves maker space resources and programming ideas  
<https://colleengraves.org/makerspace-resources-and-programming-ideas/>

3-d Printing <https://www.simonsfoundation.org/multimedia/3-d-printing-of-mathematical-models/>

MakerSpace for Education <http://www.makerspaceforeducation.com/makey-makey.html>

MakerSpace Playbook <http://makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf>

It Looks Like Fun, But Are They Learning?  
<https://www.exploratorium.edu/sites/default/files/pdfs/PetrichWilkinsonBevan-2013-ItLooksLikeFun.pdf>

Learning Through STEM-Rich Tinkering: Findings From a Jointly Negotiated Research Project Taken Up in Practice  
<http://onlinelibrary.wiley.com/store/10.1002/sce.21151/asset/sce21151.pdf;jsessionid=9715020372A82461DC59DD7EE5B1729C.f03t04?v=1&t=izhrzrno&s=9e7d824b69012df7747ff5a052bdfef881211a41>

Social Learning Theory and Developmental Psychology: The Legacies of Robert Sears and Albert Bandura  
<http://psy.cmu.edu/~siegle/35grusec92.pdf>

Maker Mindset: Dale Dougherty <https://llk.media.mit.edu/courses/readings/maker-mindset.pdf>

**More resources:**