HANDS-ON, MINDS-ON MATH – AN OFFERING OF HOMEGROWN MATH PROJECTS AND ACTIVITIES

MARCH 1, 2014

HTTP://MHINES.EDUBLOGS.ORG
HTTP://MIDPAC.EDU/
@MHINES TWITTER

GOAL

- Activities and Projects
- Strategies and Apps
- Guide sheets
- Assessment rubrics
- Student samples
- Common Core standards mapping
- Time Frame: range 90 mins to 8 class periods

A BRIEF HISTORY

- STEM Teacher for 30 years
- MEd Edtech '97, finishing PhD EdTech ('14)
- Technology Director 17 years
- HSTE Board, SEEQS Board
- Father of Aukai, 16 and Ka'io 11
- SoTF and HELS planning
- Kupu Hou Academy co-creator
- Modeling Physics (ASU)

http://nonprofitmarketer-ny.com/wp-content/uploads/2012/03/bigstock_Wearing_many_hats_29375450.jpg

MID-PACIFIC INSTITUTE

About Us | Academics | Admissions | Alumni | Arts | Athletics | Students | Parents | Giving to MPI

About MPX

MPX Program is an innovative, interdisciplinary program featuring a project-based curriculum as the primary focus of student work. This curriculum encourages students to synthesize their knowledge of Language Arts, Social Studies, Science, and Engineering through participation in collaborative "real world problem solving" setting. This school year we have projects addressing sustainability including auditing the energy use of each building on this campus that will be used to address the school's carbon footprint, and designing and constructing urban garden systems that will be used to grow produce for a cook-off competition.

On the right side of this page, you see a series of links to other activities we have done as well as links to blogs that give you a up-to-date view of the work our leaders and learners are doing - challenges and successes, their reflections about their work and the process involved in rolling up our sleeves and trying to do authentic problem-solving.

We hope you will take time to explore the activities our learners have been immersed in. If you have an interest in being involved with our program as a resource, or have questions, please contact mpx@midpac.edu

Imua! (onward!)

MID-PACIFIC INSTITUTE EXPLORATORY NEWS

NOV On Math, Modeling and Applied learning

Explore MPX

- MPX Home
- More about MPX
- MPX Frequently Asked Questions
- An Overview of MPX [.pdf]

MPX Teacher Blogs

- Heather Calabro's MPX 9 Humanities Blog
- Mark Hines' MPX 10 STEM blog
- Gregg Kaneko's MPX 9 STEM blog
- Laura Davis' MPX 10 Humanities blog

Videos/Documents

- MPX by MPX'ers
- Kolea Farms Field Trip
- Visual Mapping
- What is MPX? In student voice from their presentations of learning Fall 2011

HTTP://MHINES@EDUBLOGS.ORG
HTTP://WWW.MIDPAC.EDU/ACADEMICS/MPX/

MID-PACIFIC EXPLORATORY

- Started 2010
- Project/Problem Based
- Integrated Math/Science/Lang Arts/Social Studies/Technology
- 9th Grade: Geometry/Biology
  10th Grade: Algebra 2/Physics
- After 10th, students either go Precal or Math Studies
- Typical week blocks: 1x45, 2x90

APPS, APPS, APPS

- Desmos
- Graphical Analysis
- Numbers
- Notability
- Algodoo
- picsart
- camera

- sketchup
- Math Flyer
- geogebra
- sketch explorer
- wolfram alpha
- showme

- explain everything
- taptap blocks
- geometry pad
- Skitch
- and many more

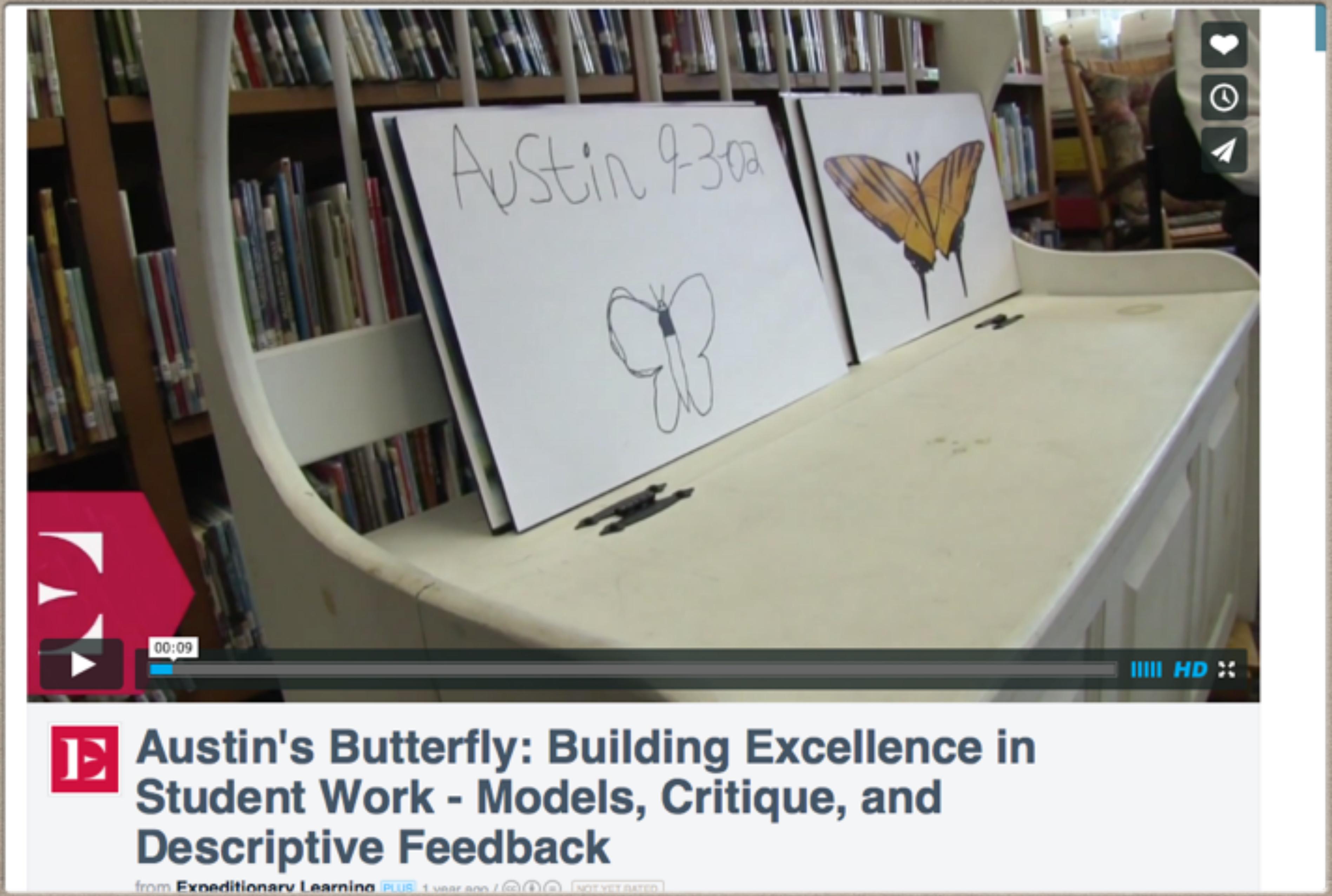
CRITIQUING AND FEEDBACK

THE VALUE OF CONVERSATION AND ITERATION

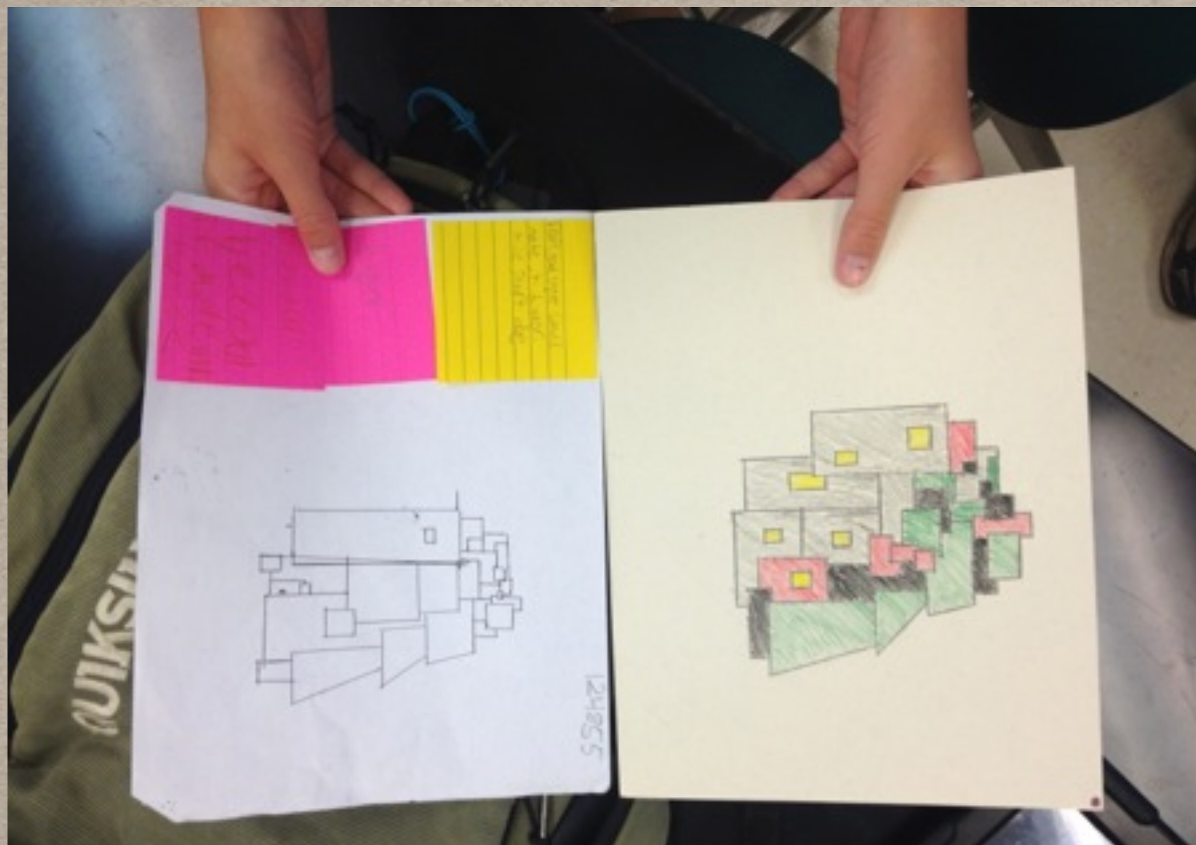
AUSTIN'S BUTTERFLY

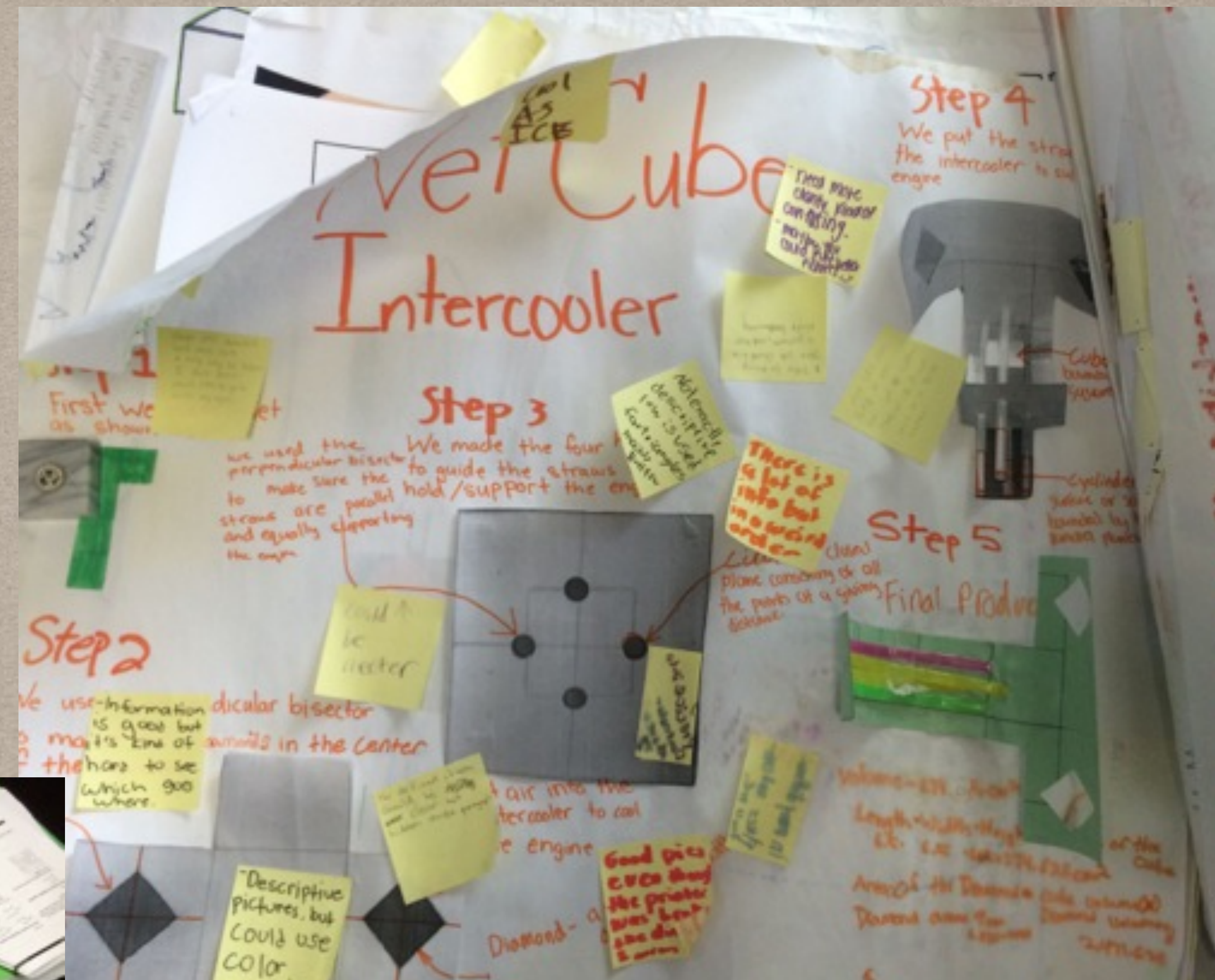
HTTP://VIMEO.COM/38247060

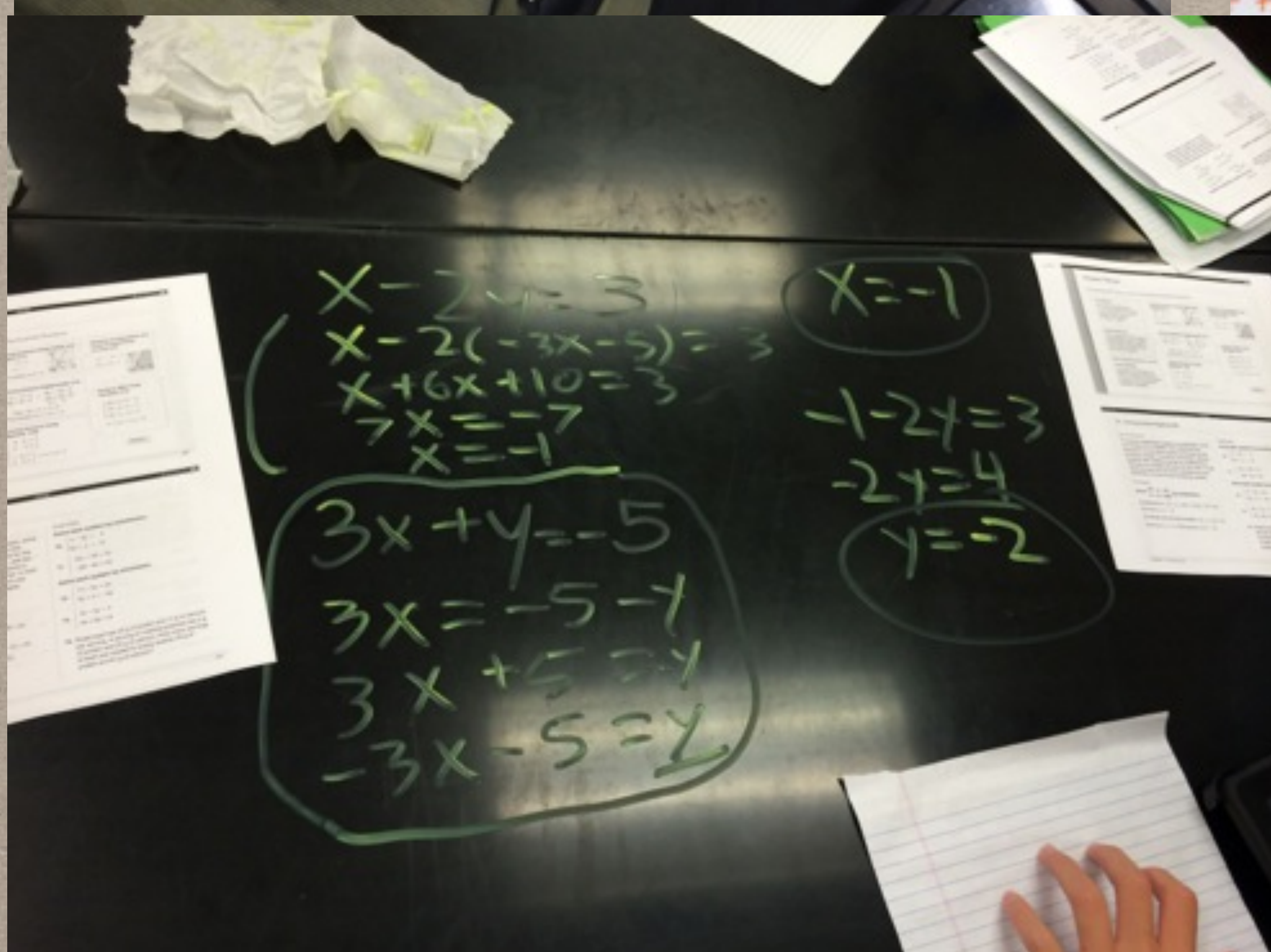
FROM RON BERGER, EXPEDITIONARY LEARNING



"ASSESSMENT IN THE SERVICE OF LEARNING"







BE SUPPORTIVE
BE KIND
BE SPECIFIC

LIGHT INTENSITY

- HSF-IF.B.4&5 INTERPRET FUNCTIONS THAT ARISE IN APPLICATIONS IN TERMS OF THE CONTEXT
- HSF-BF.A.1 BUILD A FUNCTION THAT MODELS A RELATIONSHIP BETWEEN TWO QUANTITIES
- HSF-BF.B.4 BUILD NEW FUNCTIONS FROM EXISTING FUNCTIONS

Activity - Light Intensity

Question: What happens to the intensity of light as we move further from the source?

Introduction: While we have been doing our lighting measurements, you may have noticed that light as it moves from the source does not stay the same intensity as you move away. The goal of this activity, is to understand the relationship that exists between a light source and its intensity as we move away from it.

Background Information:

We will look at a few examples in class of how light spreads out as we move away from it - here a few pictorial examples of this phenomena:

http://moblog.net/media/j/x/l/jxlatoca/6-artificial-light-project-55-light-intensity-2.jpg

http://www.sciencebuddies.org/science-fair-projects/project_ideas/Elec_img052.jpg

http://www.expertsmind.com/CMSImages/26_measuer%20by%20light%20inten.jpg

Experiment and Analysis:
Using your light meter, and keeping in mind that in good science experiments we want to have at least six data points so that we can correctly determine the mathematical relationship between the dependent and independent variable, measure light intensity between the ceiling and the floor in our classroom. As accurately as possible, measure the distance at each point of measurement from the light source. Try to locate the sensor directly under the center of the light that you are measuring from.

Once you have your data, use the iPad app *Graphical Analysis* to plot the data, and determine the best fit curve through that data to come up with a mathematical model.

Writeup:
You should submit a document that has your graph, data table and a discussion of the data and mathematical model you have determined fits this phenomena. submit that document as a PDF into this week's drop folder.

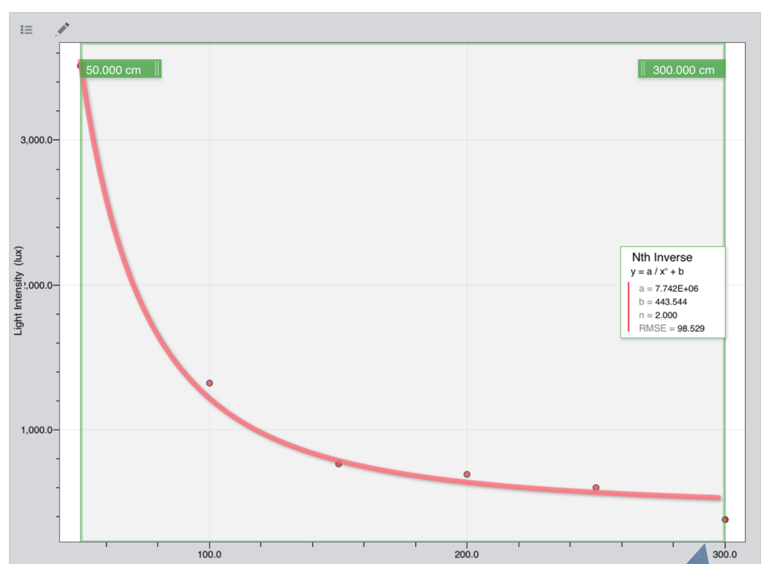
Common Core Standards Addressed:
CCSS.Math.Content.HSF-LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.
CCSS.Math.Content.HSF-LE.A.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
CCSS.Math.Content.HSF-LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

Data Table:

<u>Averages</u>

	Distance (cm)	Light Intensity (lux)
1		
2	50	3,516
3	100	1,322
4	150	766
5	200	696
6	250	600
7	300	380

<u>Graph</u>



What is this?

<u>Equation</u>
Light Intensity=(7420000/d^2)+443.6

In order to get the light intensity you need to divide 7.42 million divided by the distance squared plus b which is 443.6. This relationship shows that the light intensity decreases the further you get. This is an inverse squared relationship.

LINEARIZE THAT!

- UNDERSTAND THE CONCEPT OF A FUNCTION AND USE FUNCTION NOTATION (FIF 1,2)
- CREATE EQUATIONS THAT DESCRIBE NUMBERS OR RELATIONSHIPS (ACED 2)
- INTERPRET FUNCTIONS THAT ARISE IN APPLICATIONS IN TERMS OF CONTEXT (FIF 4, 5, 6)
- BUILD A FUNCTION THAT MODELS A RELATIONSHIP BETWEEN TWO QUANTITIES (FBF 1)

Mathematical Models and Modeling Functions

Goal: To design and practice the common core standards around linear model functions

Step 1. Define and design an experiment that you can conduct with existing classroom equipment that will generate a set of at ***at least 6*** data pairs to examine the relationship between two variables of your choosing.
Your goal should be for this data to test a hypothesis that the relation is ***linear***.
You must get permission for the teacher to move forward to step 2. You must define:

- your purpose
- your independent and dependent variables
- your anticipated domain and range
- your rationale for why you expect a linear relationship
- your apparatus and procedure

Step 2: Conduct the experiment. Make sure to run AT LEAST 3 trials to minimize error.

Step 3: For your submitted report, you must complete the **EVALUATION** section of our standard lab report:
- a table of calculated values
- a graph that includes appropriate axes and labels as well as attempts to linearize your data
- a statement of the relationship
- a mathematical model of the data, including slope and intercept with correct units. (This should be in slope intercept form)
- a brief discussion of the results and any divergent issues

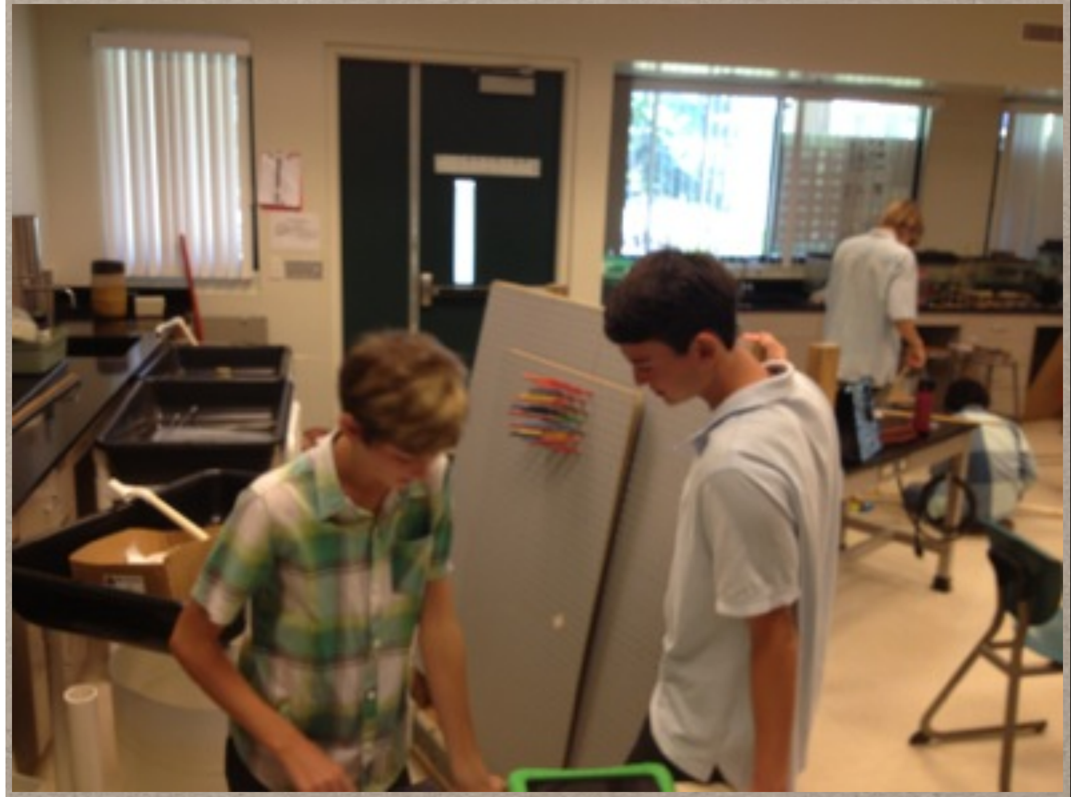
Common Core Standards Addressed:
- Understand the concept of a function and use function notation (F-IF 1,2)
  Create equations that describe numbers or relationships (A-CED 2)

- Interpret functions that arise in applications in terms of context (F-IF 4, 5, 6)
  Analyze functions using different representations. (F-IF 7, 8, 9)

- Build a function that models a relationship between two quantities (F-BF 1)

MPI Math Core Concepts Addressed:

Relation Properties, Domain and Range, Functions Properties, Function Notation
Direct Variation, Slope, Slope-Intercept form, Graphing Lines

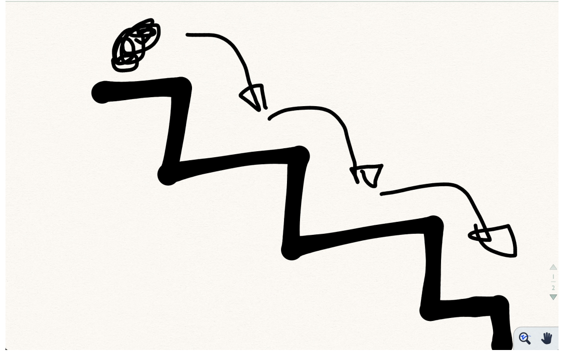


Purpose: To determine what the rate a slinky falls from different numbers of steps
Independent variable: stairs
Dependent variable: time

Anticipated domain and range: 1-6

I think this will be linear because I think the slinky will fall slower from a higher number of steps but will travel faster from a lower number of steps. This will make a linear line.

Apparatus:



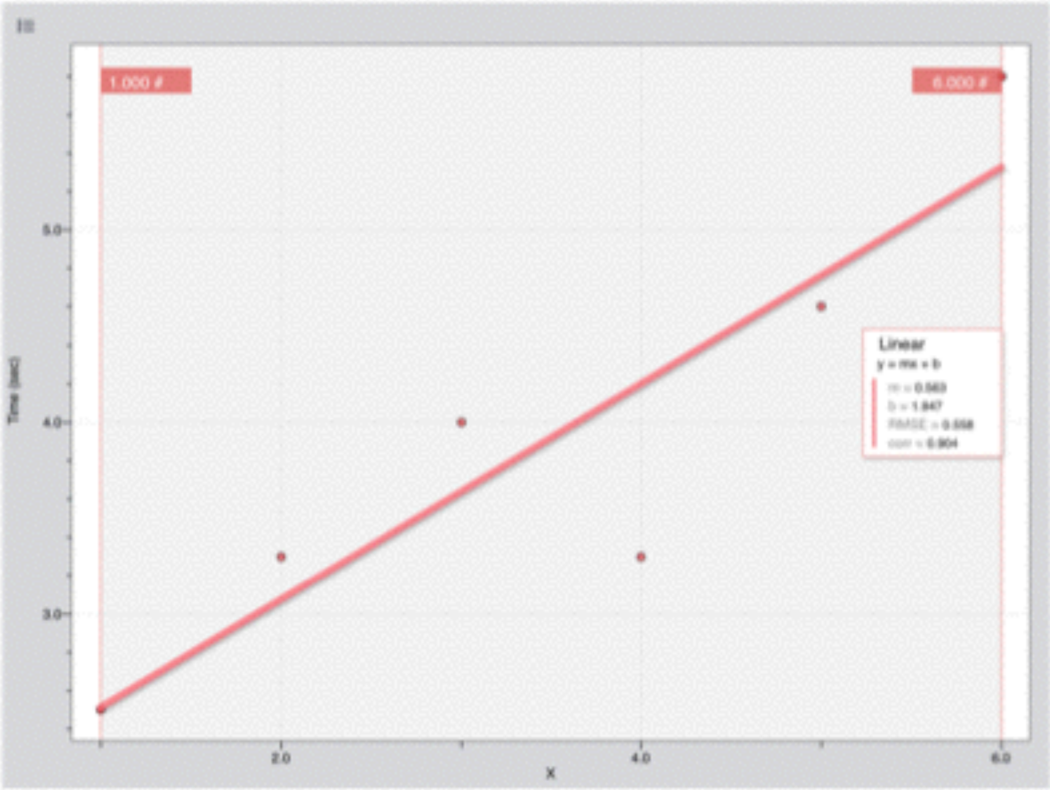
Procedure:
1. Set up slinky at top of step
2. Get timer ready
3. Using your hand, grab the top of the slinky an push it forward
4. Let the slinky fall down the steps
5. Stop timer when slinky stops
6. Repeat for each step

Data Table

	Step 1(sec)	Step 2 (sec)	Step 3 (sec)	Step 4 (sec)	Step 5 (sec)
Trial 1	2.9	3.5	3.5	3.0	4
Trial 2	2.0	2.7	2.9	3.3	4
Trial 3	2.8	3.7	5.7	3.6	4

	Steps (#)	Time (sec)
1	1	2.5
2	2	3.3
3	3	4
4	4	3.3
5	5	4.6
6	6	5.8

Graph



S=.6sec+1.947steps

This graph shows that the line is not very linear. I think it wasn't as linear because the experiment was flawed in that the slinky did not fall correctly and wasn't very reliable. You can see this in the difference in data in terms of the fourth step average drops very low. I think that I would change that if I were to do the experiment again and try and fix the slinky.

Krislyn Miyagawa
9/8/13
Group Member: Nikki Stacey

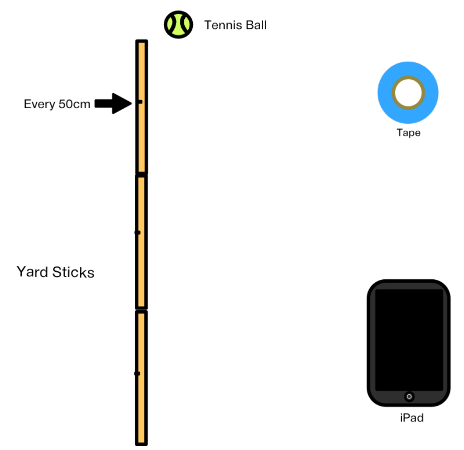
Bounce Height of a Tennis Ball

Purpose: Our purpose was to find if the starting drop height of the tennis ball would effect the height of the bounce.

Dependent: height of bounce
Independent: starting height

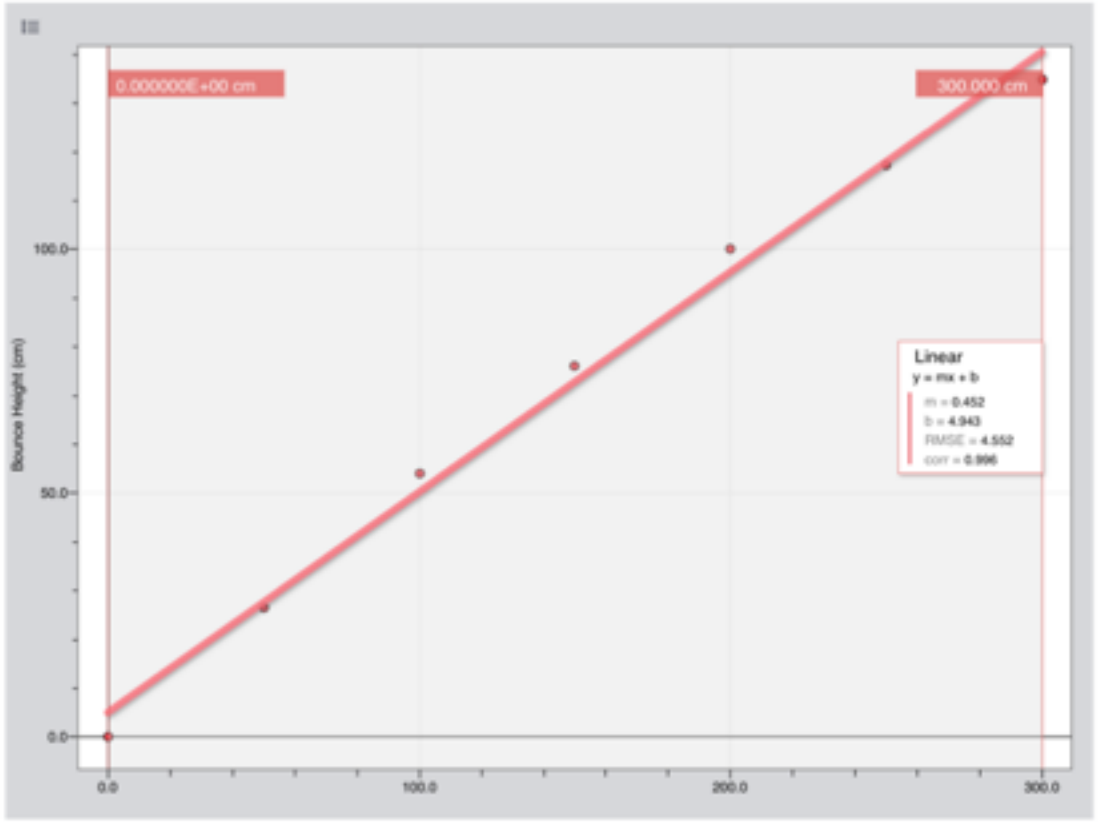
Anticipated domain: starting height of ball
Anticipated range: height of bounce

We expected a linear relationship because our increments for the starting height was measured as 50cm apart for six different heights.



Procedure:
1) Get together all materials.
2) Roll up pieces of tape and place them on the back of the yard stick. Next, place the three yard sticks against the wall.
3) Now you are going to place the ball at the 50cm mark; make sure that the bottom of the ball is aligned with the 50cm starting point.
4) Once you have your ball in place, drop it and watch to see what measurement the ball lands on, and yet again you are measuring the bottom of the ball.

Height (cm)	Average (cm)
50	26.6
100	54
150	76
200	100
250	117.3
300	135



BH(DH)=.45(DH)+4.94cm

Evaluation:
The relationship of this graph is that for every 50cm you add as the starting point, the bounce height of the ball increase about 20-30cm each time. The relationship between the bounce height and starting height is that if starting ball height increases then the bounce height will increase as well. The equation to represent this graph would be BH(DH)=.45(DH)+4.94cm. Where H is the height, .45 is the slope, (DH) is rise over run and 4.94cm is the y-intercept.

THE WORM BIN

- HSG-GMD.A.1&2&3 APPLY GEOMETRIC CONCEPTS IN MODELING SITUATIONS
- HSG-GMD.A.1&3 EXPLAIN VOLUME FORMULAS AND USE THEM TO SOLVE PROBLEMS
- HSG-GMD.B.4 VISUALIZE RELATIONSHIPS BETWEEN 2-D AND 3-D OBJECTS

MAKER SPACE MOVEMENT

Building a Mini-Worm Compost Bin

Before we get to the BIG PROJECT, we need to go through the design/build process with something simpler.

Objective: Design and build a functioning worm composting bin.

Description: Groups will be given limited wood choices and supplies (to be defined later) and will design and build a miniature, FUNCTIONING worm compost bin.

Through the process you will be required to show different geometric concepts.
-triangles
 -side relationships
 -angle relationships
 -properties of triangles
-lines
 -properties of parallel lines
 -congruency of angles with parallel lines

And biological concepts
-systems
 -composting
 -microorganisms

Process: This project will happen through a series of steps.
Steps 1 & 2 will be on a pages document. Use pictures and diagrams as necessary.

1. Define the problem: Why composting? Why is it important for the environment and sustainability?
2. Research
    a. Understanding of worm composting process
        i. Biological standpoint
        ii. Practical standpoint
    b. Understanding of a properly functioning worm bin
        i. What are the essential parts?
3. Design: Using the restraints in materials design a miniature worm composting bin.
    a. List of materials
    b. SCALE drawing of all parts needed to construct the bin
        i. 3 different views
        ii. Dimensions
        iii. Dimensions of all parts

4. Build model: Using cardboard construct a rough model of your worm bin.
5. Edit design: Make any changes necessary to design.
6. BUILD FINAL PRODUCT.

WORM BIN RUBRIC			
Category	Mastery	Developing	Lacking?
PRODUCT 10 pts			
Final Product: Completed Worm Bin	Group completes a fully functioning worm bin that fits project restraints	Does not fit restraints or may not be complete	Major completion issues.
Poster 10 pts			
Pictures/ documentation of Progress 2 pts			
Summary of Process 2 pts			
Evidence of Learning 3 pts	Students clearly show geometry and biology concepts learned through the project. These concepts are properly displayed in on their poster.	Students showed learning of geometry and biology concepts. Not as many concepts or lacks some depth from mastery.	Students either did not clearly show learning or there was too few evidences of learning.
Reflection 2 pts	Students exhibited deep thought and reflection of the PROCESS of the project. It is clear that students are able to reflect back and learn from doing this project.	Students showed some reflective thought.	
Aesthetics 2 pts	Poster is not only a good representation of this project but is also attractive, eye catching, and easy to interpret.	Poster is attractive and well thought out. May not be as easy to interpret.	Poster lacks thought and attractiveness. Difficult for audience to get a clear picture of the project.
Bonus 2 pts	Students go above and beyond expectations with either the worm bin or the poster or both.		

MPX

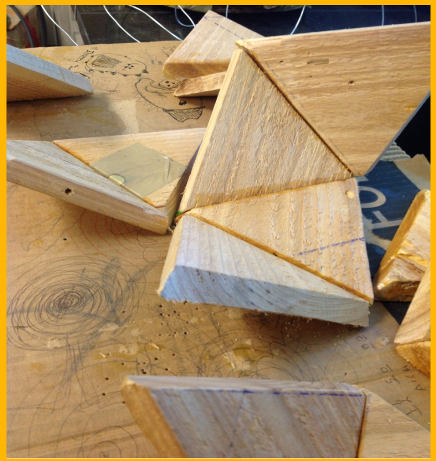
Engineering the world

Math

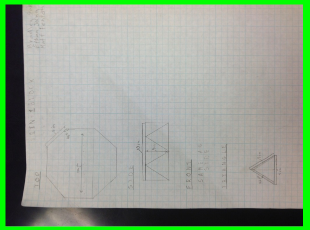
There is a lot of science in composting because the decomposition of the food and the life style of the worms and how the eat and work and digest and everything else they do are all part of biology. Biology is the study of living organisms and since there is basically only living things in the composter, it like a box o' biology. The nitrogen cycle happening through you the worms and there poop (compost) is like the way that they survive in the wild and how they normally live, with just less food because there are no humans in forests and things throwing there food scraps into the ground. Only other animals, but since they are survival animals they lave less.

Purpose

As you may know we are experiencing the rapid depletion of our resources. One of the things that is being wasted the most is our food supply. The solution to this problem is to get people to eat there vegetables even if I sound like your mom. If you have ever made or, grown your own food then you swear it tastes better so you eat it all. We are trying to make it so that every person can grow there own food more easily. Your worm composting bin was designed to be cool looking and work efficiently. We believe that if every body got one and every body started growing there food then we could be more efficient with your food system. Once we get our food system sorted I think that we can move on for the better.



Mari's garden gave us research and the inspiration



the scale drawing

card board model

final product

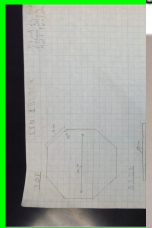
MPX

Math

There is a lot of science in composting because the decomposition of the food and the life style of the worms and how the eat and work and digest and everything else they do are all part of biology. Biology is the study of living organisms and since there is basically only living things in the composter, it like a box o' biology. The nitrogen cycle happening through you the worms and there poop (compost) is like the way that they survive in the wild and how they normally live, with just less food because there are no humans in forests and things throwing there food scraps into the ground. Only other animals, but since they are survival animals they lave less.

As you
resour
food s
there
made
you e
grow th
designe
every
then w
get ou

Mari's garden gave us research and the inspiration



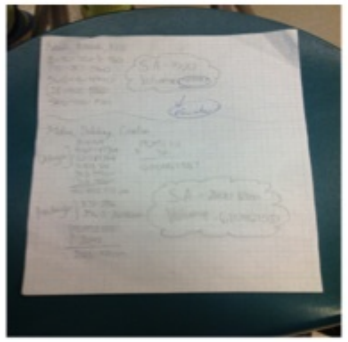
the scale

MPX WORM BIN PROJECT

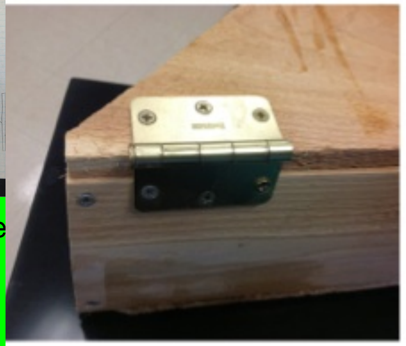
By Kris, Noah F, Isaiah P

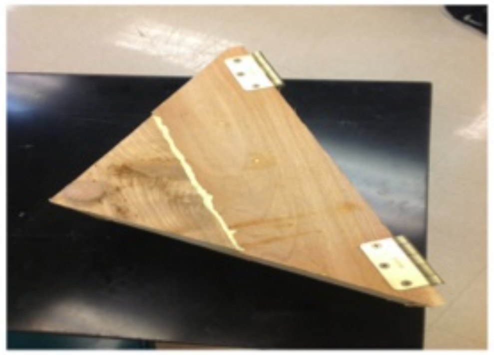
n MPX we integrate math and science into our projects by using geometry and algebra in the calculations of the cuts and the shapes angels, while also creating something which would improve sustainabilty in the classroom or at home

We started the worm bin project by making scale drawings/ calculations of what we wanted our project to look like, then we made prototype boxes with cardboard as to not waste more expensive materials like wood



After we assembled our prototypes we were ready to get to work building the real wood model. Some critical calculations and angles were figured out while in cardboard form





We attached a handle and hinges and used glue/nails to connect all of the pieces

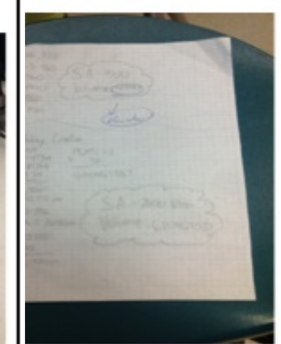
The only thing that we didn't anticipate was the length of the nail to the length of the wood, which looked like this until we got new, shorter nails

MPX

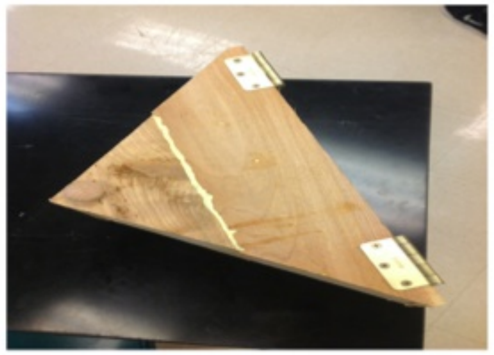
MPX WORM BIN PROJECT

By Kris, Noah F, Isaiah P

n MPX we integrate math and science into our projects by using geometry and algebra in the calculations
lso creating something which would improve sustainabilty in the



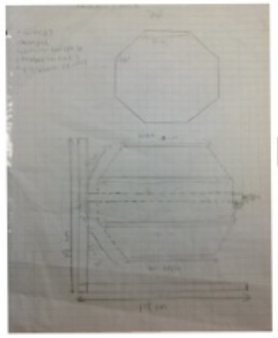
vere ready to get to work building the real wood model. Some
red out while in cardboard form



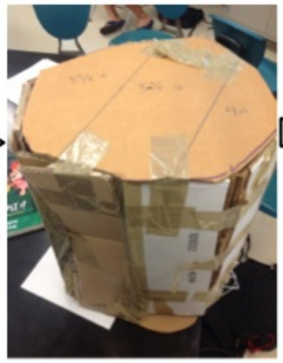
and used glue/nails to connect all of the pieces

The only thing that we didn't anticipate was the length of the nail to the length of the wood, which looked like this until we got new, shorter nails

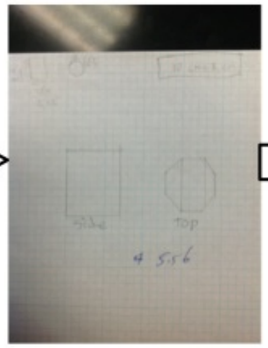
Compost bin



1st Scale Drawing



Proto-Type



2nd Scale Drawing

Final Product

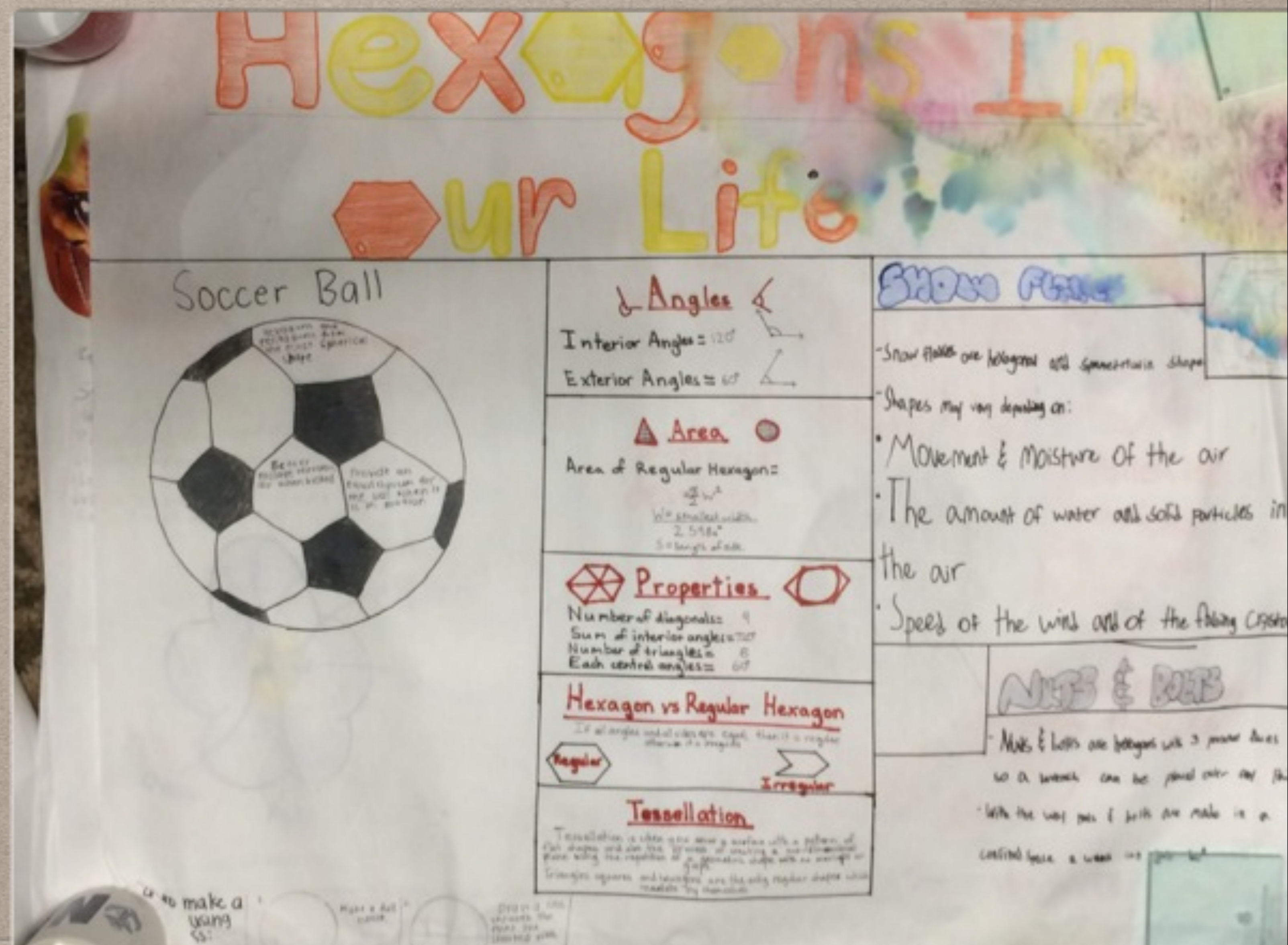
To start this project we had to make a scale drawing. While doing that we had to find the angles of the cuts and make it out of cardboard. For the prototype we started building it wrong, and had to rush it with a really bad end product. We fixed our mistakes as you can see after.

After we failed on out first draft compost bin. We had to make the real thing. The 2nd scale drawing came after we made the final product, but it came out way better.

When we were making the first compost bin a problem was we approached the idea wrong. We started making little stacks and we could nave just made the sides and a cover. That made us build really fast so the problem was trying to make the correct angle. What we did was figure out the angles had to equal 135 degrees, but since it needs to be half of the 45 degree angle in half is 22.5 and that is the angle we needed to cut. After that was done it was east, we just connected the pieces with a screw and made the covers and lined the inside of it so the worms don't…

HEXAGONS!

- HSG-GMD.A.1&2&3 APPLY GEOMETRIC CONCEPTS IN MODELING SITUATIONS
- HSG-CO.D.13 MAKE GEOMETRIC CONSTRUCTIONS

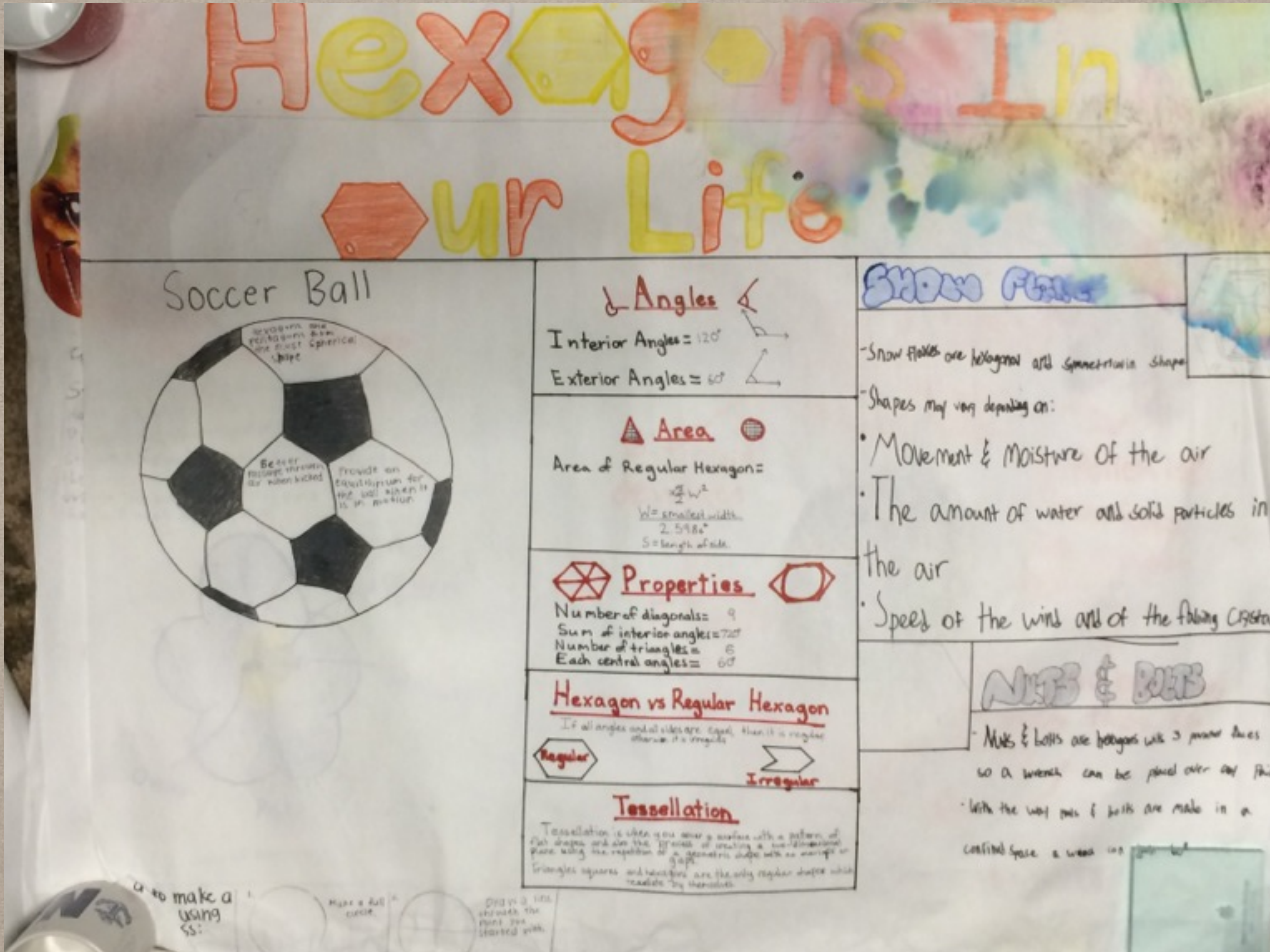


Hexagons & Bees Infographic

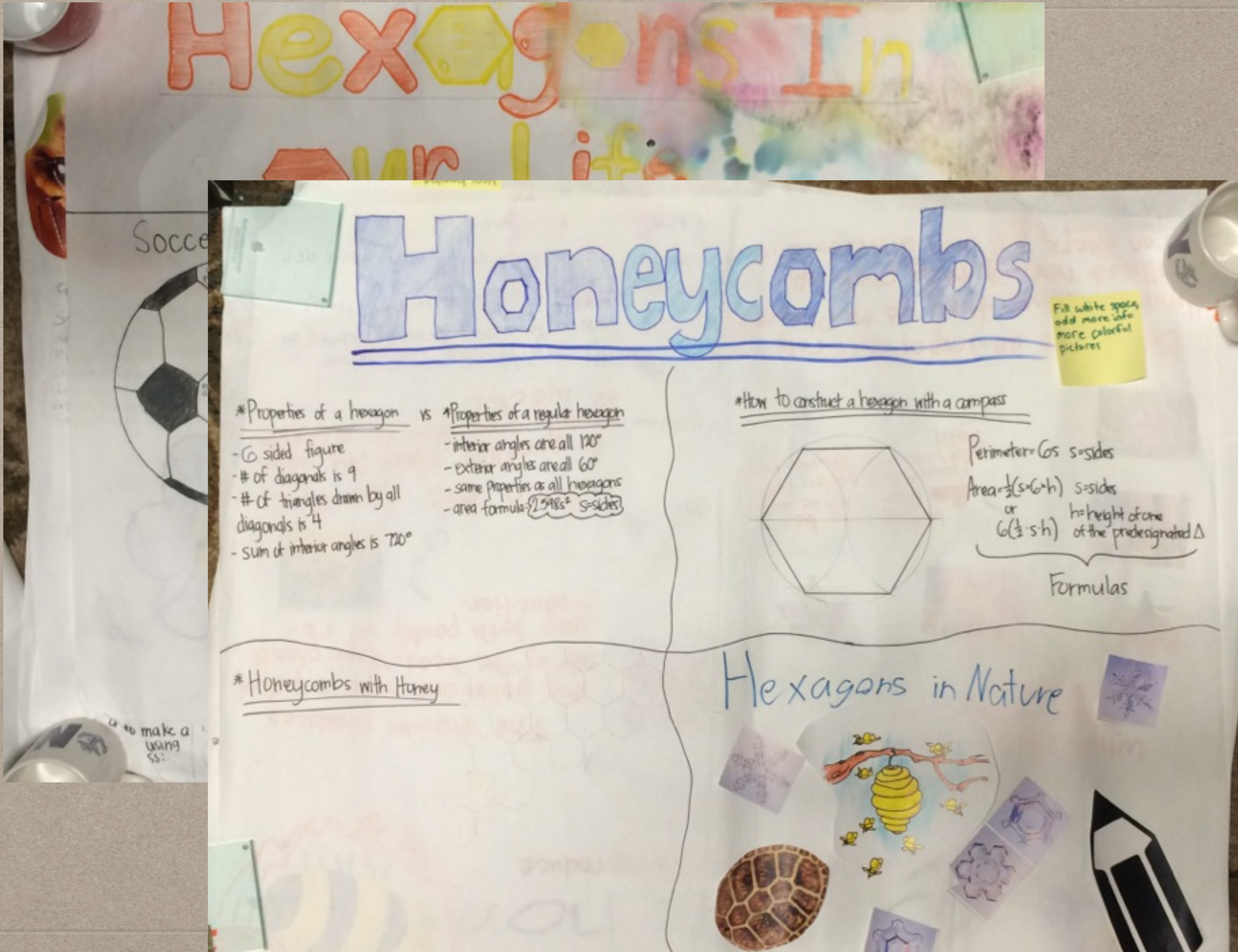
Teacher Name: **Mr. Kaneko/Mr. Hines**

Student Name: ____

CATEGORY	3 Mastery	2 Developing	1 Lacking	comments
Work Ethic	Individuals stayed on task nearly the whole time. Students worked hard.	Students stayed on task most of the time. There were occasional distractions, or re-directions required by the teacher	Students needed several redirections or were not actively involved.	
Collaboration	Student clearly worked with other group members. Discussion of work and progress was clearly evident.	Student worked inconsistently with group. There was some evidence of more individual work.	Student needs to work on collaborating with others.	
Biology/GeometryContent Why are bee hives Hexagonal? (5 pts)	Group addresses the issues including properties of a hexagon, distinguishing what a regular hexagon is from just a hexagon, the area formula, measure of interior angles and ho to construct one with a compass. **Student brings additional information - what next or something interesting.** The poster should tie this Geometry info to bee hives and address the question of **WHY** they are hexagonal.	Group does not address one or two of the key ideas/comcepts in hexagons or treats the stated issues superficially. No "what next" included Group does not address the question of WHY they form adequately or deeply.	Answer lacks clarity and does not answer question well. Lacking in detail or may be missing important information in answering the question.	
Graphics/Aesthetics	Elements of the content are nicely drawn, accurate and labeled properly. Plant Parts and the process of drawing a hexagon are told in a visually clear way. There is a balance between image and text and the infographic shows attention to detail, and is easy to read and pleases the eye.	Graphics may lack some detail or aesthetic quality. Might be missing some required steps, details or organisms. Material does not show real effort to lead viewer or be pleasing.	Graphics are lacking in detail and quality. Missing some important parts needed to properly explain this process. Typos and messing markings distract form the message	
Terms	Required terms are used IN EXPLANATION of hexagons and bees and not simply defined.	Either missing some terms, not properly used or simply defined.	Too few terms given for full credit.	



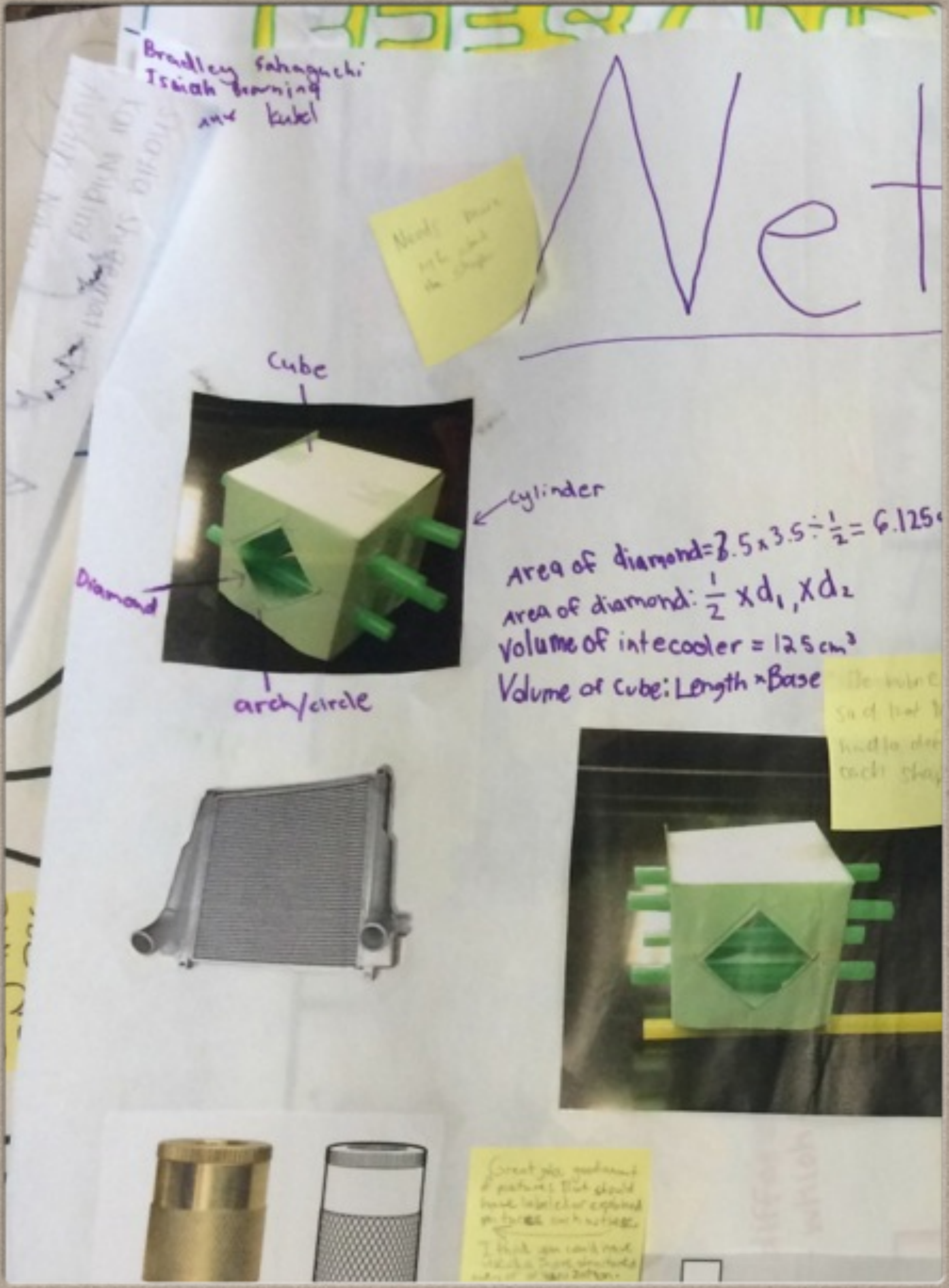
Hexagons In our Life
Soccer Ball
Angles
Interior Angles = 120°
Exterior Angles = 60°
Area
Area of Regular Hexagon=
W= smallest width
S= length of side
Properties
Number of diagonals= 9
Sum of interior angles= 720°
Number of triangles= 6
Each central angles= 60°
Hexagon vs Regular Hexagon
Regular
Irregular
Tessellation
-Shapes may vary depending on:
• Movement & Moisture of the air
• The amount of water and solid particles in the air
• Speed of the wind and of the falling crystals



Honeycombs
Fill white space, add more info, more colorful pictures
*Properties of a hexagon vs *Properties of a regular hexagon
- 6 sided figure
- # of diagonals is 9
- # of triangles drawn by all diagonals is 4
- sum of interior angles is 720°
- interior angles are all 120°
- exterior angles are all 60°
- same properties as all hexagons
- area formula: 2.598s² s=sides
*How to construct a hexagon with a compass
Perimeter = 6s s=sides
Area = ½(s·6·h) s=sides
or
6(½·s·h) h=height of one of the predesignated Δ
Formulas
*Honeycombs with Honey
Hexagons in Nature

THE INTERCOOLER

- HSG-CO.A.1&3&5 EXPERIMENT WITH TRANSFORMATIONS IN THE PLANE
- HSG-CO.D.12 MAKE GEOMETRIC CONSTRUCTIONS



Cool as Ice
(adapted from nrich.maths.org)

Goal: To understand the different ways we can represent and build geometric solids

Essential Question: How do engineers construct 3-d models from 2-d materials?

Activity 1: Triangle Construction with Compass

Essential Question: What are the properties that define a triangle and how can I draw them accurately?

Activity Instructions.

Teach yourself how to draw a triangle with a compass by following the instructions here:

http://www.mathopenref.com/consttrianglesss.html

Once you feel you can draw triangles, play the following game"

Generate three random numbers from 1-10. Use the following website to generate your random numbers:

www.random.org

Make sure to label the lengths of your triangle's legs. Do this until you have generated an assortment of triangles: Scalene, Right, Isosceles, Acute, Equilateral. What pattern do you see emerging? Can you always make a triangle?

Once you have constructed your triangles, take a picture and post these on your posterous blog and explain what you learned from this activity.

If you want to construct a Right Triangle, you need to draw a right angle.

http://www.mathopenref.com/constperplinepoint.html

Try to construct a few right triangles for practice!

Activity 2: Understanding nets.

A net is a 2-dimensional representation that can be folded into a 3-dimensional shape.

Draw out the the sample net from the resources in iTunes U (labeled cube-net) and construct a cube from it. How many different nets can be designed to still build a cube? In your team see how many different nets you can create. You have 20 minutes to complete this activity.

What strategies to did you use to come up with your ideas? How many did you get?

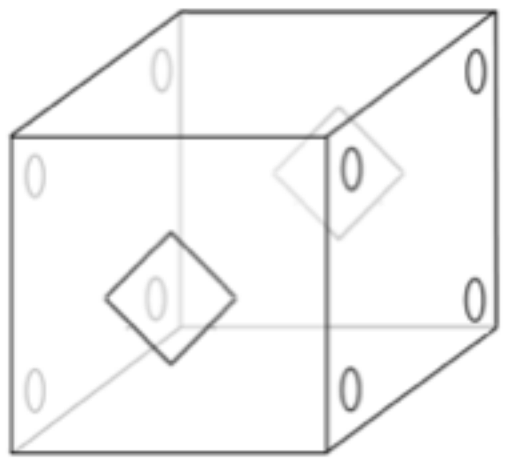
Let's compare with other groups to see what they came up with.

Activity 3: Cool as Ice challenge:

Intercoolers are used as a cooling mechanism, for instance for a car engine, by maximizing the air-flow around the engine.

Your task is to design and construct a prototype intercooler, based on a cube, to house a model engine which requires cooling.

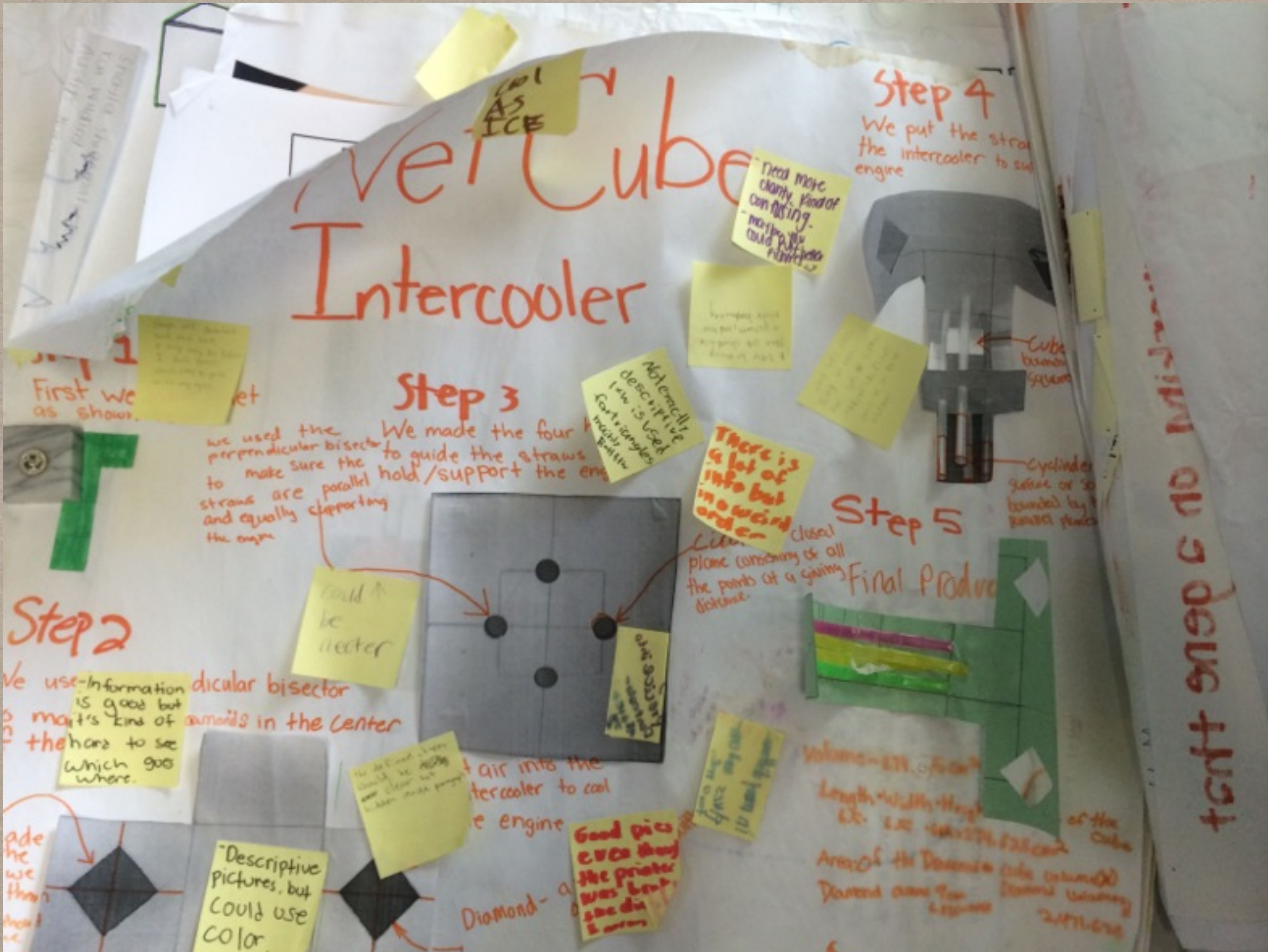
Intercooler Specifications
two opposing faces to be punctured by a diamond shaped hole in the center, which should be as large as possible without weakening the structure or allowing the 'engine' to fall out
the other two opposing faces to be punctured by 4 holes to take support tubes (drinking straws will be used in the prototype)
the intercooler must support the engine when suspended by the support tubes



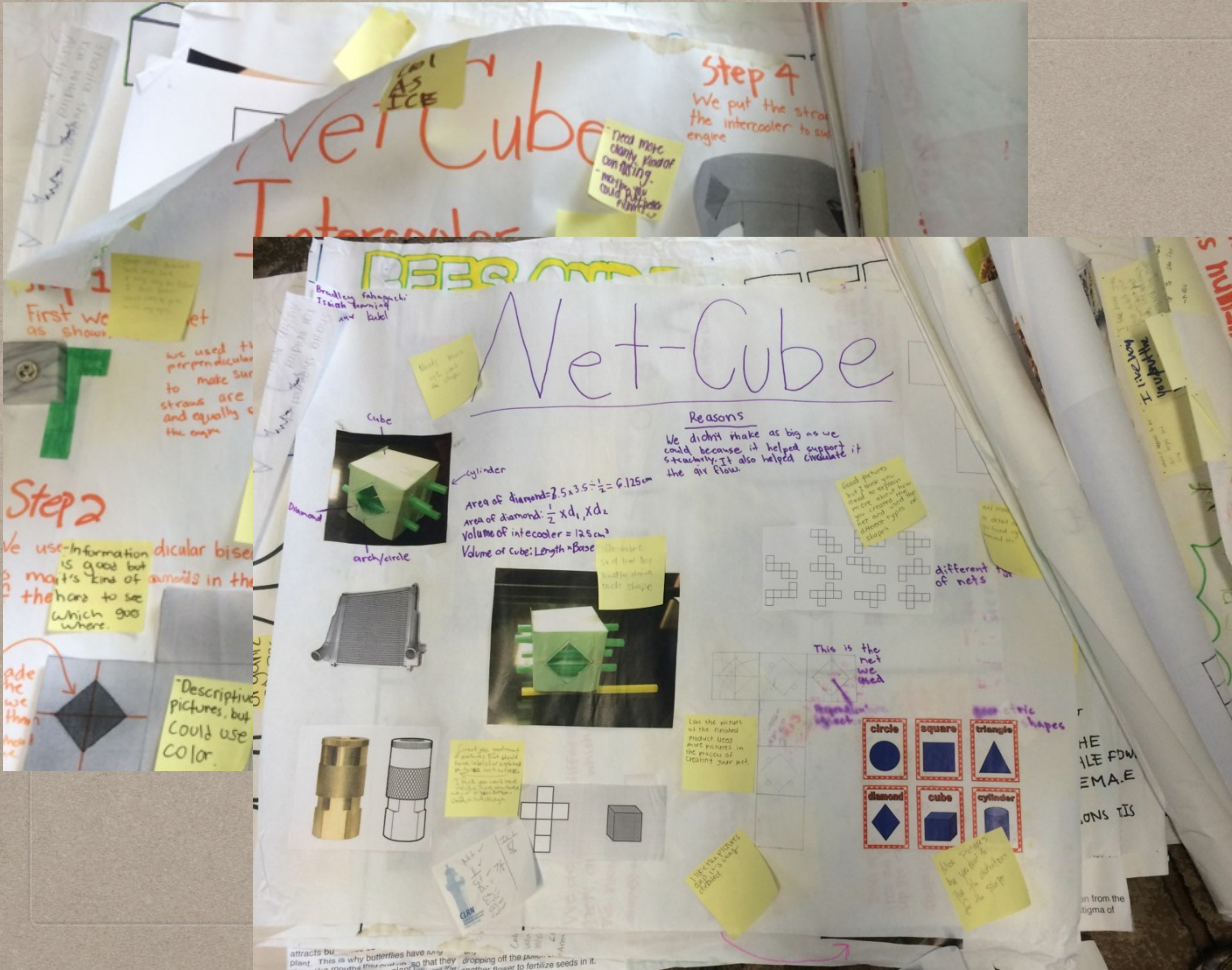
You have available to you:
8.5 x 11 sheet of card stock (use this to construct your final product from a net of your design)
Scrap paper (for prototyping)
Compass
rulers, tape, pencils, scissors
4 drinking straws
1 model engine (teacher will have a model sample for the class)

Key questions you should consider before starting
What do you need to know/decide to complete this task?
What tasks will each group member have?
How will you make sure the coolers pass quality control

Download taptap blocks

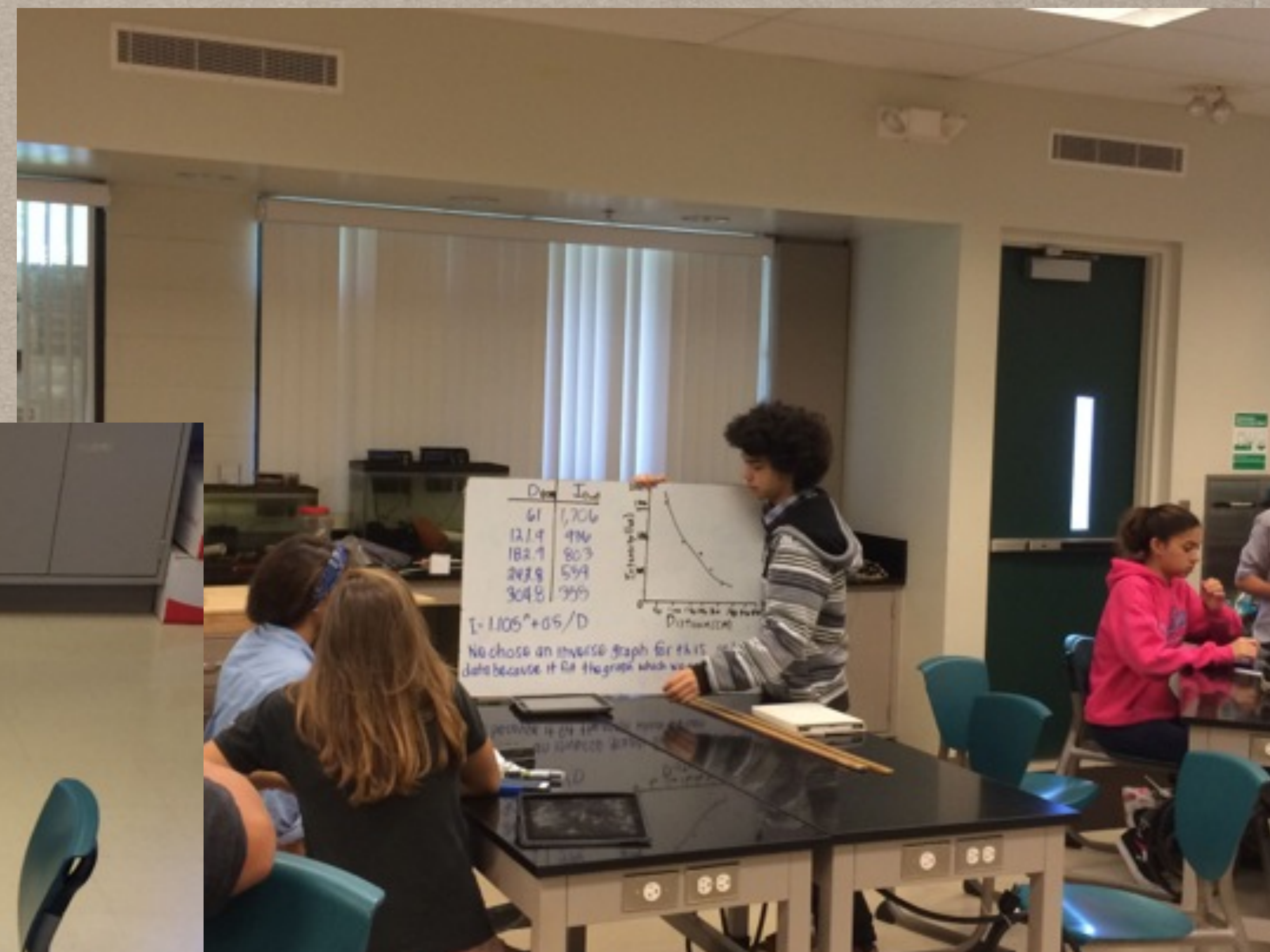


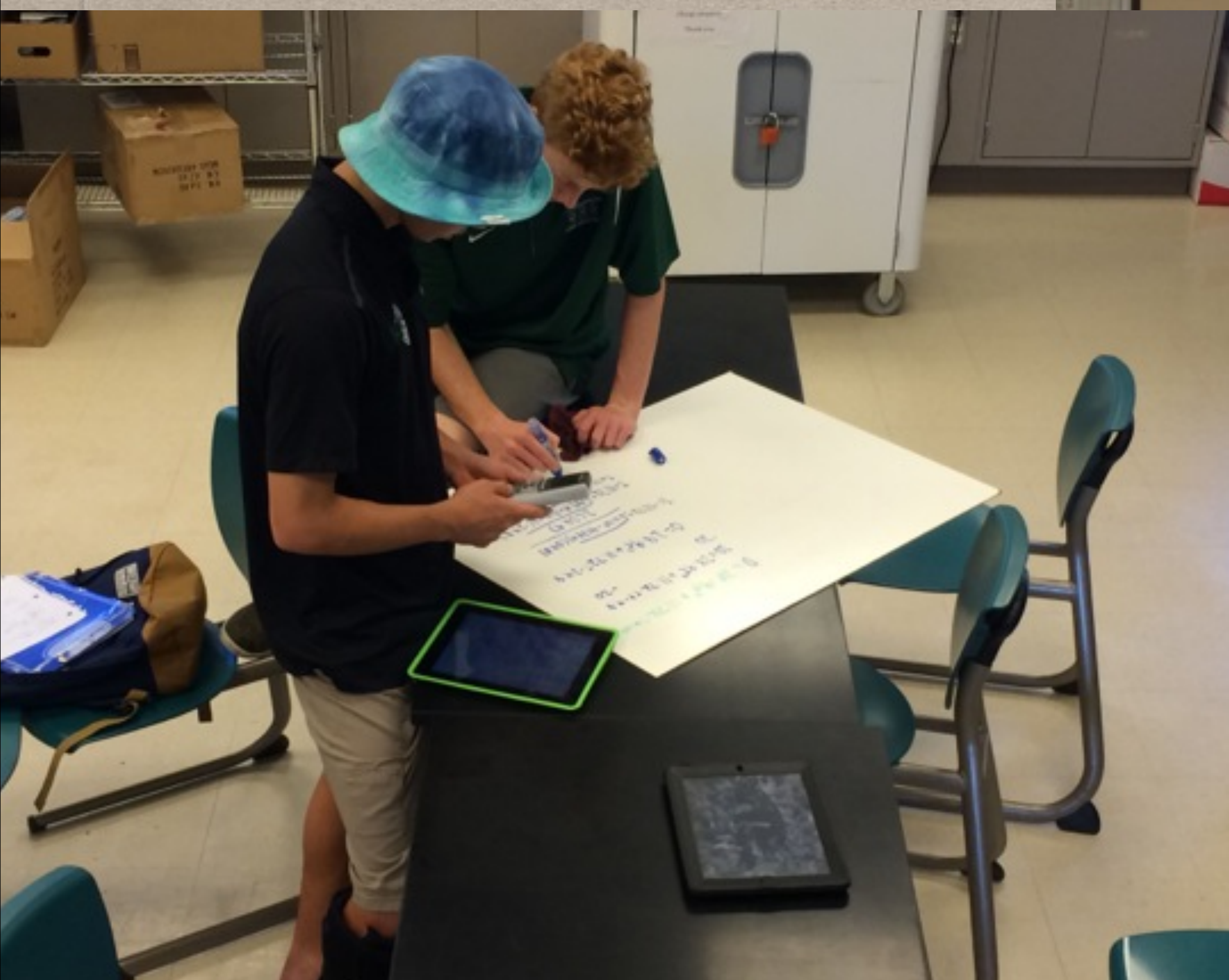
Cube
Intercooler
Step 3
We made the four
to guide the straws
hold/support the
we used the perpendicular bisector to make sure the straws are parallel and equally supporting the engine
Step 4
We put the straws
the intercooler to
engine
Step 5
Final Product
Step 2
dicular bisector
in the center
air into the
tercooler to cool
engine
Diamond -
Information is good but it's kind of hard to see which goes where.
"Descriptive pictures, but could use color.
could be neater
There is a lot of info but in a weird order
Good pics even though the printer was broken
Need more clarity
Cube
Cylinder

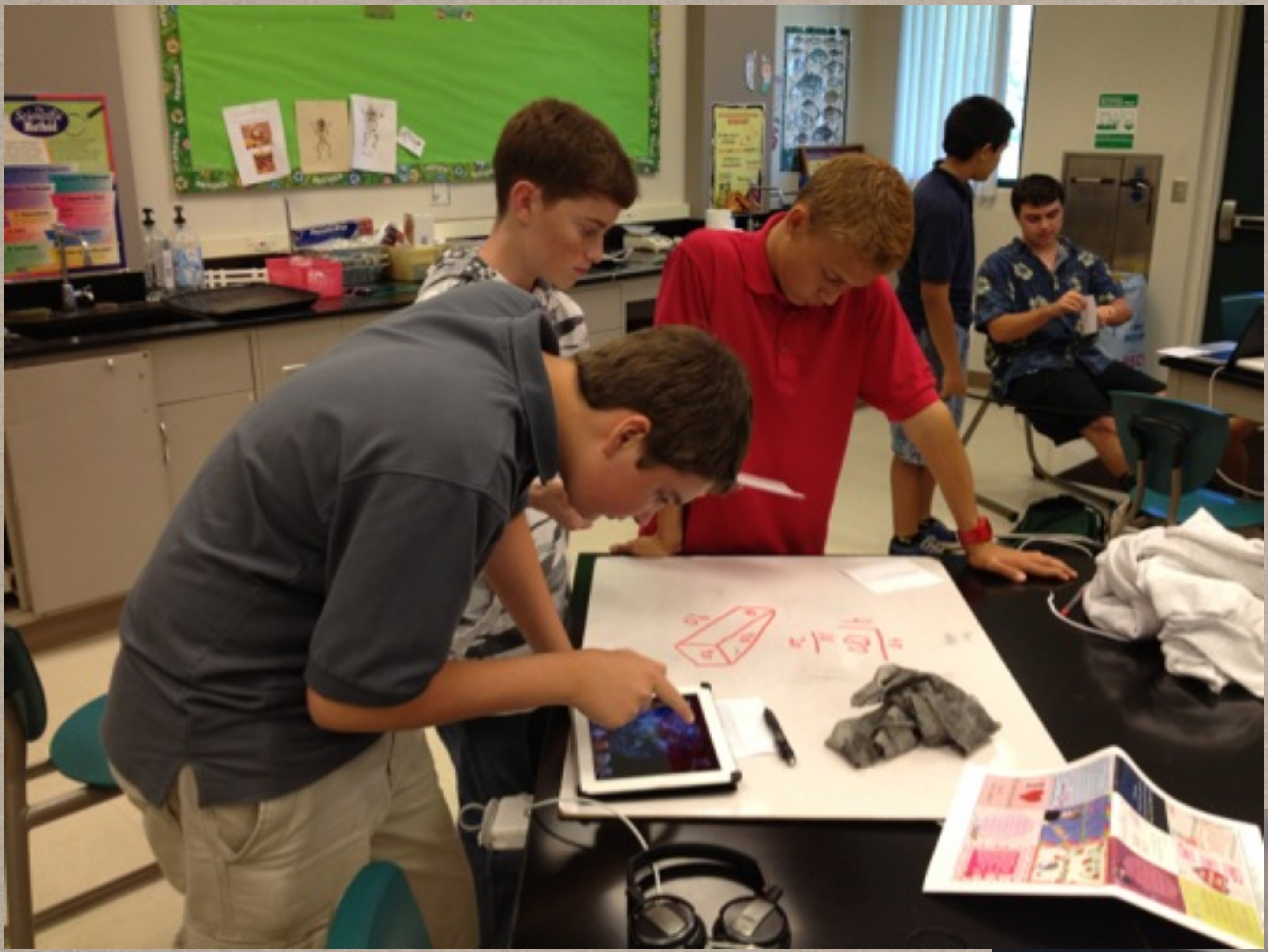

Net Cube
Step 4
Need more clarity. Kind of confusing.
Step 2
Information is good but it's kind of hard to see which goes where.
Descriptive pictures, but could use color.
Net-Cube
Bradley Sakaguchi
Reasons
We didn't make as big as we could because it helped support it structurally. It also helped circulate the air flow.
Cube
cylinder
Diamond
arch/circle
Area of diamond=3.5x3.5÷½=6.125cm
Area of diamond: ½ x d1 x d2
Volume of intecooler = 12.5 cm³
Volume of cube: Length x Base
This is the net we used
circle
square
triangle
diamond
cube
cylinder
Like the picture of the finished product. Need more pictures in the process of creating your net.

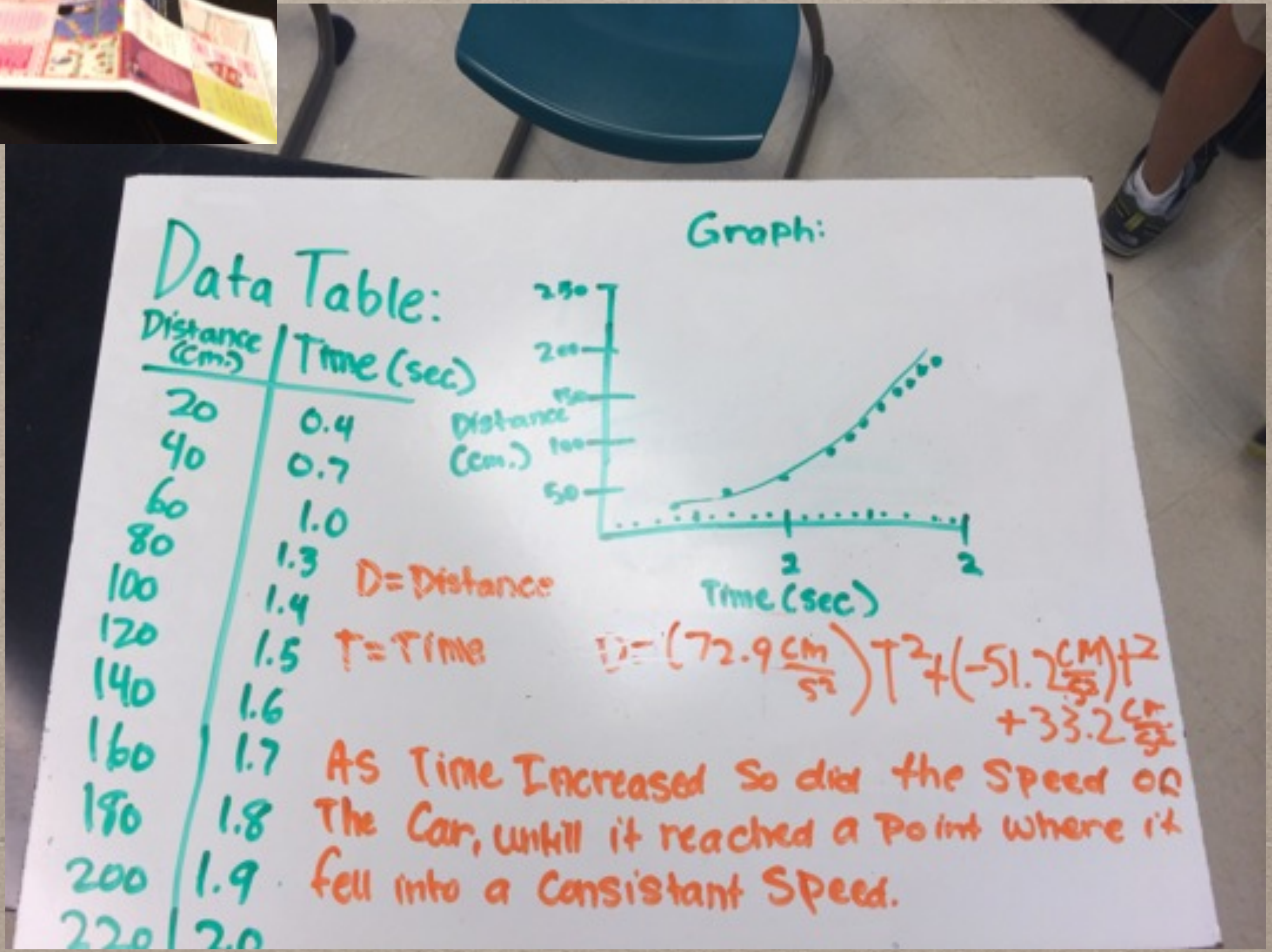
WHITEBOARDS

THE IMPORTANCE OF CONVERSATION AND PEER FEEDBACK


61 1,706
803
594
We chose an inverse graph for this
data because it fit the graph which



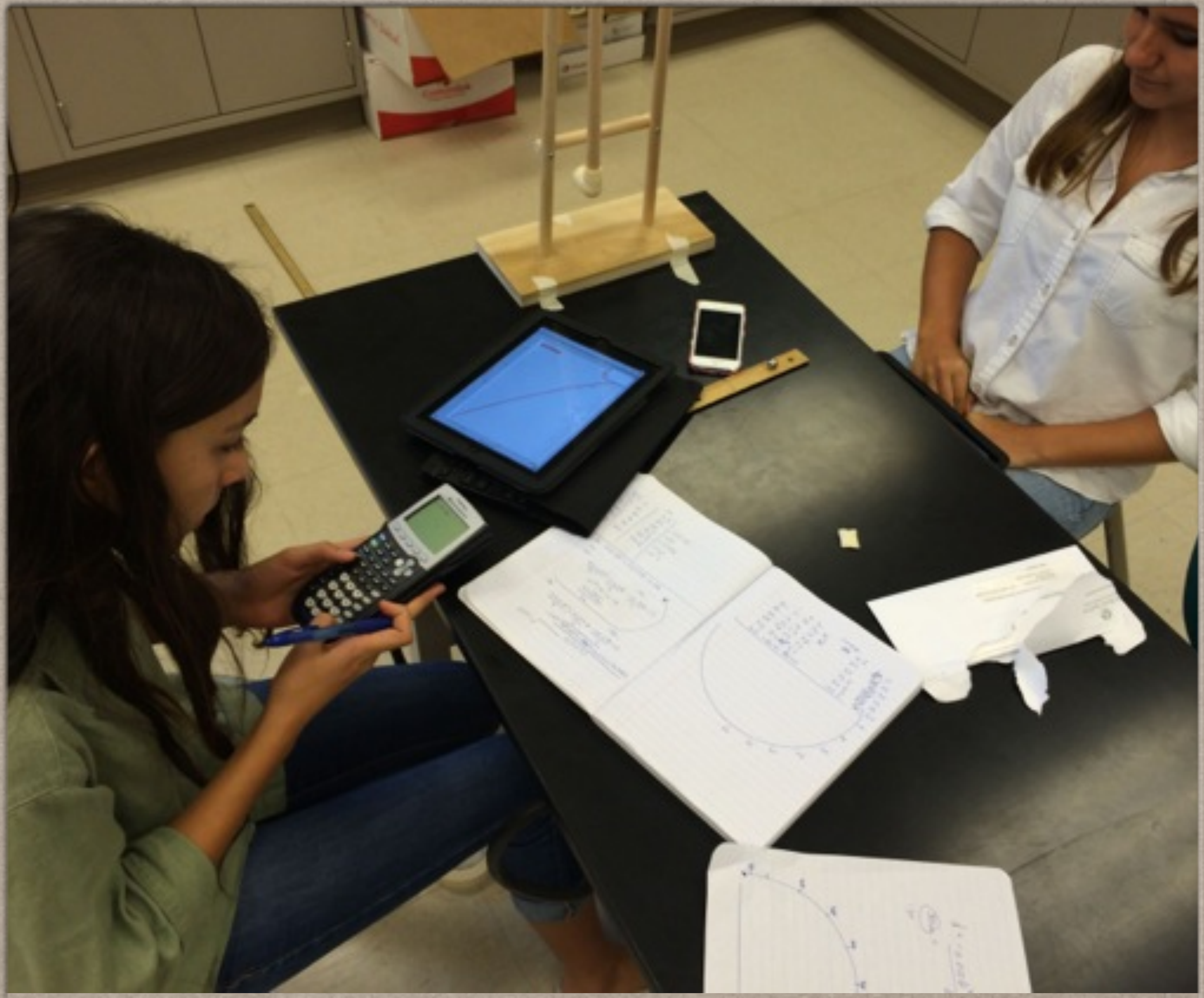




Data Table:
Distance (cm.)
Time (sec)
20 0.4
40 0.7
60 1.0
80 1.3
100 1.4
120 1.5
140 1.6
160 1.7
180 1.8
200 1.9
Graph:
Distance (cm.)
Time (sec)
D=Distance
T=Time
As Time Increased So did the Speed of The Car, untill it reached a Point where it fell into a Consistant Speed.

PREDICTIVE MODELING (POLYNOMIAL FUNCTIONS)

- HSF-IF.B.4&5 INTERPRET FUNCTIONS THAT ARISE IN TERMS OF THE CONTEXT
- HSF-IF.C.7 ANALYZE FUNCTIONS USING DIFFERENT REPRESENTATIONS
- HSF-BF.A.1 BUILD A FUNCTION THAT MODELS A RELATIONSHIP BETWEEN TWO QUANTITIES



Predictive Modeling

Often in a physical system, we create a mathematical model to allow predictions to be made. Today we are gong to do just that.

1. Take the mechanical system from the teacher and place it at the edge of a table. Practice launching a ball from it.

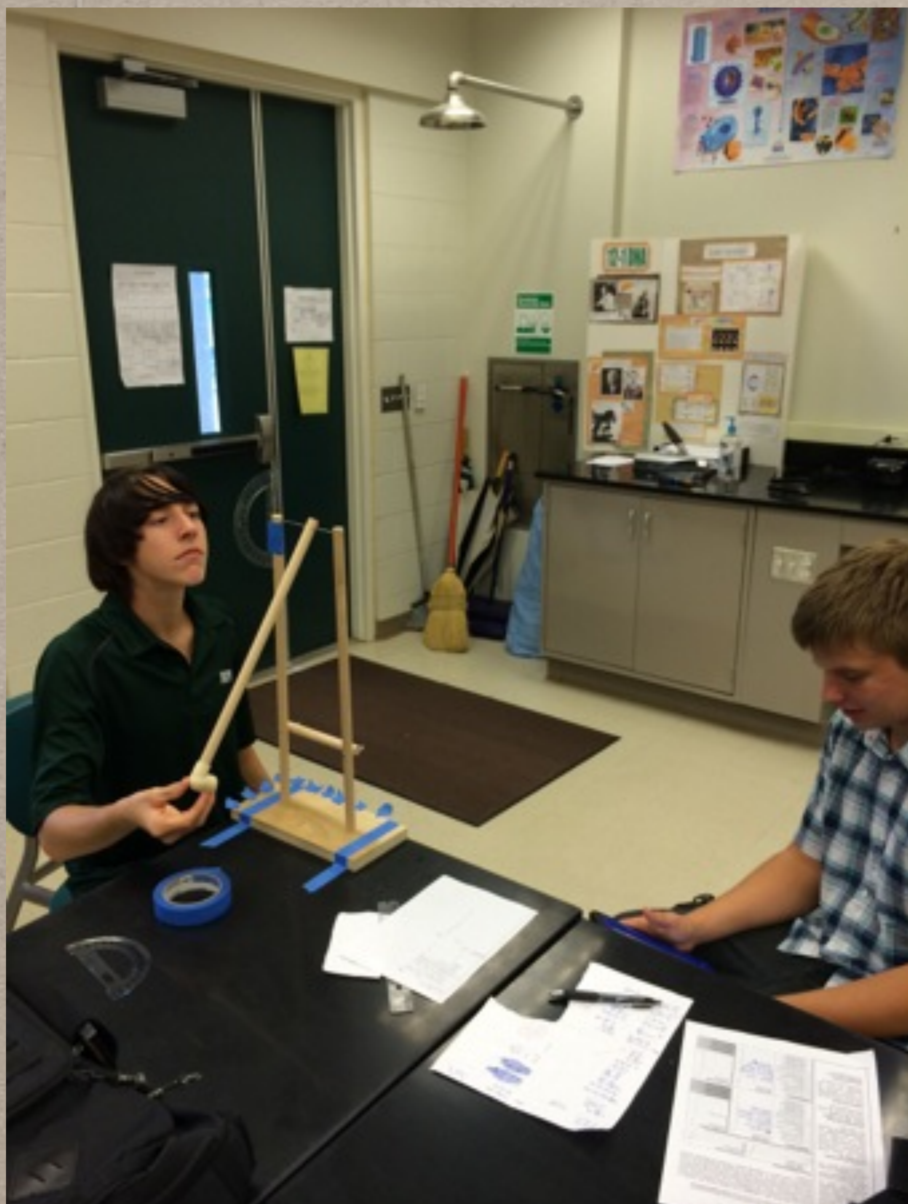
2. Notice that the distance the ball travels horizontally is dependent on the angle that the arm on the device is swung.

3. Develop a plan to collect data so that a relationship (mathematical model) can be derived using Graphical Analysis between the angle and the diastase traveled.

4. Run the experiment and develop the mathematical model. Take a couple of pictures of the experiment in action for later reference. Make sure to select the best model - be prepared to justify your rationale.

5. Once you have the model, let your teacher know - it is time to TEST your model to see if it can correctly predict a specific scenario!

6. For complete credit, you must send me your graphical analysis file (each team member needs to have their own) and a summary of results!



Predictive Modeling

Often in a physical system, we create a mathematical model to allow predictions to be made. Today we are gong to do just that.

1. Take the mechanical system from the teacher and place it at the edge of a table. Practice launching a ball from it.

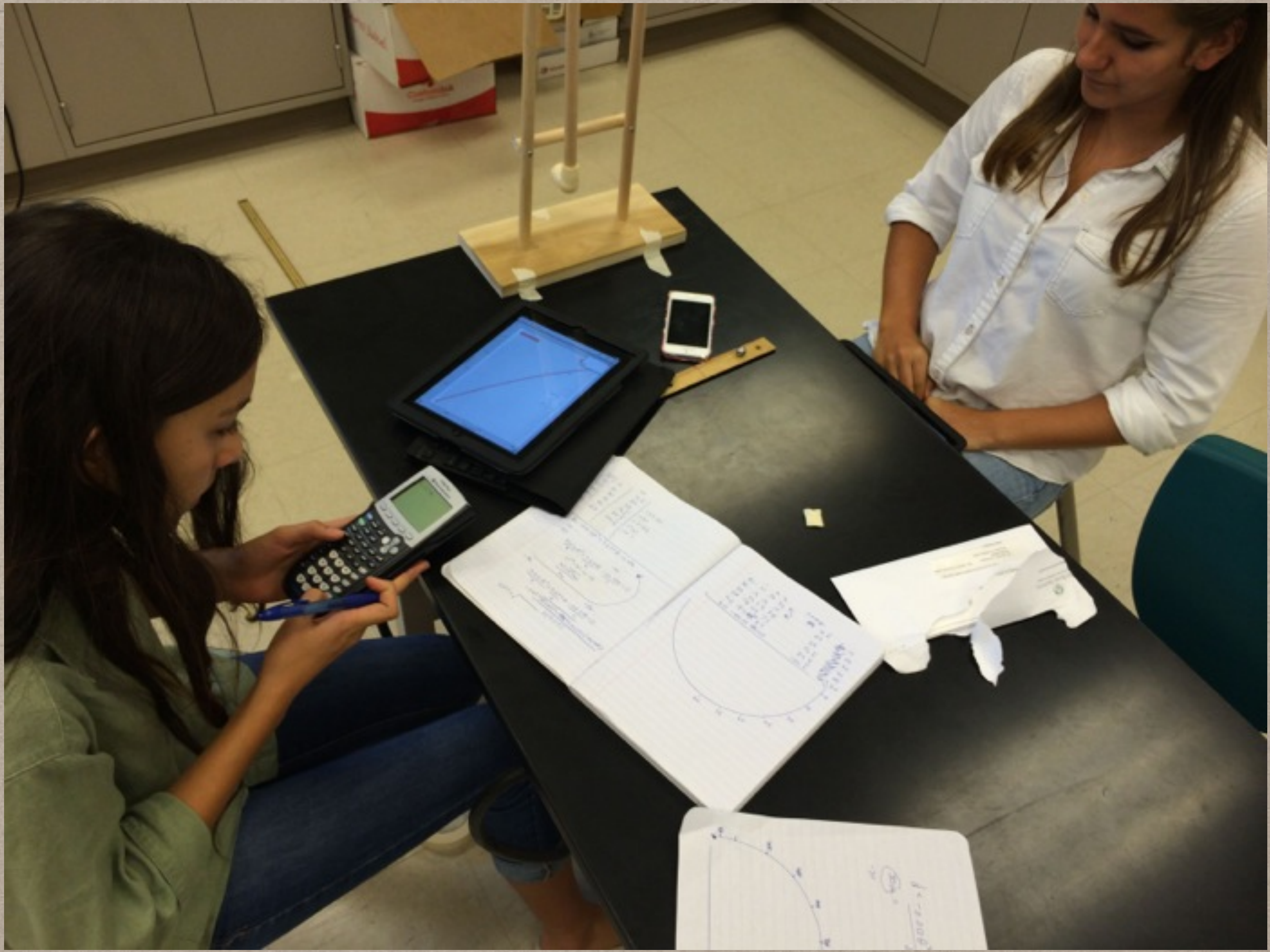
2. Notice that the distance the ball travels horizontally is dependent on the angle that the arm on the device is swung.

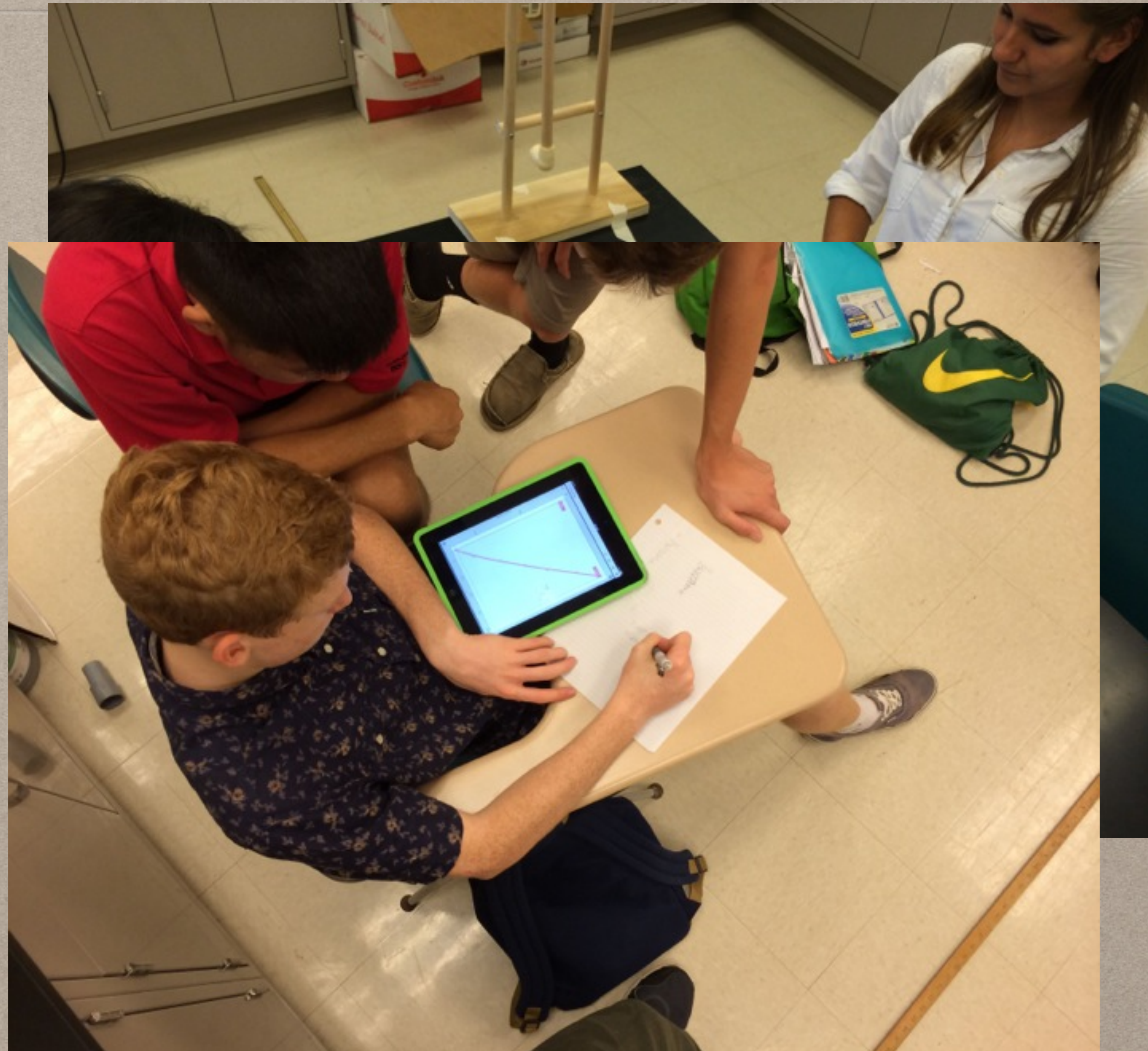
3. Develop a plan to collect data so that a relationship (mathematical model) can be derived using Graphical Analysis between the angle and the diastase traveled.

4. Run the experiment and develop the mathematical model. Take a couple of pictures of the experiment in action for later reference. Make sure to select the best model - be prepared to justify your rationale.

5. Once you have the model, let your teacher know - it is time to TEST your model to see if it can correctly predict a specific scenario!

6. For complete credit, you must send me your graphical analysis file (each team member needs to have their own) and a summary of results!





iPad 2:11 PM 85%

Documents Undo Blank 4

Angle (degrees)	Trial 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Average (cm)
15	15	14	16	15
30	31	33	29	34.3
45	41	38	41	40
60	83	83	82	82.6
75	110	107	104	107
90	132	132	128	130.6

Mathematical Equation:
Distance=.008(degree)^2 + .795(degree) + .430

52 words

Blank 4

Angle (degrees)	Trial 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Average (cm)
15	15	14	16	15
30	31	33	29	34.3
45	41	38	41	40
60	83	83	82	82.6

$$84 = .008x^2 + .795x + .430$$
$$-84 \qquad\qquad\qquad -84$$
$$0 = \underset{a}{.008}x^2 + \underset{b}{.795}x - \underset{c}{84.430}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-.795 \pm \sqrt{.795^2 - 4(.008)(-84.430)}}{2(.008)}$$

$$x = \frac{-.795 \pm 1.82}{.016}$$

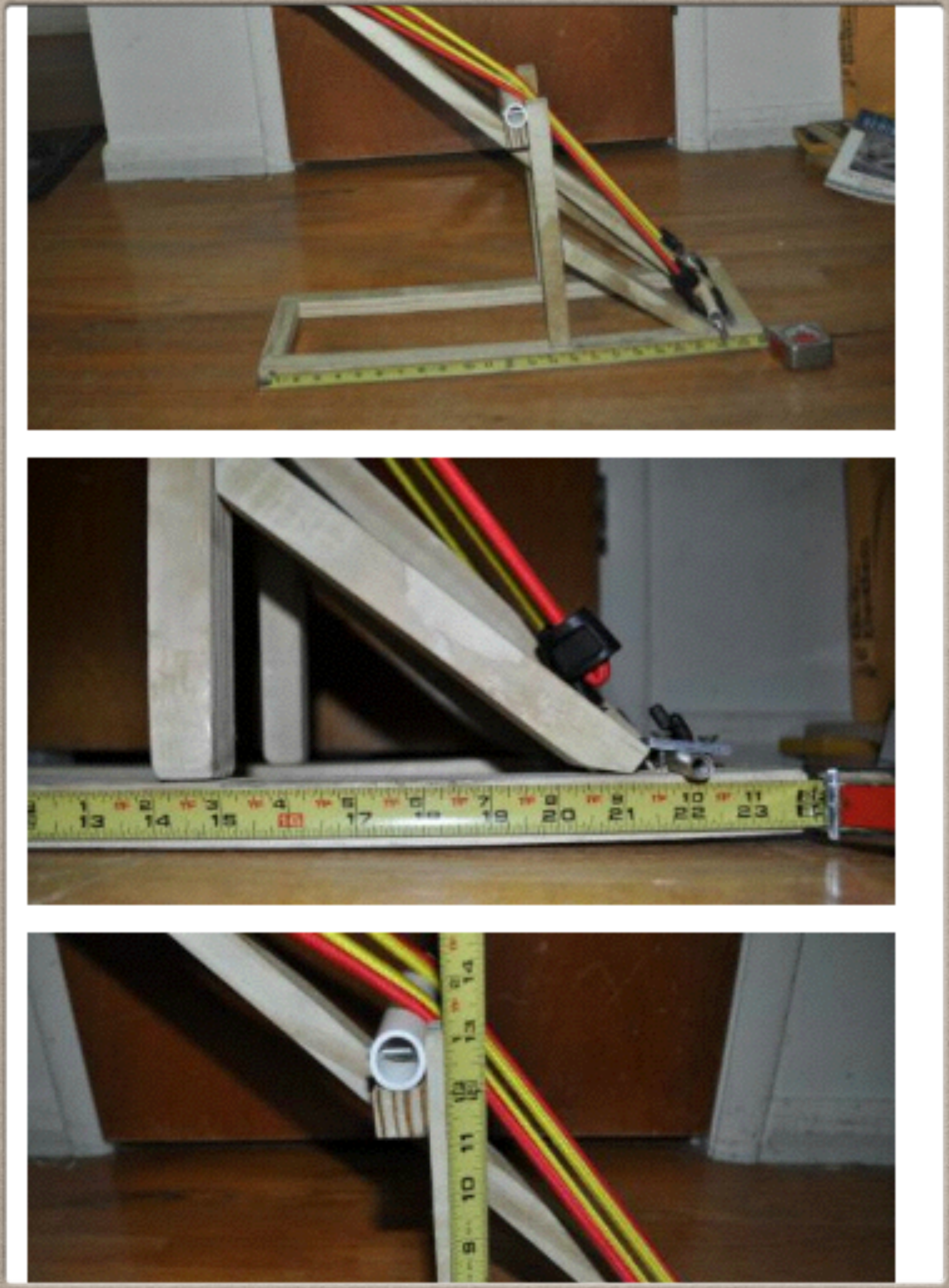
$$x = \frac{1.025}{.016} \qquad x = 64.06$$

Blank 4

al 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Average (cm)
15	14	16	15
31	33	29	34.3
41	38	41	40
83	83	82	82.6

SCALE MODELS: CATAPULTS

COMMON CORE



Catapult Protypes:

Our goal today is to build a scale model of the catapult that we see on this page:

http://stormthecastle.com/catapult/mark-thomas-modified-ogre-catapult.htm

we will eventually make the actual model, but in order to see the construction requirements, a scale model is a good way to start.

Schematic diagrams

to start, you are to make a three view schematic diagram so that you're both aware of the materials needed, as well as how they fit together and other design considerations. On one piece of graph paper, accurately and completely create top, side, and front view diagrams making sure to include all important measurements and edges, drawn accurately and with straight lines using a ruler and labeling all parts as necessary.

please look at these presentations about how to make a scale drawing:

http://www.authorstream.com/Presentation/Tirone-38765-Orthographic-Projection-Multi-View-Drawing-History-Revolving-pr-Education-ppt-powerpoint/

http://www.authorstream.com/Presentation/waqqas-314623-orthographic-projection-education-ppt-powerpoint/

Here are a few examples of what a good three view representation should look like:

http://image.thefabricator.com/a/articles/images/2249/precision-large-view-figure5b.gif

http://www.dimcax.com/gdt_web/november-04_files/july-02-1.gif

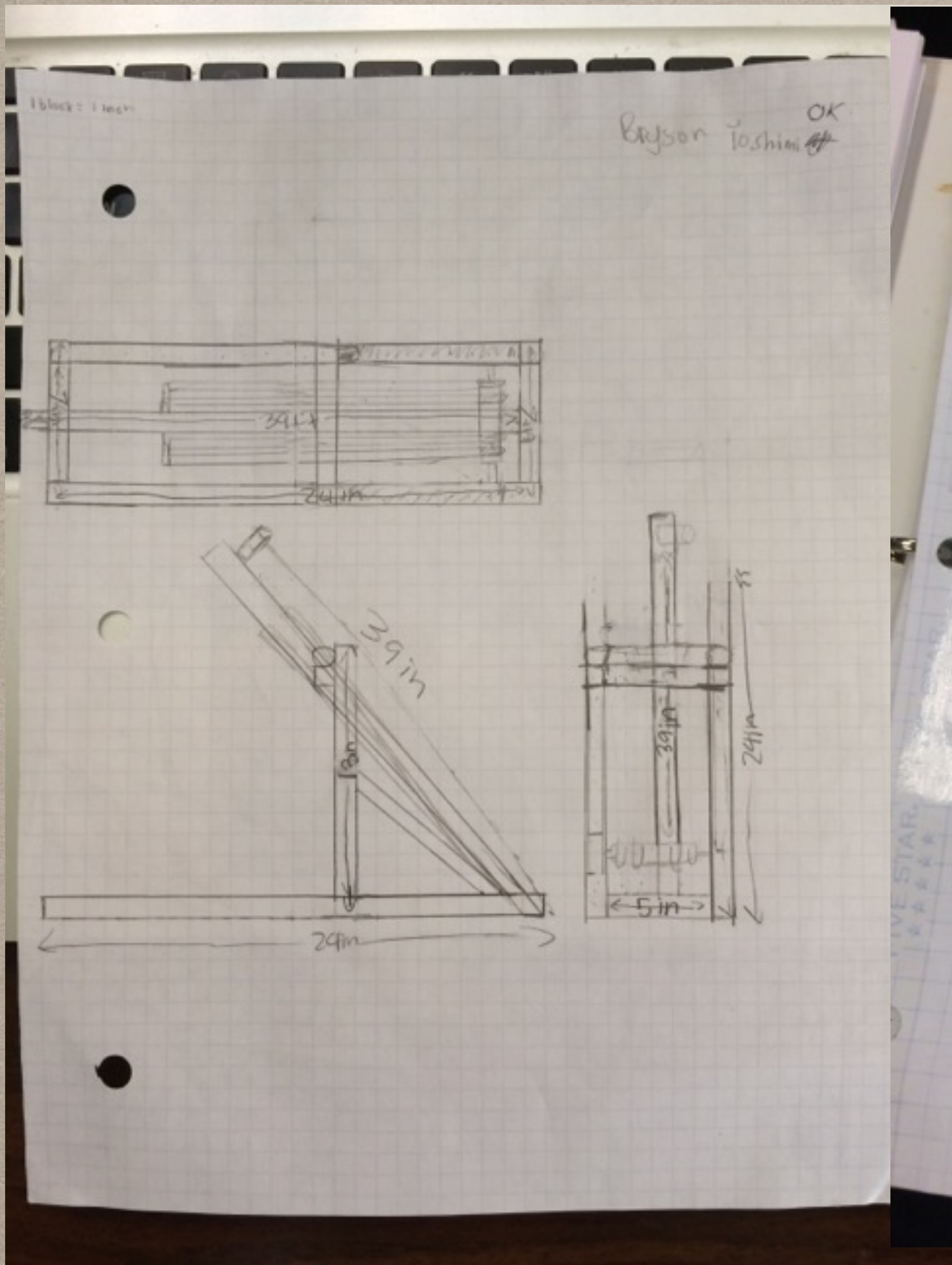
http://upload.wikimedia.org/wikipedia/commons/thumb/4/45/Mech_draw_1.svg/200px-Mech_draw_1.svg.png

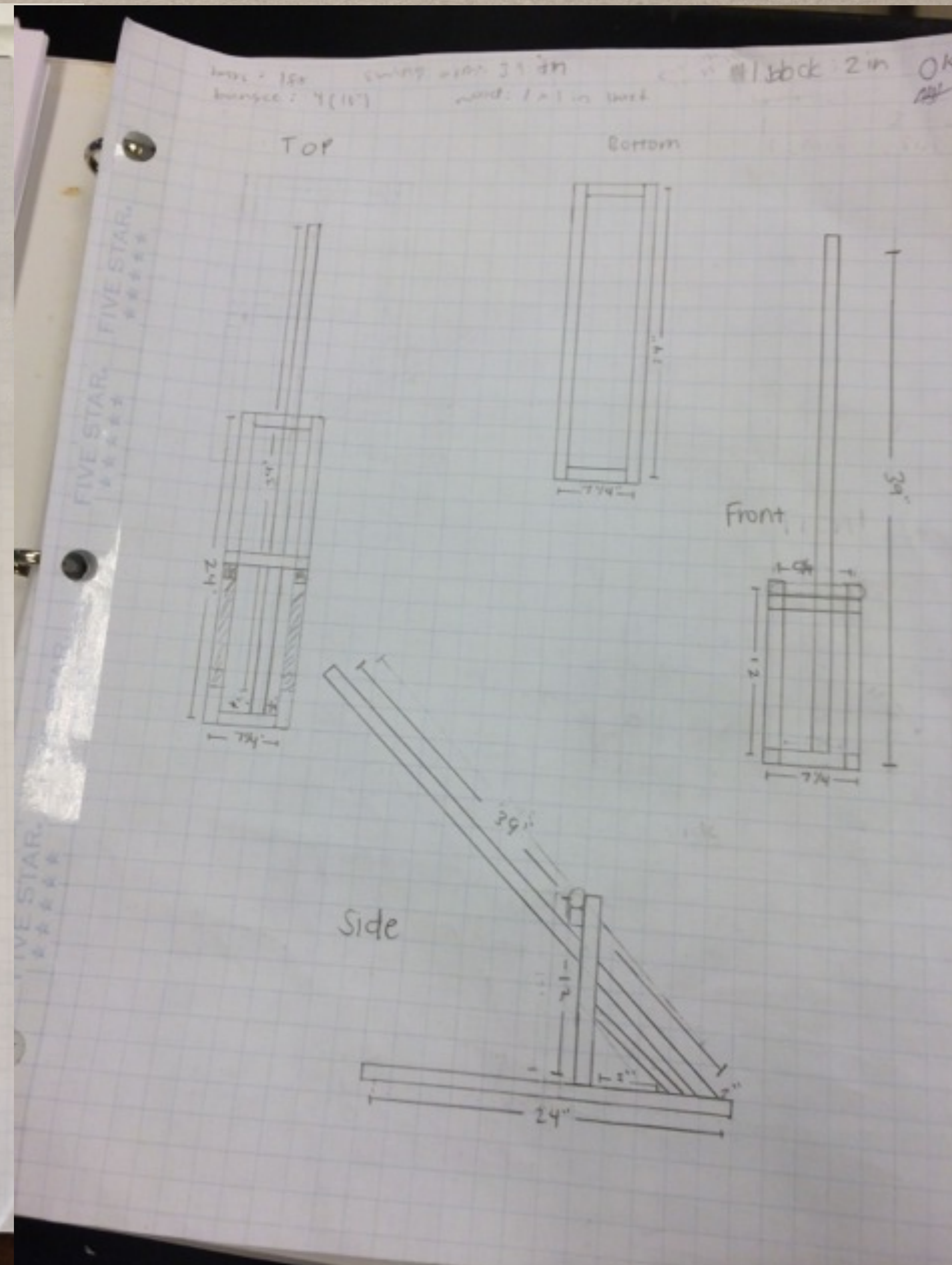
http://graphicalcommunication.skola.edu.mt/wp-content/uploads/2010/09/Engineering-Drawing-1.jpg

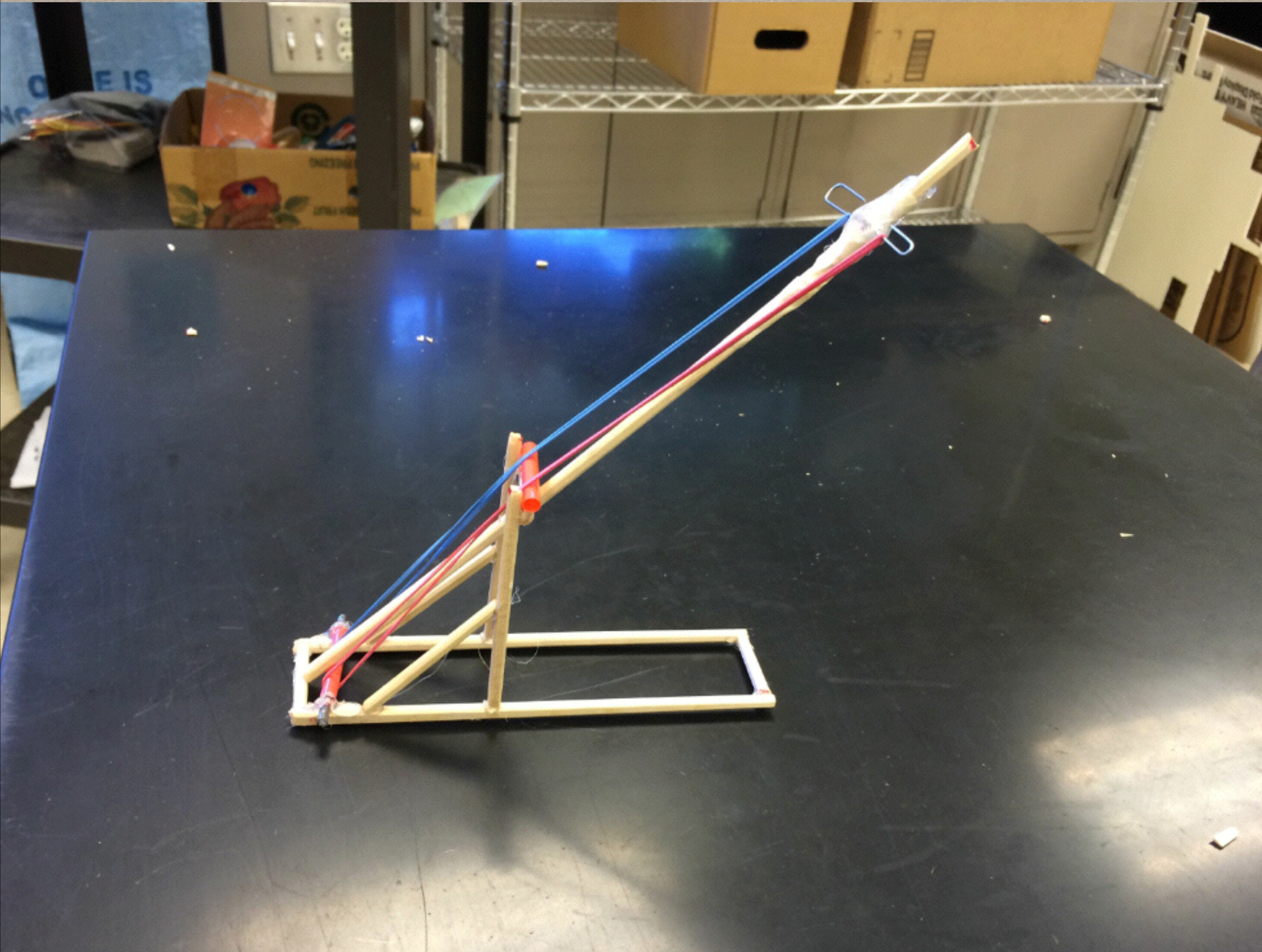
http://engineeringtraining.tpub.com/14069/img/14069_162_6.jpg

http://graphicalcommunication.skola.edu.mt/wp-content/uploads/2010/09/Form-4-HYE-2009-010109-Model-11.jpg

Once you have created your schematic orthographic drawings and have them approved, get your materials and build a 1/4 scale model of the catapult.

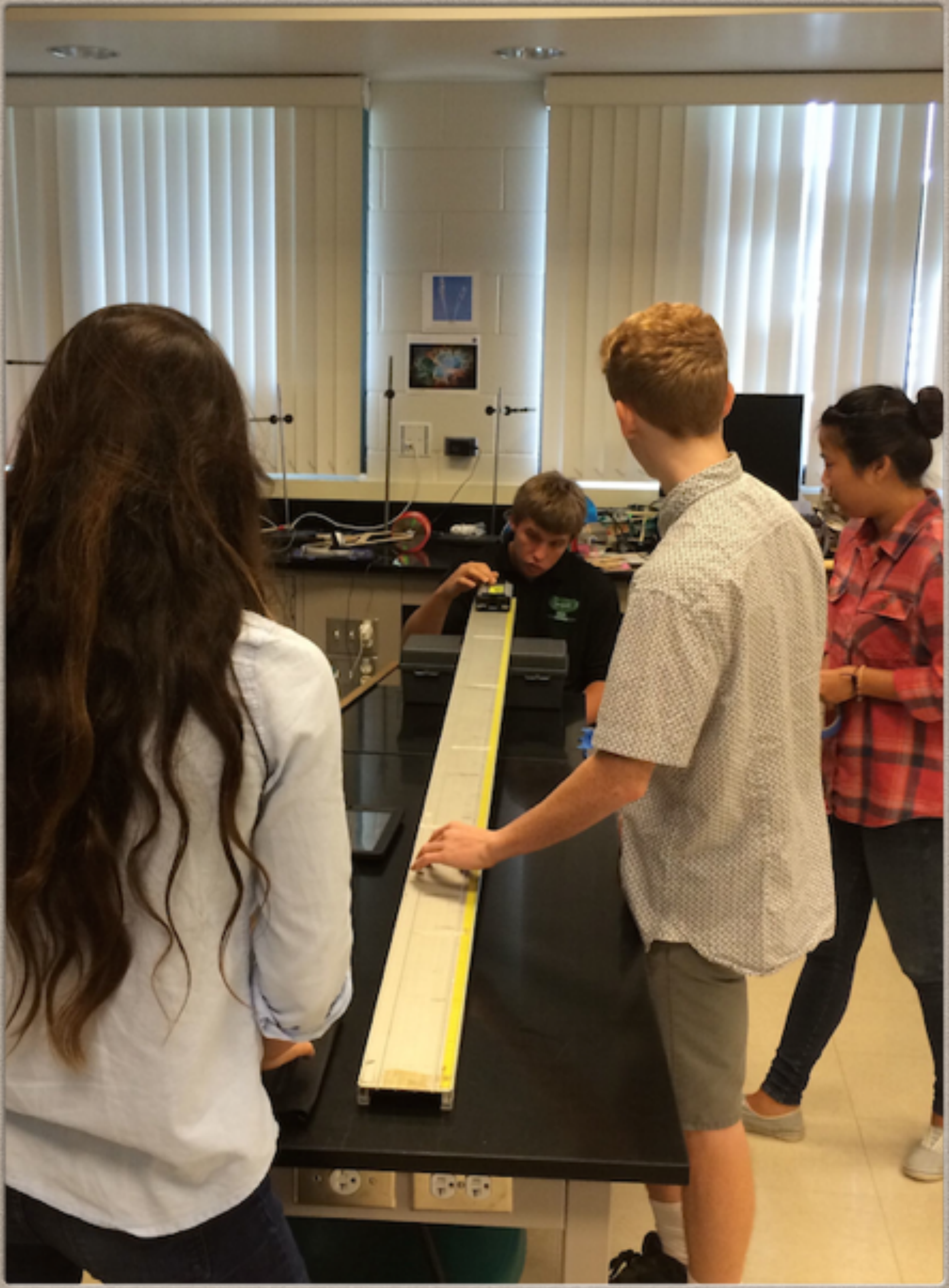

OK
Bryson Toshimi
24in
39in
29in
5in
39in
24in


OK
Top
Bottom
Front
Side
39"
24"



MODELING ACCELERATED MOTION

- HSA-CED.A.1&2 CREATE EQUATIONS THAT DESCRIBE NUMBERS OF RELATIONSHIPS
- HSF-BF.A.1 BUILD A FUNCTION THAT MODELS A RELATIONSHIP BETWEEN TWO QUANTITIES



Modeling Motion

In this activity, we are going to run an experiment in which an object rolls down an incline plane, and we examine the relationship between how far it rolls, and how much time it takes.

In order to set up this activity, you will use your iPad both as a camera, timer, and mathematical analysis tool. we will discuss the particulars of the experiment design as a class, but the outcome should be a document that includes the following:

- brief description of the experiment with a picture of the experimental setup
- data table that includes multiple trials, and averages
- graph of data that includes appropriate choice in mathematical model and appropriate use of labeling axes and fit
- a mathematical model stated (equation) using correct variables and units on any constants
- a written statement of the relationship of the variables
- a brief discussion of experimental questions and concerns

this should be submitted as a PDF document in this week's Showbie folder

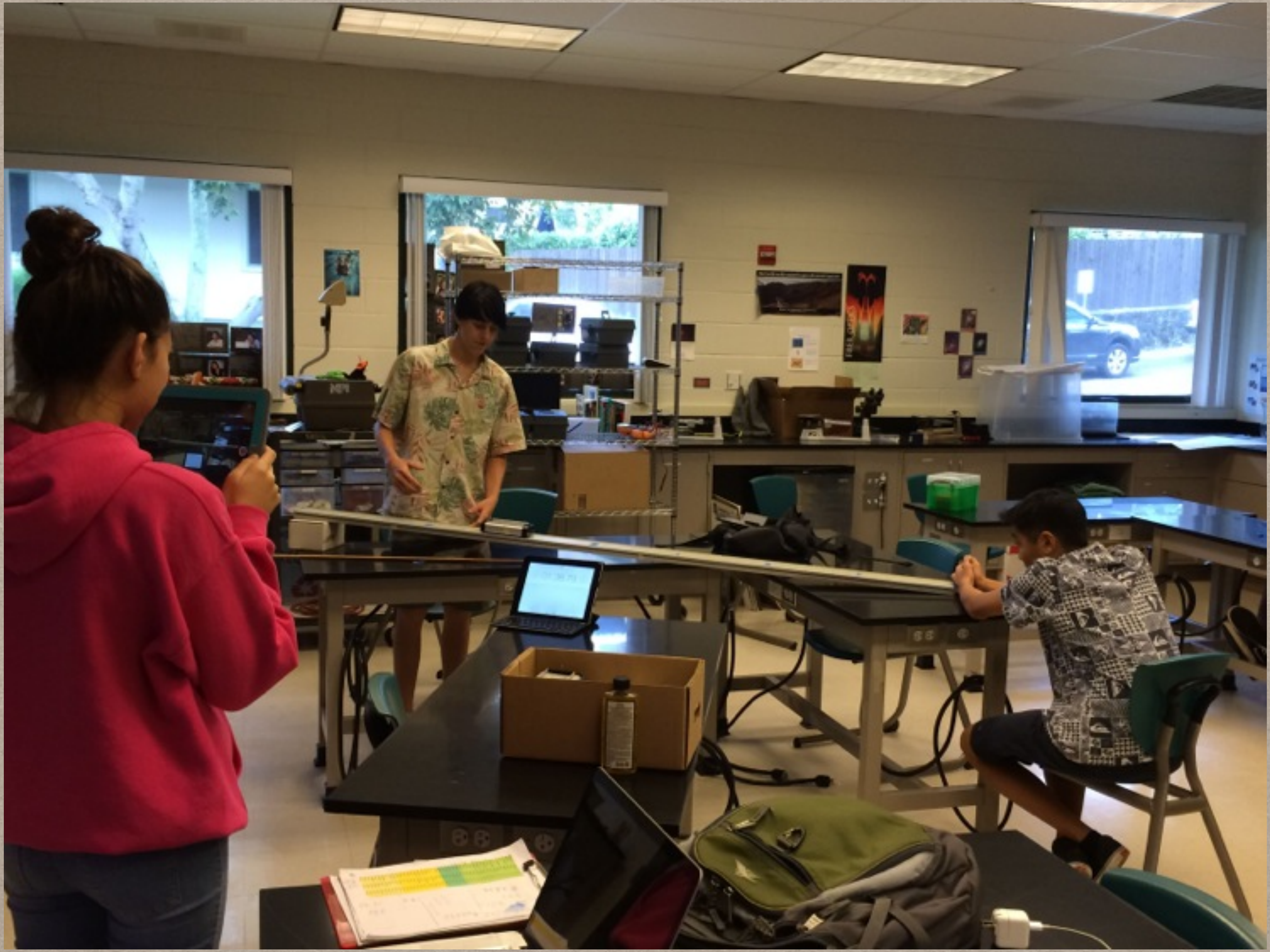
Resources supporting this activity

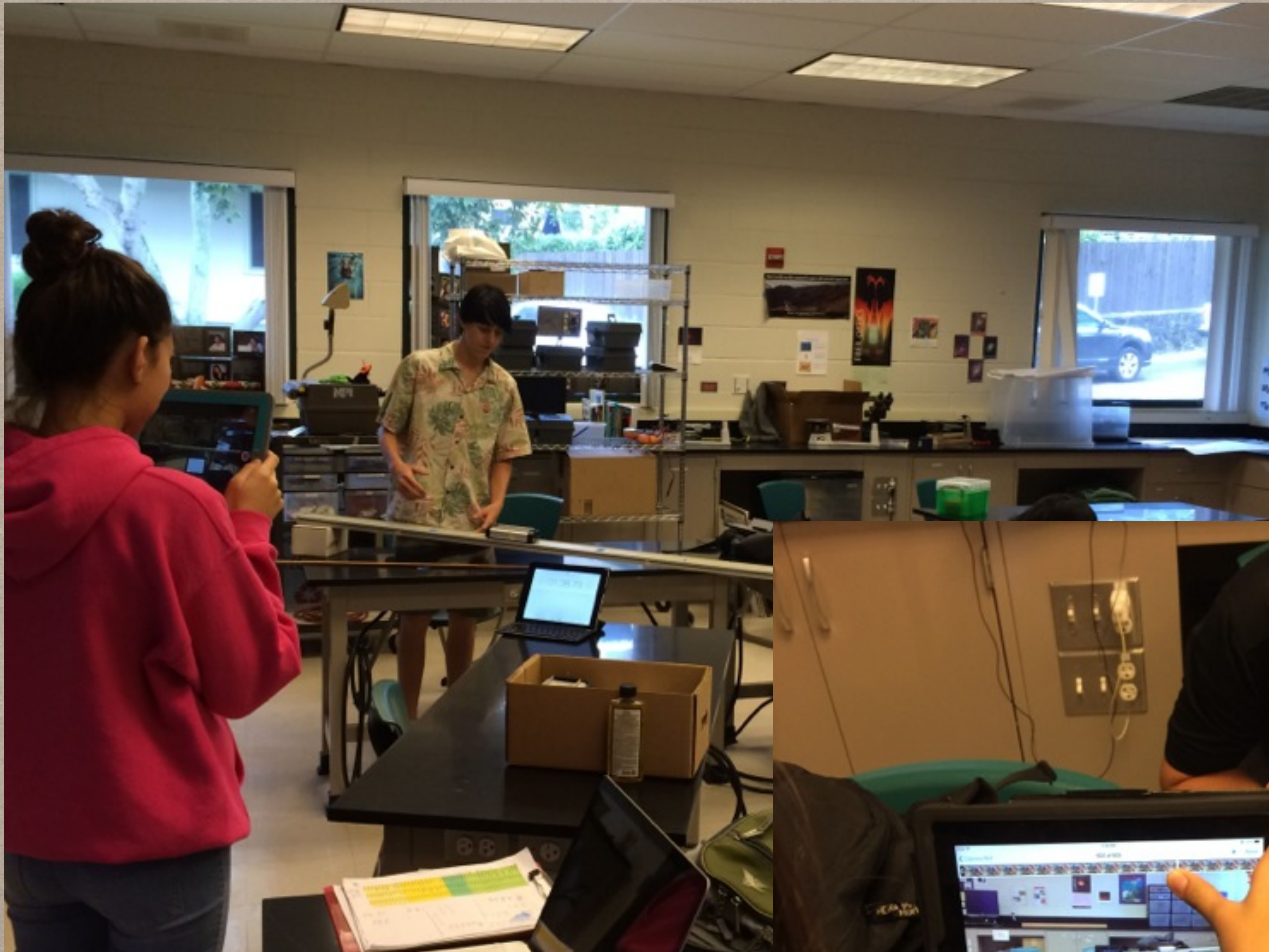
http://www.youtube.com/watch?v=ZUgYc6Bi46w

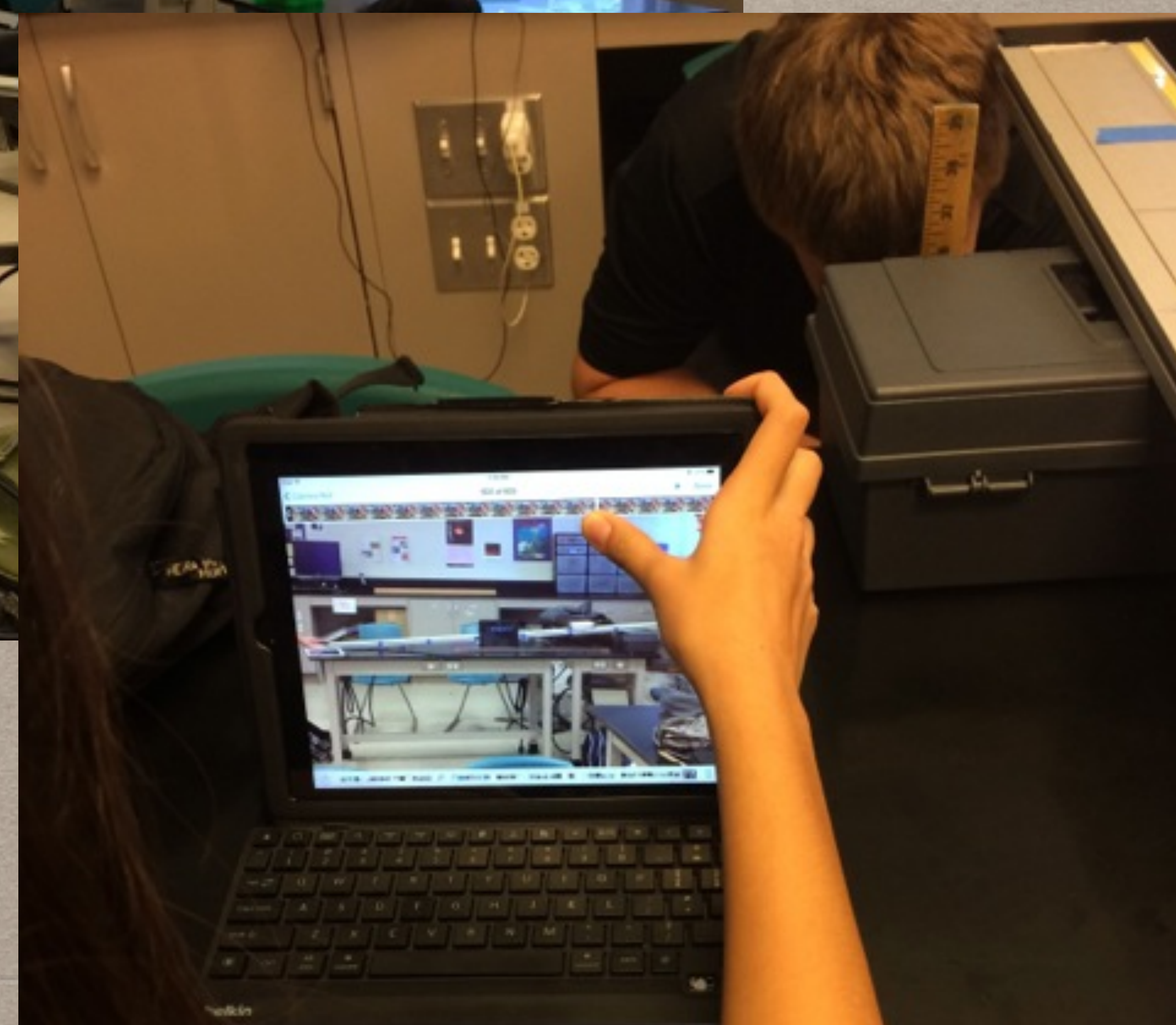
http://demonstrations.wolfram.com/GalileosInclinedPlaneExperiment/

http://www.youtube.com/watch?v=tUmVqgBp06s

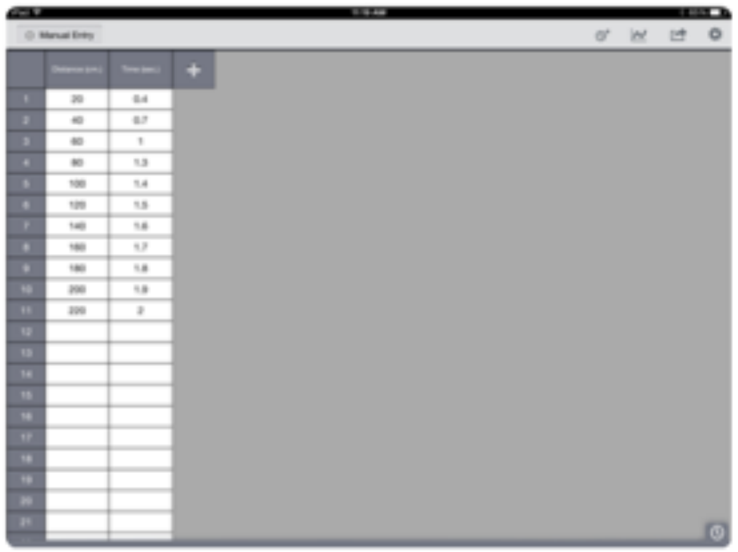
http://www.youtube.com/watch?v=qBAh2zN7se4

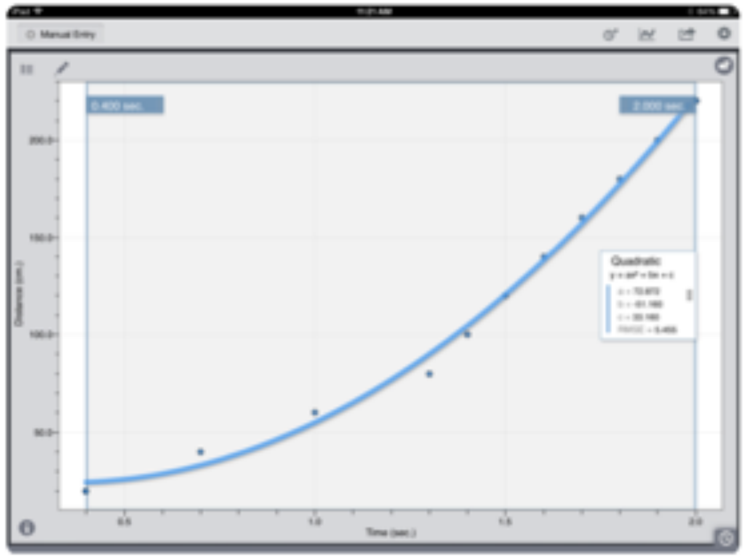






In the lab which we conducted we timed the amount of seconds it took for a car to reach the end of a rial. We recorded it with video. We had one person taping, one person start/stop the timer and start the car, and one person stop the car. We then used the recorded data to construct charts, tables, and functions.

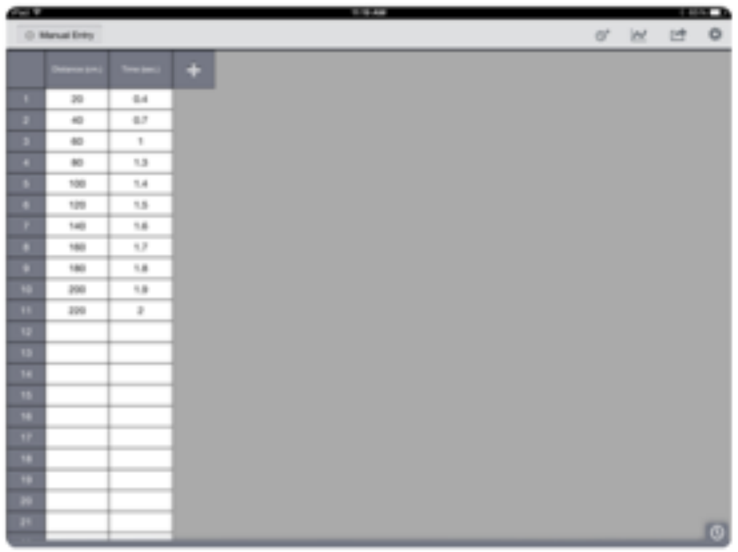


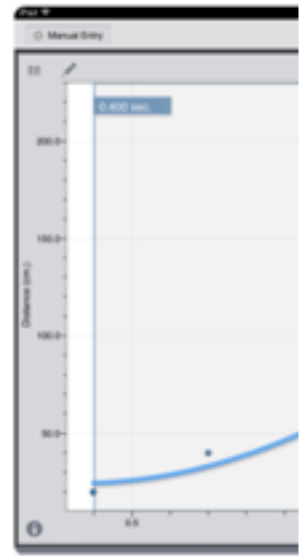


D= distance in cm
T= time in seconds

D=72.9T^2+(-51.2)T+33.2

In the lab which we conducted we timed the amount of seconds it took for a car to reach the end of a rial. We recorded it with video. We had one person taping, one person start/stop the timer and start the car, and one person stop the car. We then used the recorded data to construct charts, table

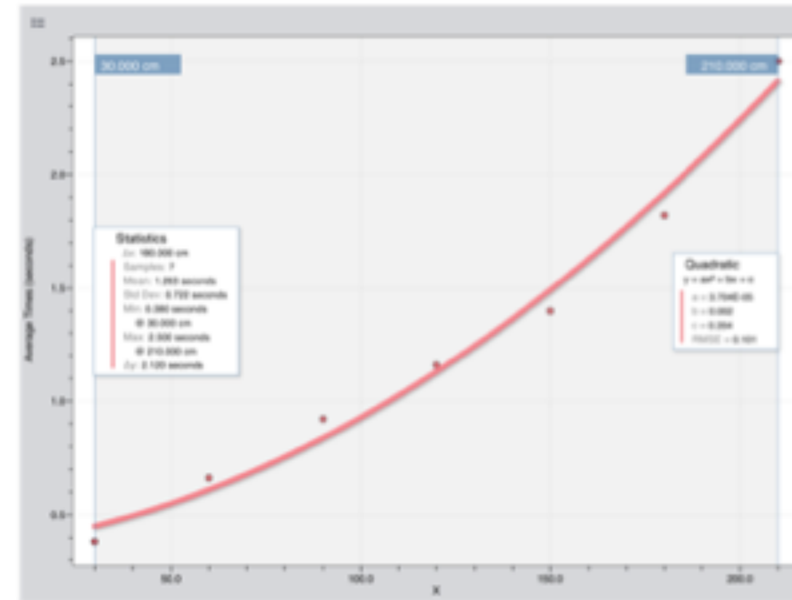




D= distance in cm
T= time in seconds

D=72.9T^2+(-51.2)T+33.2

Graph:

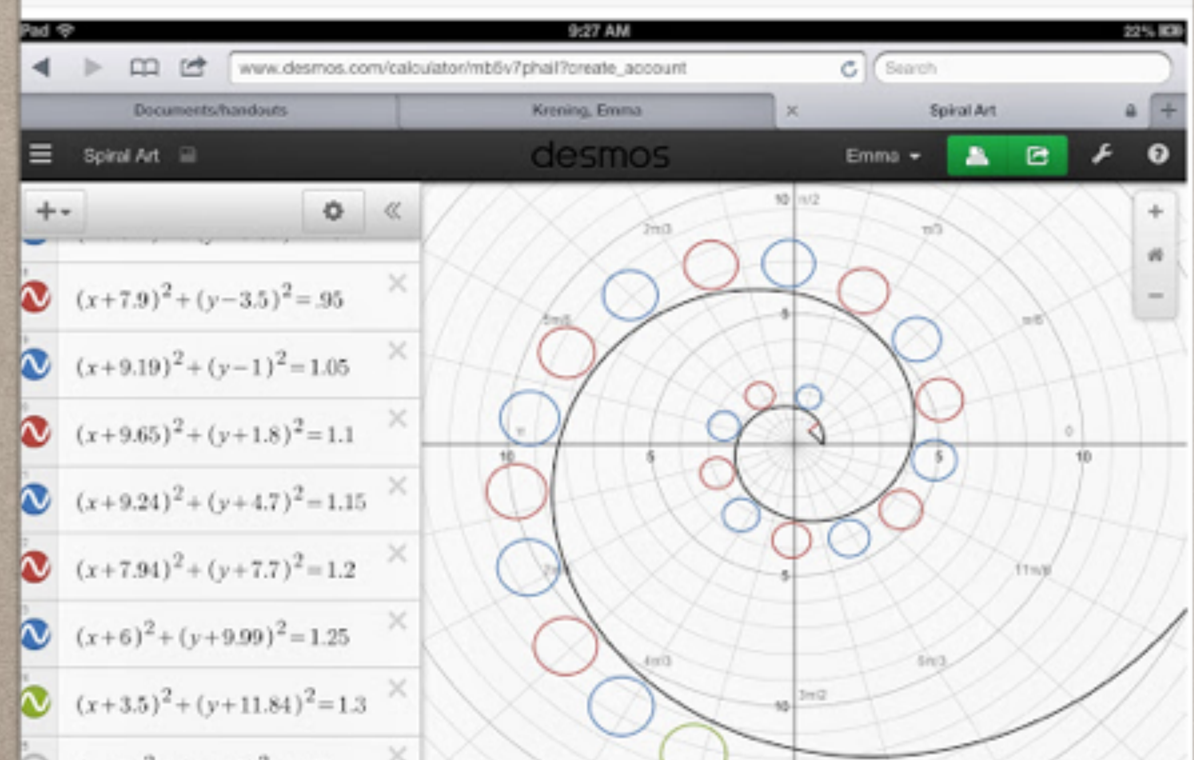


This graph is using a quadratic formula. The equation given is y = ax squared + bx + c. So to take this equation and make it so that it is specifically fitting this set of data we must change the letters used. So the equation would read: T(time)= ad(distance)squared + bd + c. Then when you plug in the numbers it would be T= 3.704d squared + .002d + .354. We chose this style of graph because of how well it fit the plotted points that were on the graph.

This is an image of the set up we used to perform this experiment. Shows the ramp, the pieces of blue tape, object rolling down, timer set up next to the ramp, and the people at both ends.

EXPLORING MATH PATTERNS IN ART

- HSA-REI.A.2 REPRESENT AND SOLVE EQUATIONS AND INEQUALITIES GRAPHICALLY
- HSA-REI.D.11 REPRESENT AND SOLVE EQUATIONS AND INEQUALITIES GRAPHICALLY
- HSA-CED.A.3 CREATE EQUATIONS THAT DESCRIBE NUMBERS OR RELATIONSHIPS



Exploring Math Functions and Inequalities Through Art

In this activity, we're going to explore ways in which some forms of art can be re-expressed as mathematical functions, and developed an original piece of art that you will create a mathematical function for.

This activity explores the Algebra 2 topics of functions, equations and graphs, as well as Linear systems including any qualities. it also begins to explore some of the functional relationships covered later in the course that include quadratics, radical expressions, and other functional forms that create different kinds of curves.

Step 1: Bitmap vs Vector graphics
One of the important basic concepts to understand in the marriage between arts and digital technology is the difference between bitmap (painting or raster) graphics and vector graphics. There are a variety of software and mobile applications for both kinds of graphics. start by reading and understanding the difference between them at this link, and explore this a little on your own Web search before you continue:

http://graphicssoft.about.com/od/aboutgraphics/a/bitmapvector.htm

Make sure you understand the difference and can explain this, since it is a critical idea in this activity.

Step 2: Exploration of Geometric centered art
graphic art and painting covers a wide range of style and historical approaches, but there are a few that lend themselves easily to creating mathematically-based (vector) descriptions. A few examples of styles include:

- Cubism
- Mondrian
- Albers
- Kandinsky

All of these approaches have in inherently visual mathematical structure that can be easily unfolded.
Using a web browser, learn more about each of these styles, and look at a variety of images of each of these arts styles. For each of the four listed, pick three images that you think are interesting and convey a geometric sense of wholeness. Keep track of these images by putting them into your photo library so you can include them in a summary document during this activity (make sure to keep the URL, so you can give correct reference of where you got it).
In your own words, give a paragraph description of each style, and your three examples using a word processor like Pages, and put this document in our class digital dropbox for this activity. Your goal will be to create a piece of art modeled after one of these styles. Please indicate at the end of your summary which style you would like to mimic, and why. Don't forget to add references/links/urls for both your images and your research! Checklist for submission here

Step 3: First Draft
Using just pencil and an 8 1/2 x 11 sheet of paper, create a sketch of your intended piece of art – no color necessary at this point. be sure to think about your use of line and curve, as every line in curve you draw will need to be modeled using the software Desmos.
Once you have completed this first draft, take a picture of it with your iPad in put it in your showbie folder we will do a round of critiquing and feedback as a class.

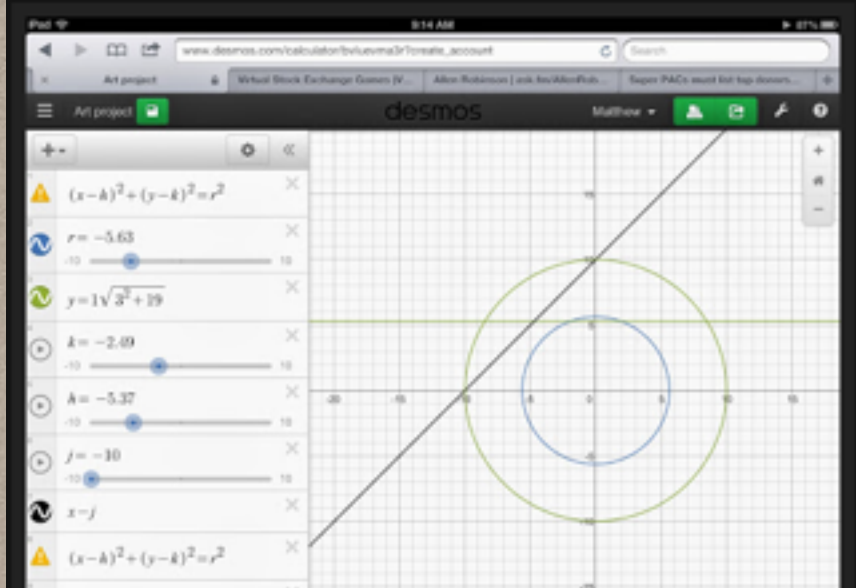
Step 4: Revision and Color
Taking into account the feedback that we collected as a class, go back to your original draft, and now strengthen your lines and curves, and add color to bring your sketch to life. once you are finished, take a picture of this, and put that image in your dropbox.

Step 4: Creating the Mathematical Model
In order to convert your drawing into a digital mathematical model, we need to create a coordinate system with your drawing so that we can convert lines and curves into mathematical statements that match up to a coordinate plane. Although there are a variety of ways we could accomplish this, a simple physical way would be to put a transparent grid on top of your drawing, and start mapping the points where lines and curves begin and end (think domain and range of each function) and then defining the mathematical statements for each one of those lines and curves. For each type of geometric shape, there is a corresponding relationship (function) that will best fit your drawing. In class, we discussed and played with a variety of functions that correspond to the conic sections that are central to so much of the work in algebra 2: line, circle, parabola, ellipse, Hyperbola.
These can easily be found by web searching but there is one example of their mathematical statements here:
http://www.wyzant.com/help/math/algebra/conic_sections

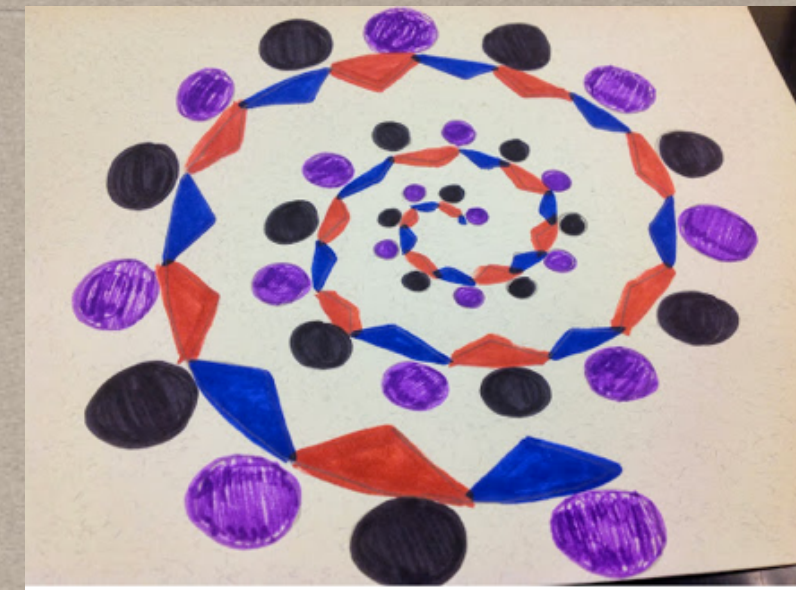
You can also look at examples on the Desmos website (http://desmos.com) to see examples of other projects and the curves that were made and what mathematical statements allowed them – please remember you'll need to consider limitations of domain and range for your functions.

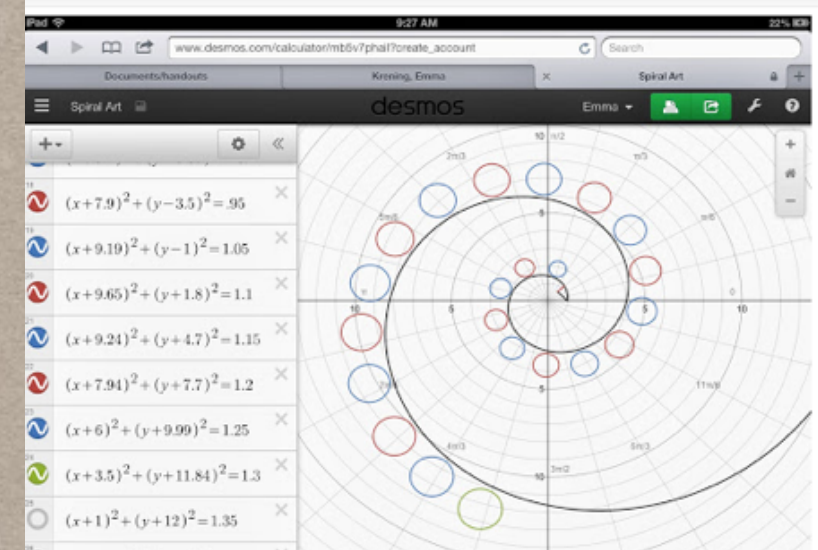
Deliverables and assessments:

- Fluency with understanding bitmap and vector graphics (this will be quizzed at some point)
- Summary of your exploration of the different kinds of art submitted as a PDF in our digital dropbox from step two. Checklist for completion here
- First draft submitted in digital dropbox
- Second draft submitted in digital dropbox

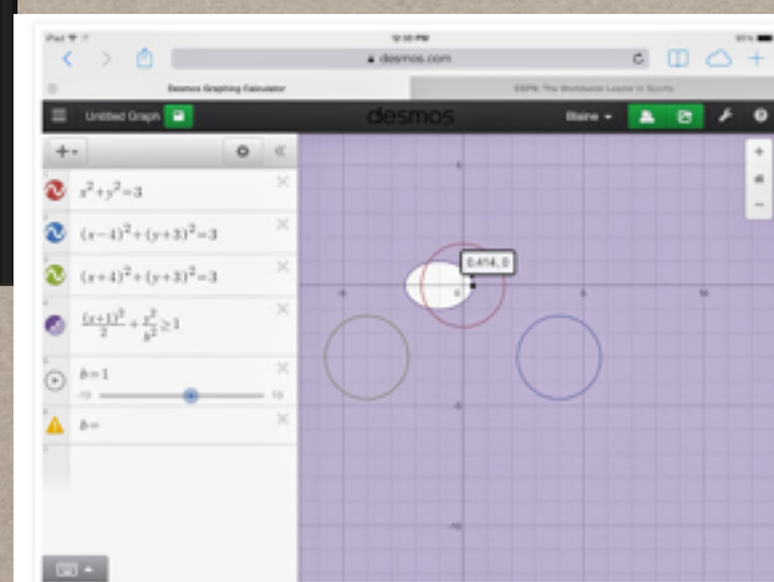


Art project
desmos
$(x-h)^2+(y-k)^2=r^2$
$r=-5.63$
$k=-2.49$
$h=-5.37$
$j=-10$
$x=j$





Spiral Art
desmos
$(x+7.9)^2+(y-3.5)^2=.95$
$(x+9.19)^2+(y-1)^2=1.05$
$(x+9.65)^2+(y+1.8)^2=1.1$
$(x+9.24)^2+(y+4.7)^2=1.15$
$(x+7.94)^2+(y+7.7)^2=1.2$
$(x+6)^2+(y+9.99)^2=1.25$
$(x+3.5)^2+(y+11.84)^2=1.3$
$(x+1)^2+(y+12)^2=1.35$



Untitled Graph
desmos
$x^2+y^2=3$
$(x-4)^2+(y+3)^2=3$
$(x+4)^2+(y+3)^2=3$
$b=1$

Student Name:____________________ **Reviewer Name** ________________________

Art in Math Project (43 pts):

- **Top of reflection page includes student name and project title (1 pt)**

- **Professional Level of Work (2 pts.):**
  - ☐ Is it professional and neat?
  - ☐ Is work free of typos, misspelled words, and, punctuation and grammatical errors?
  - ☐ Was the work submitted on time?

Comments

Art work included (12 pts.):
  - ☐ Was the artwork included?
  - ☐ Does the artwork to indicate attention to detail
  - ☐ Are there clean lines, appropriate coloring and shading, attention to detail?
  - ☐ Does the artwork clearly stay to the form of an intended artistic style?

Comments:

- **Desmos Printout included (12 pts.):**
  - ☐ Was a printout included?
  - ☐ Does the print out have both the graphs as well as all of the functions?
  - ☐ Are domain and range limits clearly used?
  - ☐ Are the functions written with accepted mathematical clarity?
  - ☐ When appropriate, are the representations of lines, and other conic sections?
  - ☐ Is there use of inequalities?
  - ☐ Does the use of functions indicate attention to detail in lines matching up and shading from inequalities that is consistent with the overall drawing?

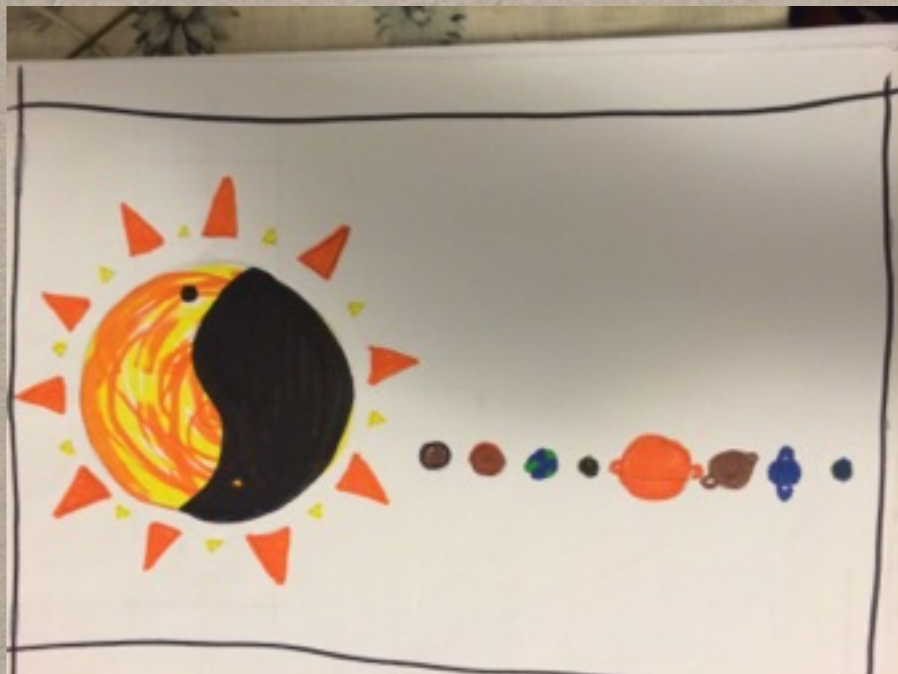
Comments:

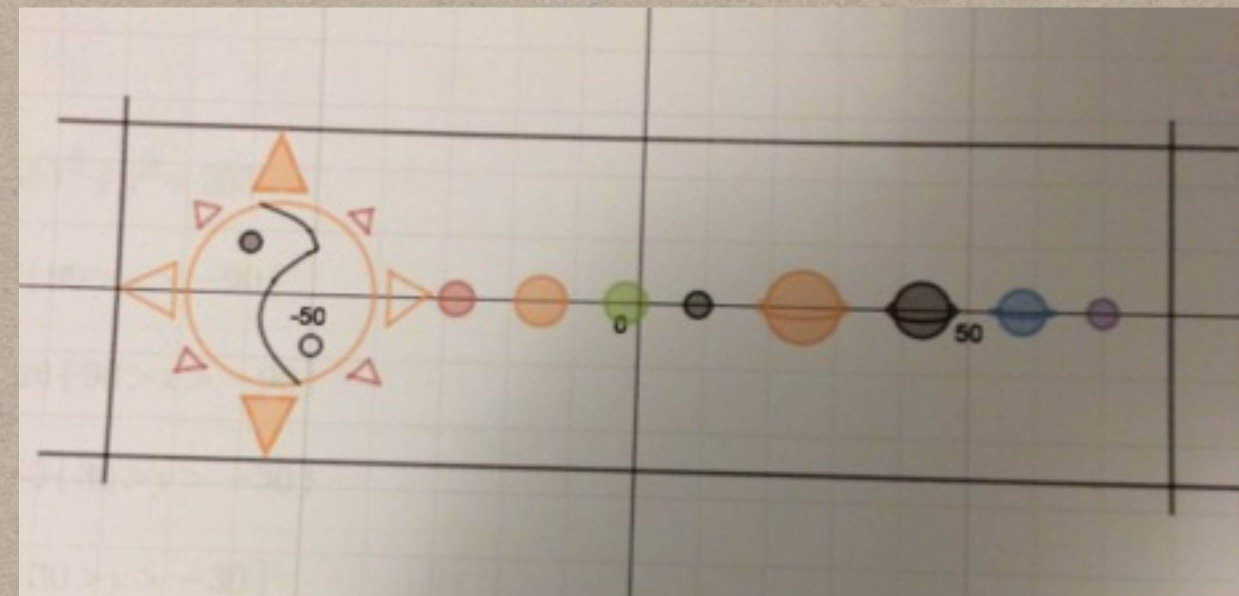
- **Organization of Reflection (2 pts.):**
  - ☐ Is the writing at an appropriate level?
  - ☐ Is it organized in a clear and logical manner?
  - ☐ Is it clear, concise, and free of redundancies and extra wording?
  - ☐ Is it "reader oriented," that is pleasant and easy to read?
  - ☐ Is it between 300 and 600 words?

Comments:

- **Reflection Content (8 pts.):**
  - ☐ Is there a clear explanation of how the artwork is drawn in the style of a particular artist?
  - ☐ Does that detail include description of objects, function and form, color and balance?
  - ☐ Are there specific examples given within the text?
  - ☐ Is there an explanation of the mathematics within the project?
  - ☐ Are at least three specific functions in the Desmos printout discussed including their form and function within the graph?
  - ☐ Are domain and range limits discussed?
  - ☐ Is there mention of conic sections and an explanation of their functional representation?
  - ☐ Is there a discussion of inequalities and how they are shown in the project?
  - ☐ Is there a recognition of permutations (translation) of the functions?
  - ☐ Is there discussion of the challenges and successes?
  - ☐ Are specific examples given?
  - ☐ Is there guidance given to the viewer that leads them to appreciate aspects of your work?

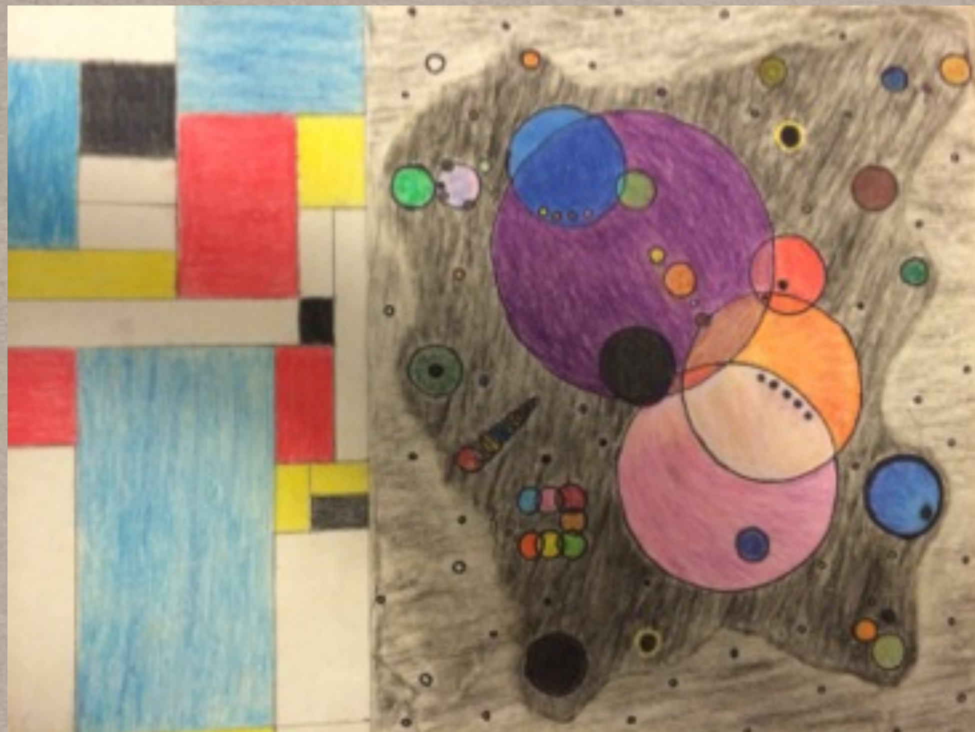
Comments:

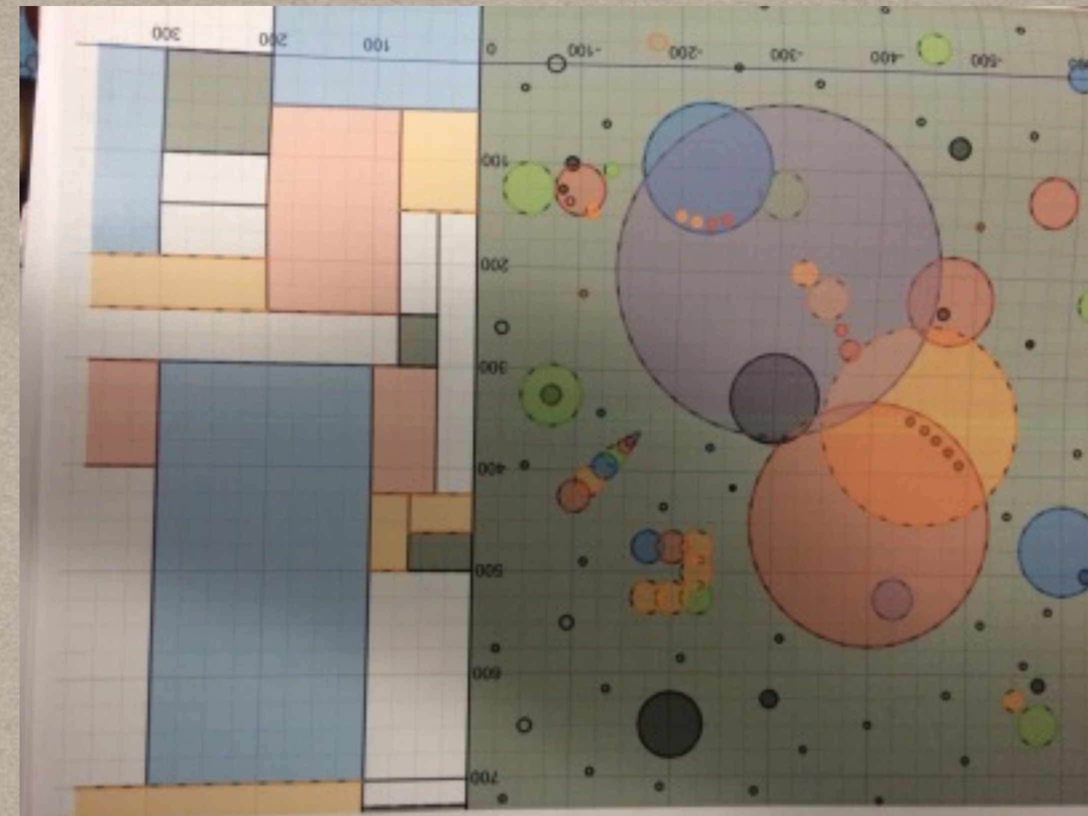




16. $y= -2.2x-98\{-56<x< -51.9\}$
17. $x= -1y-32\{-45<x< -42\}$
18. $x=5y-110\{-45<x< -41.5\}$
19. $y=9x+389\{-42.12<x< -41.7\}$
20. $x= -38.4\{-4.2<y<4.2\}$
21. $x= -1.9y-31\{-38.5<x< -32\}$
22. $x=1.2y-33\{-38.4<x< -32.1\}$
23. $y= -16.3\{-59.9<x< -51.9\}$
24. $y=2.2x+98\{-56<x< -51.9\}$
25. $y= -2.2x-148\{-59.89<x< -55.9\}$
26. $x= -71.3\{-4.2<y<4.2\}$
27. $y= -.5x-39.7\{-79<x< -71.3\}$
28. $y=.5x+40\{-79<x< -71.3\}$
29. $y=1x+31\{-13<y< -10\}$
30. $x=20\sin(.08y+5)-38\{-14<y<2\}$
31. $x=10\sin(.15y+5)-38\{2<y<6.5\}-10$
32. $x=10\sin(.3y+5)-38\{10<y<14\}-23$

1. $(x+55)^2+y^2=205$
2. $y=26\{90>x> -90\}$
3. $y= -26\{90>x> -90\}$
4. $x= -80\{30>y> -30\}$
5. $x=80\{30>y> -30\}$
6. $(x+28)^2+y^2\leq 7$
7. $(x+15)^2+y^2\leq 15$
8. $(x+2)^2+y^2\leq 10$
9. $(x-9)^2+y^2\leq 4$
10. $(x-25)^2+y^2\leq 32$
11. $(x-43)^2+y^2\leq 18$
12. $(x-58)^2+y^2\leq 12$
13. $(x-70)^2+y^2\leq 5$
14. $y=16.3\{-59.9<x< -51.9\}$
15. $y=2.2x+148\{-59.89<x< -55.9\}$





Kai Wilding,Mr Hines,10/4/13

I used Kandinsky style art work on the left side of my page and Mondrian style on the right. I use shape, color, background and foreground to truly resemble Kandinsky while remaining a personally created piece. Mondrian on the right was shown by using the basic primary colors and squares to represent my artistic vision and Mondrian's inspiration. Kandinsky, in both my art work and his, uses a black background and a ghosty barrier around the featured shapes. Mondrian, in both my art and his work, uses a lot of white space and unshaded squares to bring out the color and lessen the perspective of busyness on the audience even though if your not thinking about it, the white is unnoticeable.

I balanced out my two sides by using almost opposite artistic styles. The Mondrian is using squares and represents control and normality. Where as the Kandinsky side uses all circles and represents the absence of control, anarchy and the creativity of human nature. The colors, brightness, shapes, positions and sizes show the contrast and ultimately, the opposites sides and functions of a human brain.

To make the biggest circle in my desmos I used the function; $(x+300)^2+(y-200)^2=26420$
The x and y axis being x=-300 and y=200 and the radius of the circle being 26420. This is because in this type of function adding numbers to x moves the shape left of 0 and the subtraction of numbers from x moves the shape to the right of 0. The same thing with y but down and up.

To shade in the big blue square on the Mondrian side is used the function; $300<y<700\{100<x<300$
This is an example of a bounded inequality that has range. This shading creates a square with four sides because it has both an x and y values creating a domain and range. Also to create the biggest red circle I used a conic section of;

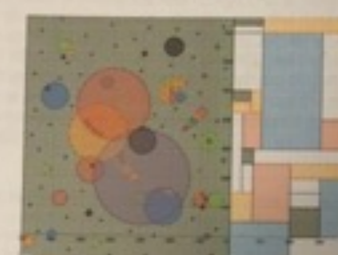
$(x+400)^2+(y-450)^2=1500$

I feel like I had a lot of successes and challenges both which I overcame and wasn't able to overcome while completing this project. I feel I had a lot of fun and success in drawing a similar art work to the inspiring pieces. I also feel it was a lot easier because I only used circle and line equations. It was very hard though to draw the circles on paper. My compass was messing up but I wanted to make it precise. So I just had to rough it out. Also that desmos only has a restricted amount of colors was annoying because I couldn't do a lot of art related techniques on the internet.

Although I had my fair share of ups and downs with this project, I loved this project.i had a great time creating, editing, and being inspired by art and math.

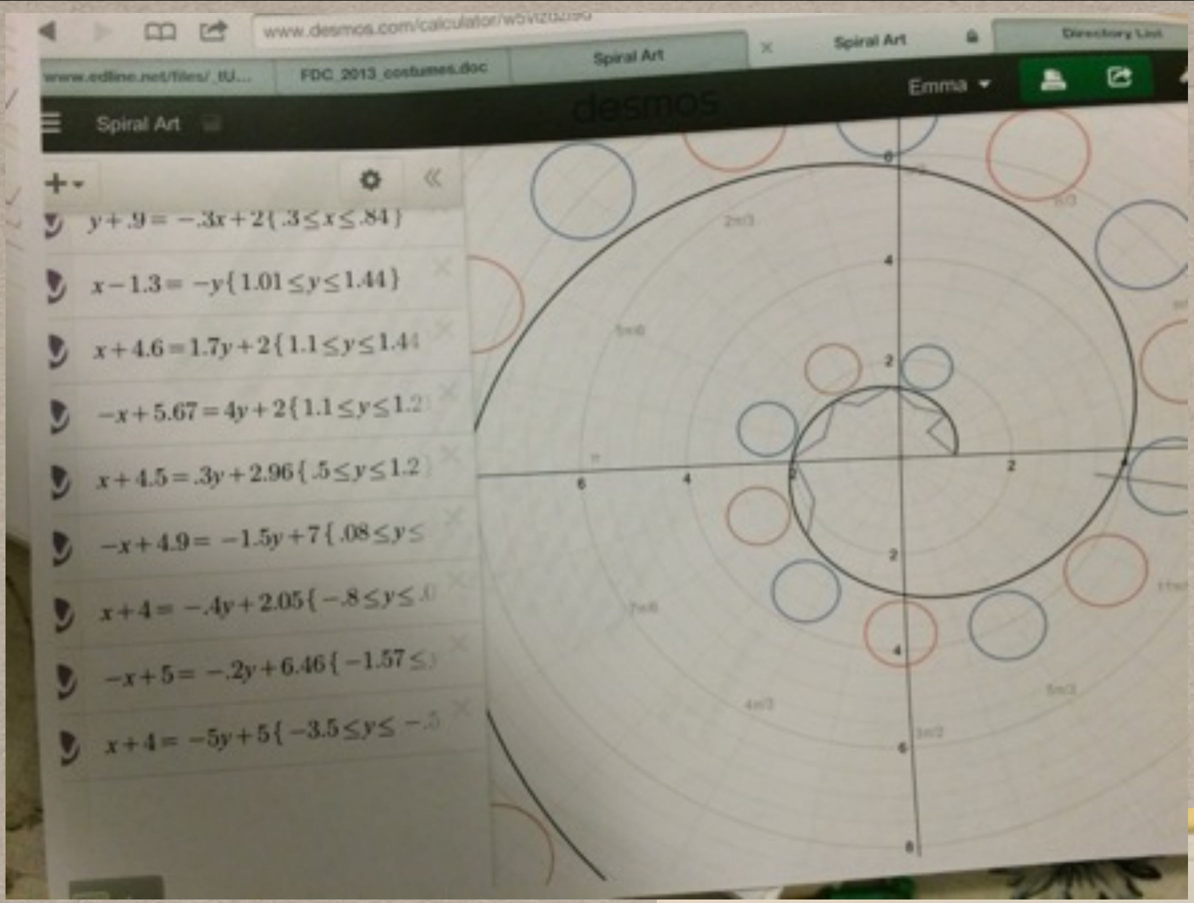
Kai Wilding,Mr Hines,10/4/13

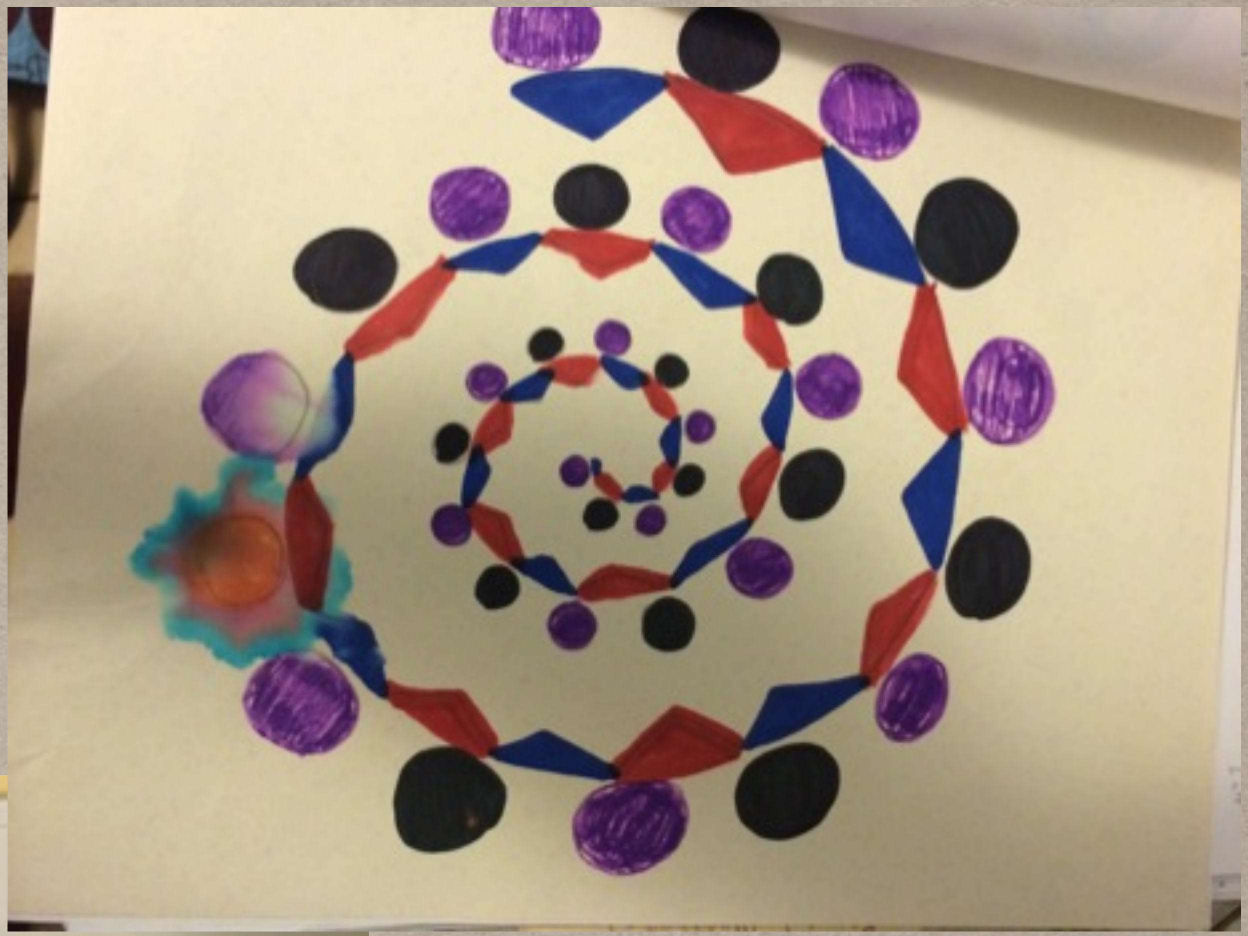
Desmos Reflection



While preparing for my Art and Math project I researched a series of artists and genres of art. Two that stood out were Mondrian and Kandinsky.;
Mondrian artworks are made up completely of rectangles. Longer, shorter, fatter, and skinnier rectangles. They all fit together like a puzzle and arrange themselves so that it is not repetitive but mix match. He also uses primary or basic colors to completely fill some boxes to add contrast.

Kandinsky is psychedelic. He uses all types of shapes and colors to create a mind bending experience. His art explodes off the canvas. He uses color, shape, size, and brightness all at once to truly surprise his audience. I love his artwork and it is truly a masterpiece. Kandinsky uses a lot more shapes, lines and structures to give some variety and action.





Art in Math Project

By: Emma Krening

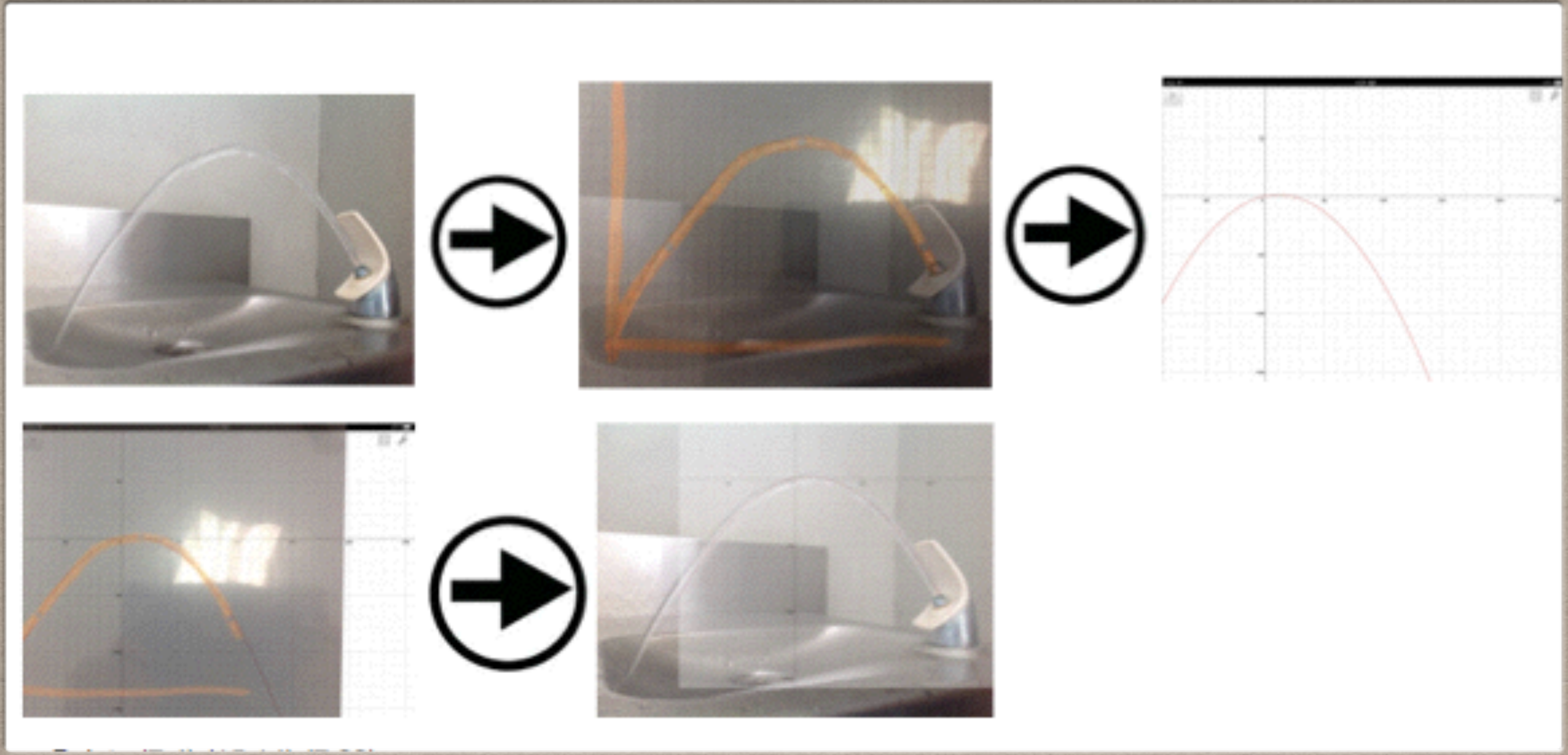
In my piece of art I am representing the art form of Kandinsky. I believe that my piece relates to Kandinsky because of the amount of different geometric shapes that are represented in my art piece. As well as the color choices that help to show different emotions, which is what Kandinsky did with his art pieces himself. In my piece of art I had decided to have three main shapes. These were circles, my spiral, and triangles made by the formation of two lines on the spiral. I added a unique feature to my piece which was as the spiral grew the size of the circles on the outside grew as well as the triangles adding a cool unique affect to it.

The three functions I needed to use were the circle function, line functions, as well as a spiral. The spiral made things very difficult for me in the whole process of adding everything onto the graph considering that the spiral changed the type of graph I had to use. In the case of the circle function permutations came to great use. A permutation is when you either change or add or subtract a number from an axis are of an equation in order to move the shape or line. The ability to move the circle left right up down so easily and knowing exactly what to do was great. This was the only area where conic sections had been used in my art piece. Then when I got to the lines portion domain and range with the use of inequalities were used a lot. This enabled me to control the length of the line I was creating so that I was able to make the types of triangles I had been constructing.

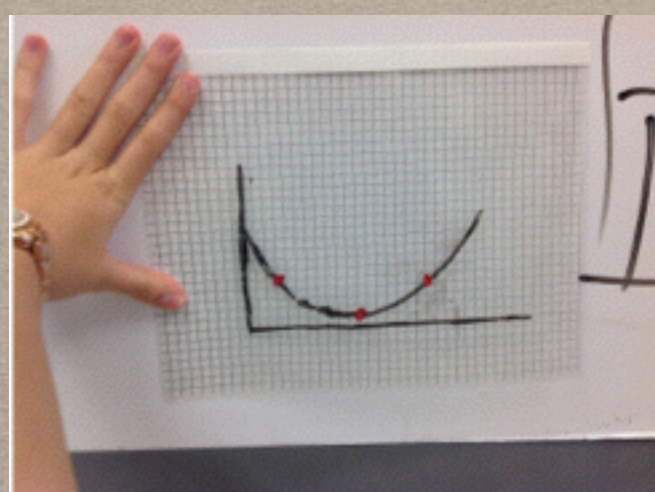
In my art piece I had one great success and one great challenge. The great success had been the circles. I had mastered the permutations and was able to make all the circles I needed with no problem what so ever. But then once I reached the lines I had the most difficult time ever. Changing the slope to get the perfect angle, getting the correct length of the line, and most of all placing it where I wanted it to be. These were all so difficult and were even harder because of the type of graph I had been working on which had been affected by the spiral I was using in my piece.

FORM AND FUNCTION IN THE REAL WORLD: QUADRATICS

- HSA-SSE.A.1 INTERPRET THE STRUCTURE OF EXPRESSIONS
- HSA-APR.B.3 UNDERSTAND THE RELATIONSHIP BETWEEN ZEROS AND FACTORS OF POLYNOMIALS
- HSA-CED.A.3 CREATE EQUATIONS THAT DESCRIBE NUMBERS OR RELATIONSHIPS
- HSF-BF.B.3 BUILD NEW FUNCTIONS FROM EXISTING FUNCTIONS



Above is my real life Porabola



Finding Form and Function in the real world

Your goal today is to find a shape in the real world outside the classroom that looks parabolic, and to develop the mathematical function that reprints it.

Step 1: Take your iPad and go outside with a partner and find some natural or man made object that takes the form of a parabola. Take a picture of that object (maybe take a couple just to make sure).

Step 2. Back in the class room, take your picture and align it so that it is either opening upward or downward. Zoom in so it fills the screen. Place a grid on top of the shape. Define where the origin is (do not put it on the vertex of your parabola).

Step 3: Find a least three points on the parabola from your grid - make sure the write these down.

Step 4: We know the standard form of a parabola is Y = Ax^2 + Bx + C. Since you have at least 3 pairs of X and Y values, you can plug these into the standard form to create an equation of A, B band C. For example if one of your points was (2, -3), it would be :

Y = Ax^2 + Bx + C

-3 = A(2)^2 + B(2) + C

-3 = 4A + 2B + C

Step 5: Now that you have 3 equations with 3 unknowns, you can use either substitution, elimination or matrix to solve the 3 equations to find the values of A, B and C. There is a way to use your graphing calculator to solve it through matrices - here is one explanation:

http://www.youtube.com/watch?v=FlLsxIWD6a8

here is another

http://www.missouriwestern.edu/cas/documents/MatricesonTI2013.pdf

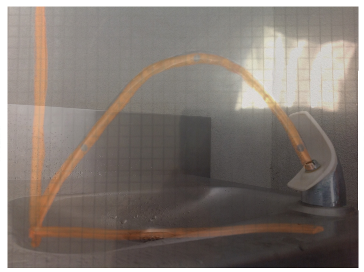
Step 6: Once you have solved for A, B and C write the function and graph it using Desmos. Does it look like the curve you saw in nature?

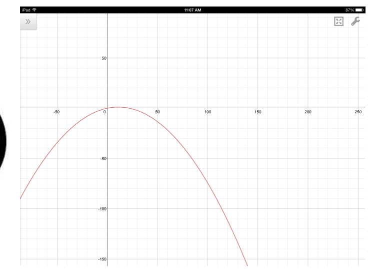
Step 7: Trace the curve from Desmos onto a transparency sheet. Overlay the curve onto your original picture - does it match?

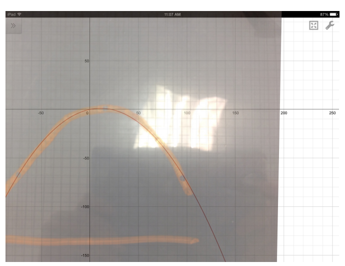
Step 8: Summarize! For your reflection, type up a summary that includes your original picture, your math work (points, description of you three equations, how you solved them), your overlay (capture this somehow), and a summary of how well your function fit your form. Pau.

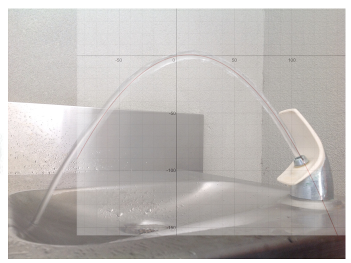
Step 9: BONUS! Every Quadratic Function can be written in standard form

Parabolas and Quadratics in Real Life
Water Fountain



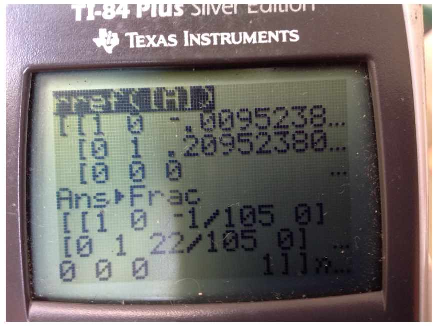


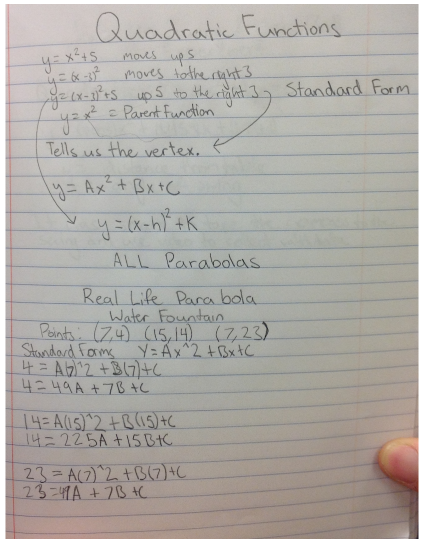


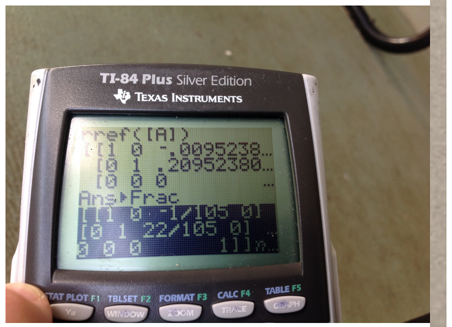


Points:(7,4) (15,14) (7,23)
Math function: y=1/105x^2+22/105x+0
Standard form: y=(x-11)^2+1.15

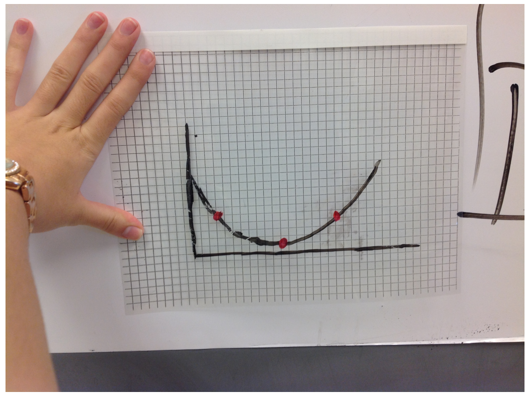
Our graph worked and matched up quiet well using desmos. The only thing I would mention would be that the opening size of the graph and the picture is a little different as it expands. I think this is just because both sides of the water fountains water are not identical but slightly differ which causes a slight difference in graph.



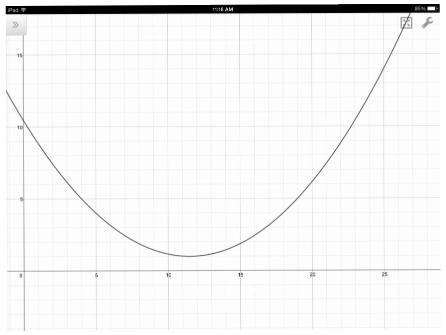




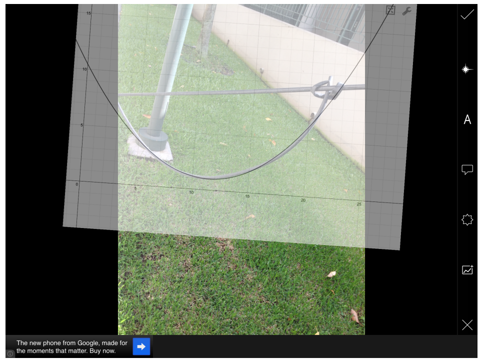
Above is my real life Porabola



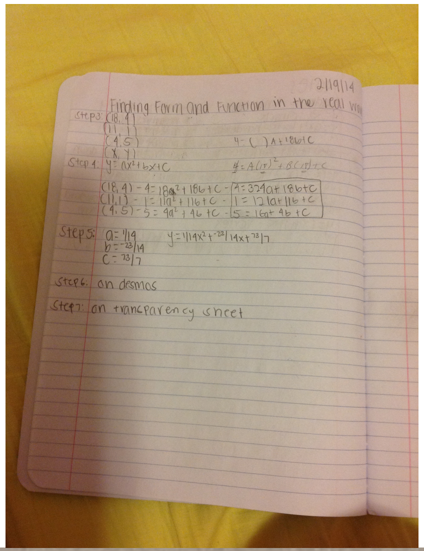
Above is the tracing of my real life Porabola, after I traced it I marked 3 points that intersected with another



Above is the finish product on Desmos when I figured what point A,B,C was. I graphed it using points



Above is the transparency of my original shape to my desmos graph after graphing the points



To the left is my steps of my work.

Summary: I think my function fit my form pretty well, even though I had to adjust it a little it was close.

SOME FINAL THOUGHTS

- Lots of good resources out there to get started (see Bibliography)
- Problems come from the real world - think like a mathematician! Or at least Dan Meyer (water fountain, draining pool)
- Celebrate Student work - make excellent work visible
- time time time!
- partner with/befriend a science teacher

BIBLIOGRAPHY & RESOURCES

- Bryan Meyer: Doing Mathematics http://www.doingmathematics.com
- Dan Meyer http://blog.mrmeyer.com
- Buck Institute for Education http://bie.org
- Envision Learning Project exchange: http://www.envisionprojects.org/cs/envision/print/docs/750
- High Tech High Math Resources: https://sites.google.com/a/hightechhigh.org/hth-math-common-core-standards/home
- ASU Modeling: http://modeling.asu.edu
- PERTS: http://www.perts.net/home/orientation/cp2.php
- Vernier http://www.vernier.com
- Makerspace: http://makerspace.com


MID-PACIFIC INSTITUTE

About Us | Academics | Admissions | Alumni | Arts | Athletics | Students | Parents | Giving to MPI

About MPX

MPX Program is an innovative, interdisciplinary program featuring a project-based curriculum as the primary focus of student work. This curriculum encourages students to synthesize their knowledge of Language Arts, Social Studies, Science, and Engineering through participation in collaborative "real world problem solving" setting. This school year we have projects addressing sustainability including auditing the energy use of each building on this campus that will be used to address the school's carbon footprint, and designing and constructing urban garden systems that will be used to grow produce for a cook-off competition.

On the right side of this page, you see a series of links to other activities we have done as well as links to blogs that give you a up-to-date view of the work our leaders and learners are doing - challenges and successes, their reflections about their work and the process involved in rolling up our sleeves and trying to do authentic problem-solving.

We hope you will take time to explore the activities our learners have been immersed in. If you have an interest in being involved with our program as a resource, or have questions, please contact mpx@midpac.edu

Imua! (onward!)

MID-PACIFIC INSTITUTE EXPLORATORY NEWS

NOV On Math, Modeling and Applied learning

Explore MPX

- MPX Home
- More about MPX
- MPX Frequently Asked Questions
- An Overview of MPX [.pdf]

MPX Teacher Blogs

- Heather Calabro's MPX 9 Humanities Blog
- Mark Hines' MPX 10 STEM blog
- Gregg Kaneko's MPX 9 STEM blog
- Laura Davis' MPX 10 Humanities blog

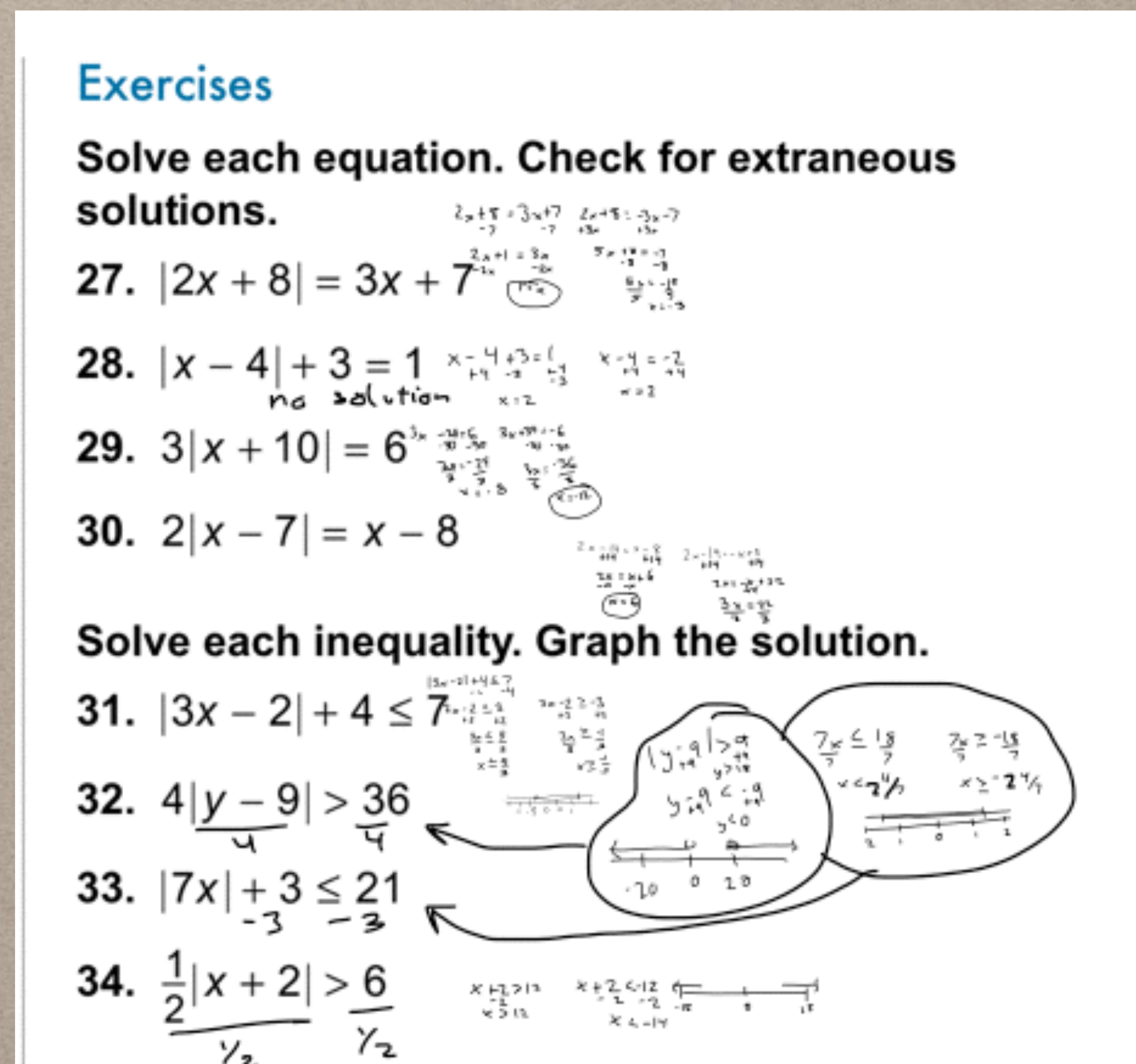
Videos/Documents

- MPX by MPX'ers
- Kolea Farms Field Trip
- Visual Mapping
- What is MPX? In student voice from their presentations of learning Fall 2011

HTTP://MHINES.EDUBLOGS.ORG
HTTP://WWW.MIDPAC.EDU/ACADEMICS/MPX/

THE SLIDES THAT FOLLOW WERE NOT PART OF THE PRESENTATION BUT INCLUDED AS ADDITIONAL RESOURCES FROM OTHER PROJECTS

Working with Notability



Exercises

Solve each equation. Check for extraneous solutions.

27. $|2x + 8| = 3x + 7$

28. $|x - 4| + 3 = 1$

no solution

29. $3|x + 10| = 6$

30. $2|x - 7| = x - 8$

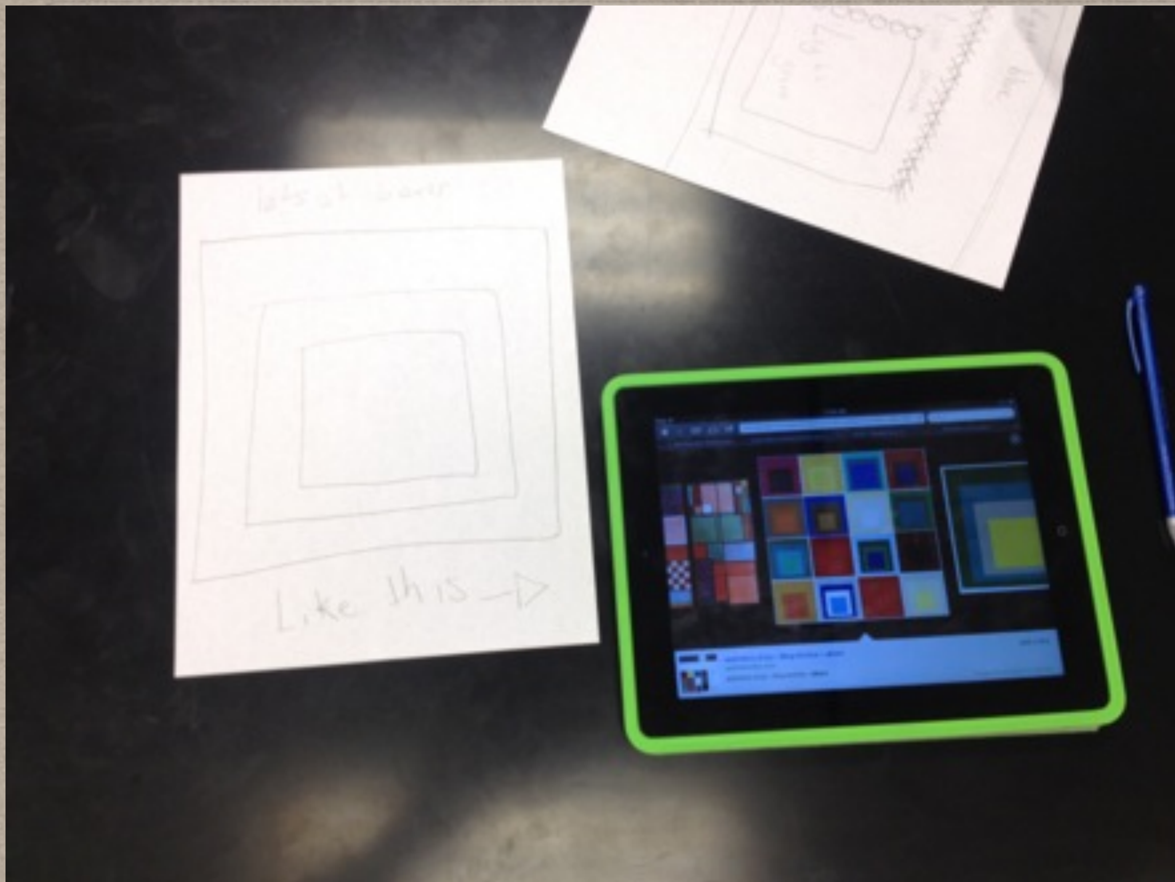
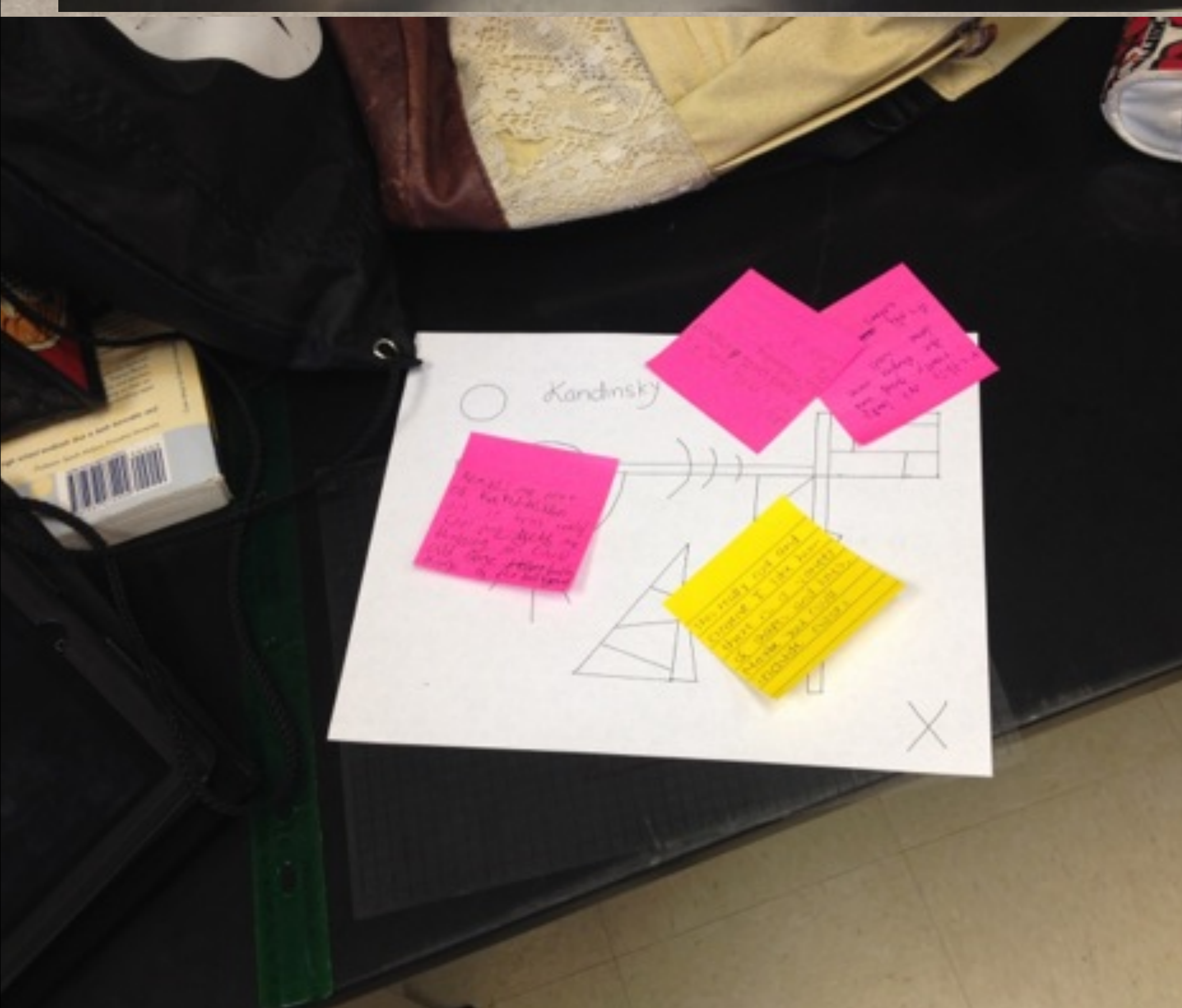
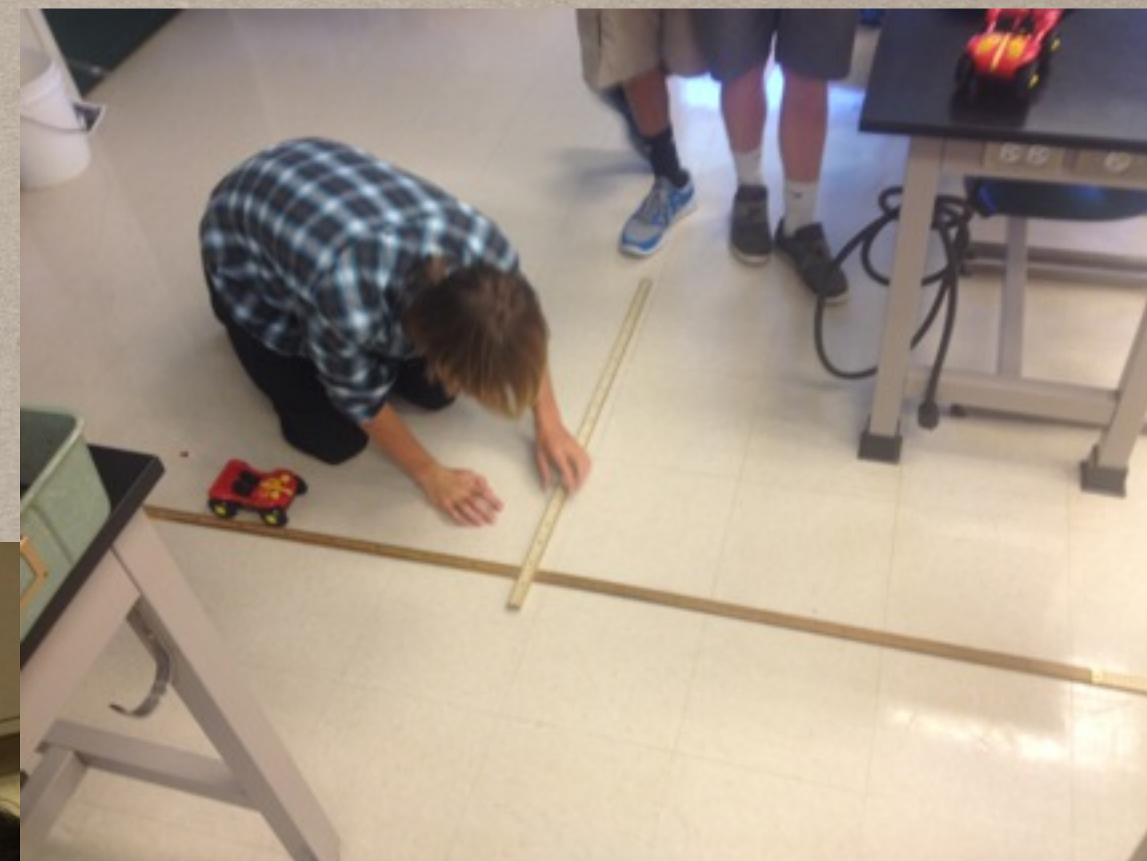
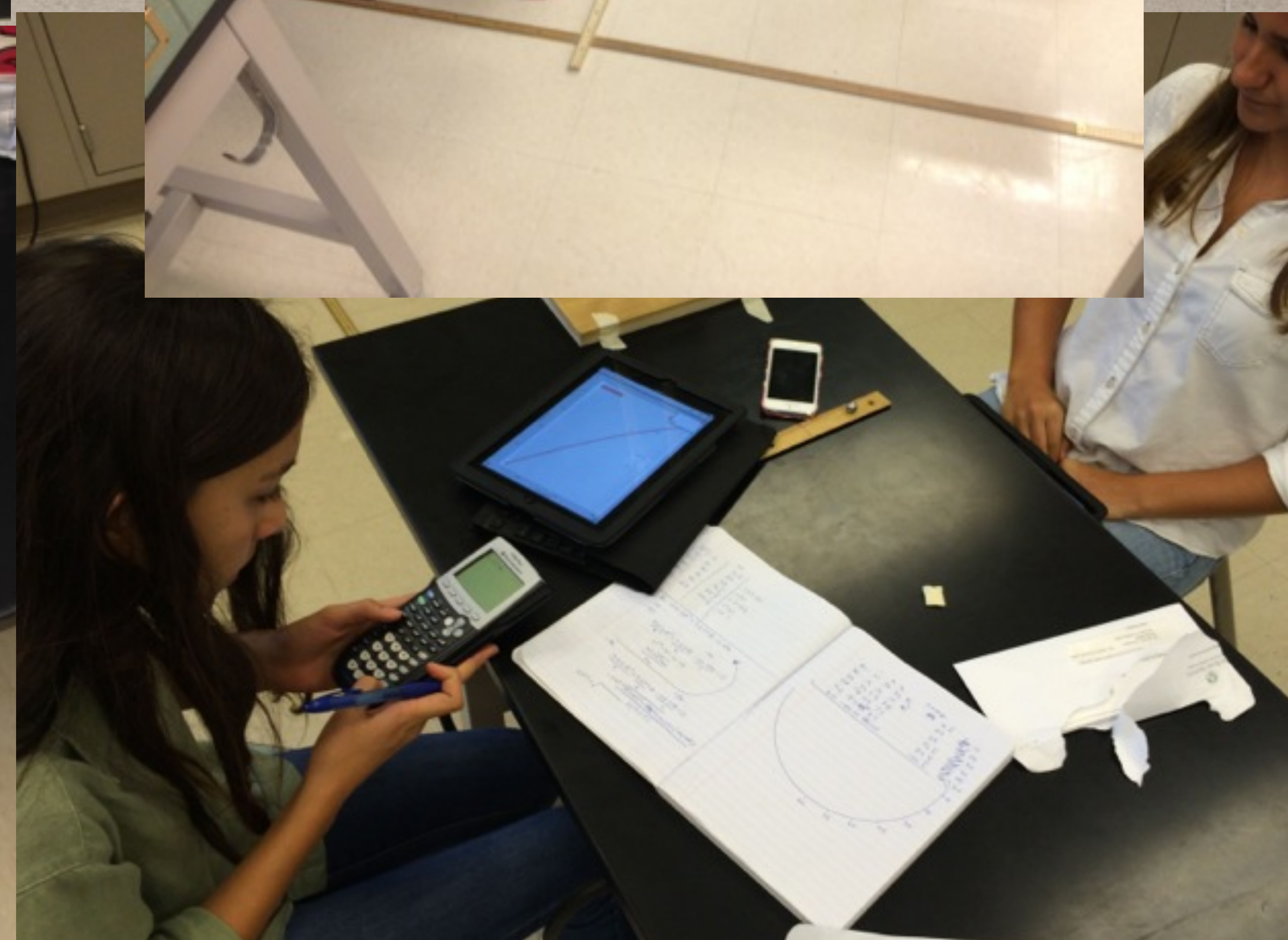
Solve each inequality. Graph the solution.

31. $|3x - 2| + 4 \leq 7$

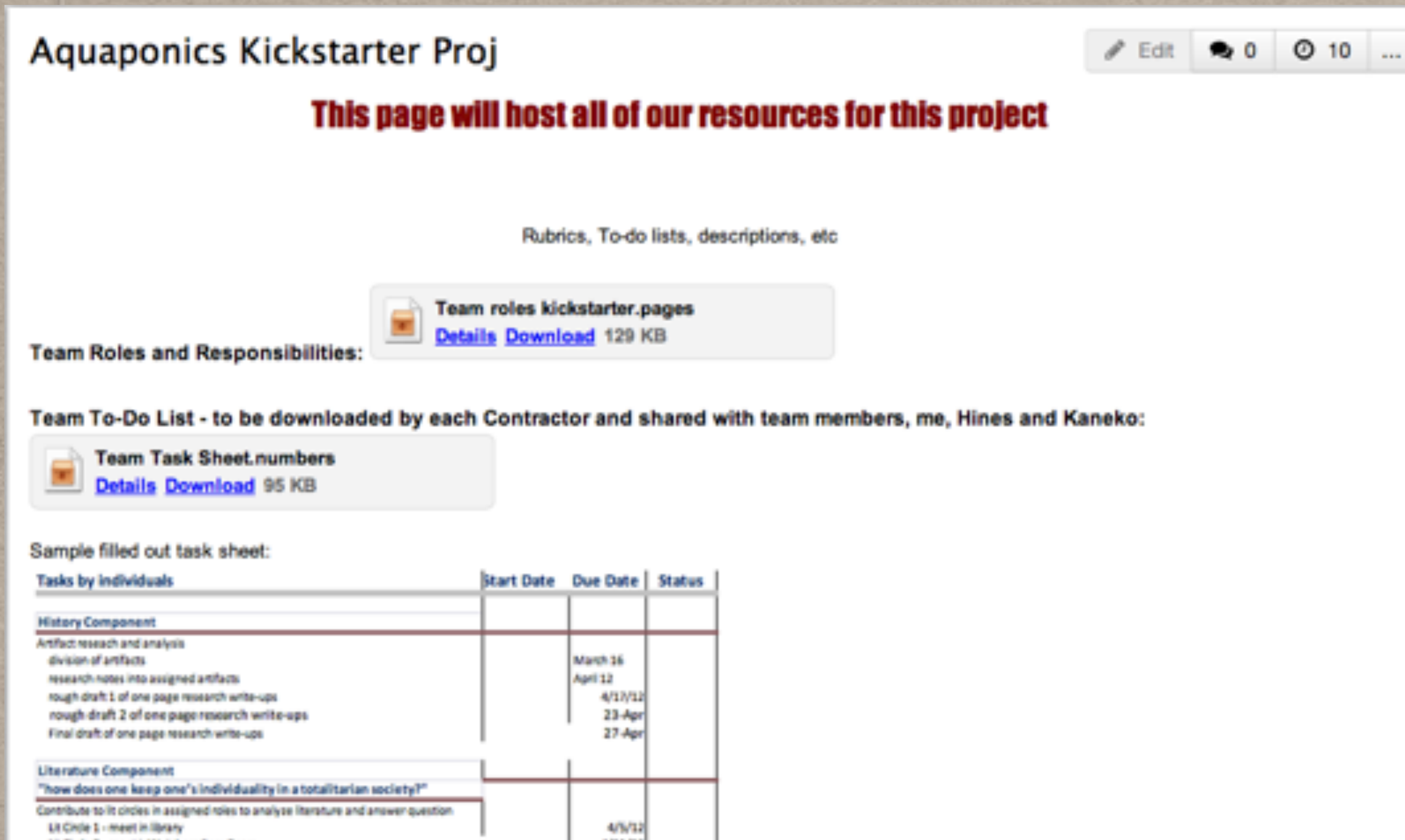
32. $4|y - 9| > 36$

33. $|7x| + 3 \leq 21$

34. $\frac{1}{2}|x + 2| > 6$


Like this

Kandinsky



EXAMPLE: AQUAPONICS PROJECT

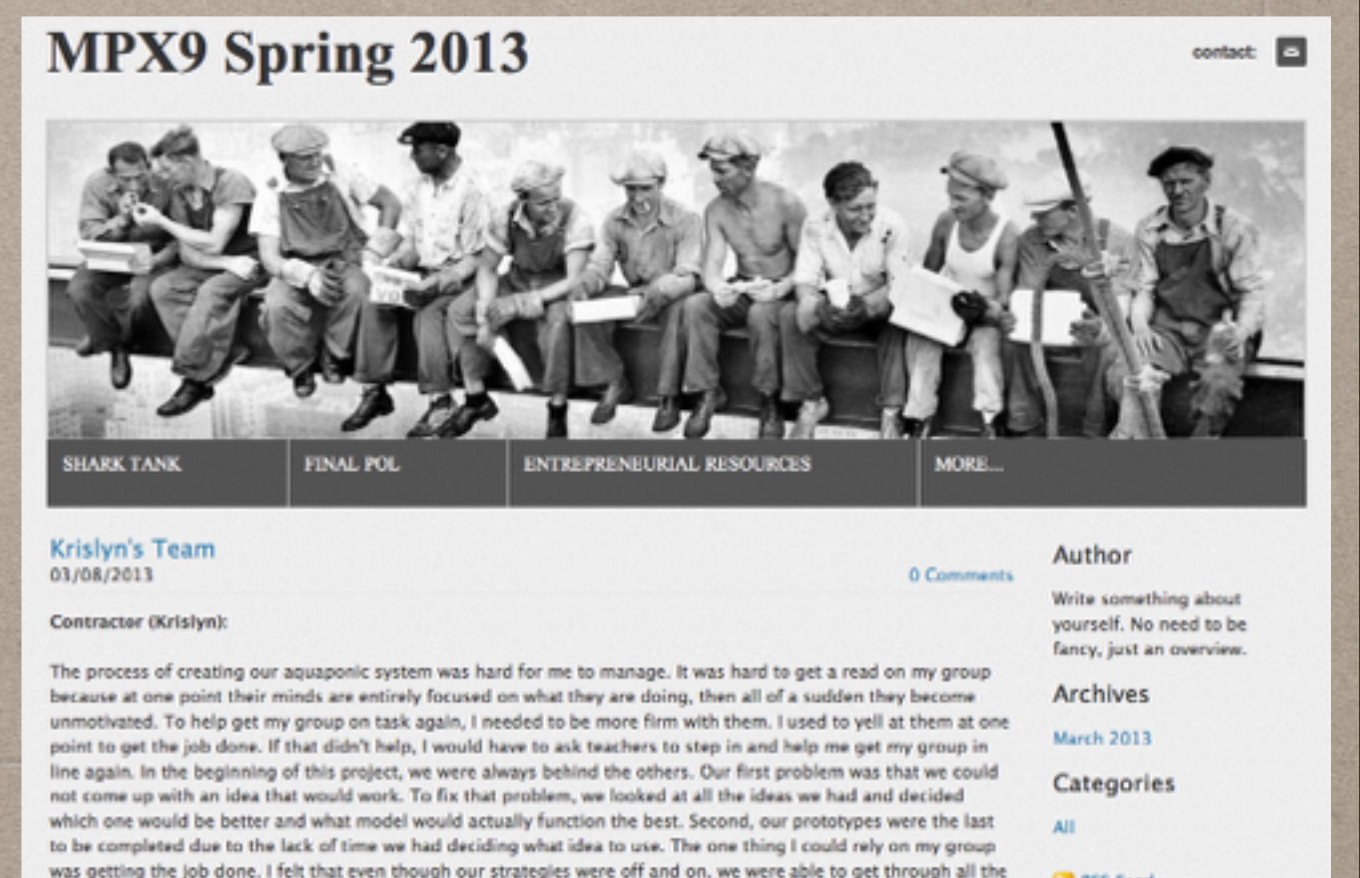


Students as:

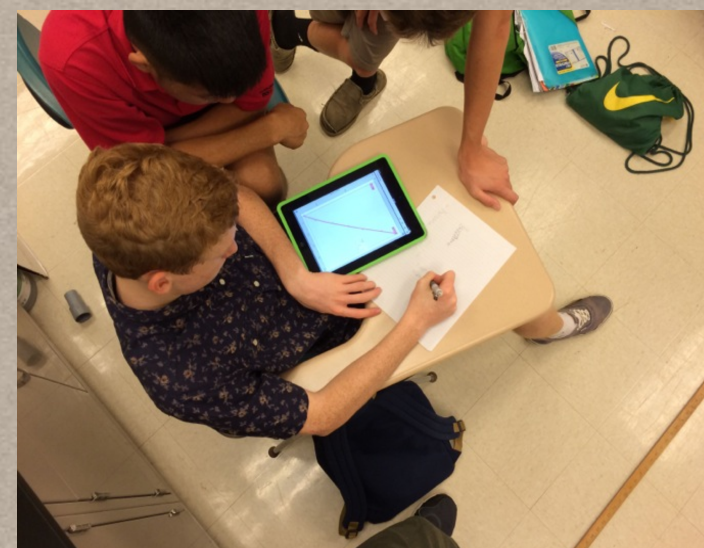
Designers, Builders, Salesman, Scientists, Reflective Writers, Social Media Advocates

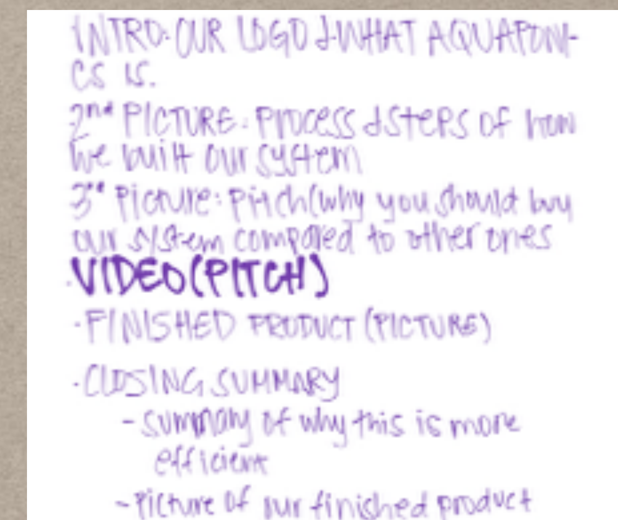
Scaffolded Design:

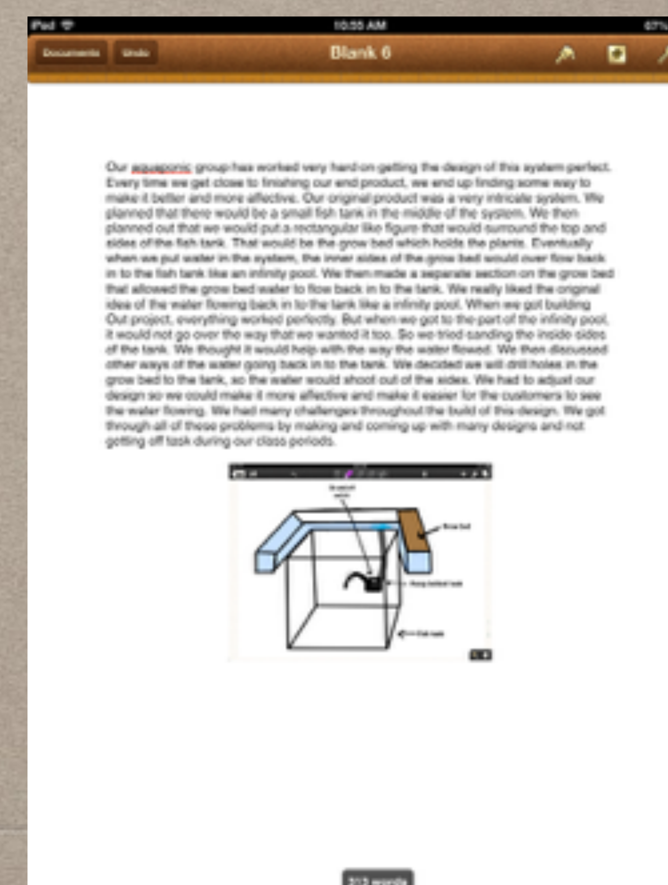
Essential Question, Clear timeline and deliverables, roles and responsibilities, voice and choice, use of technology

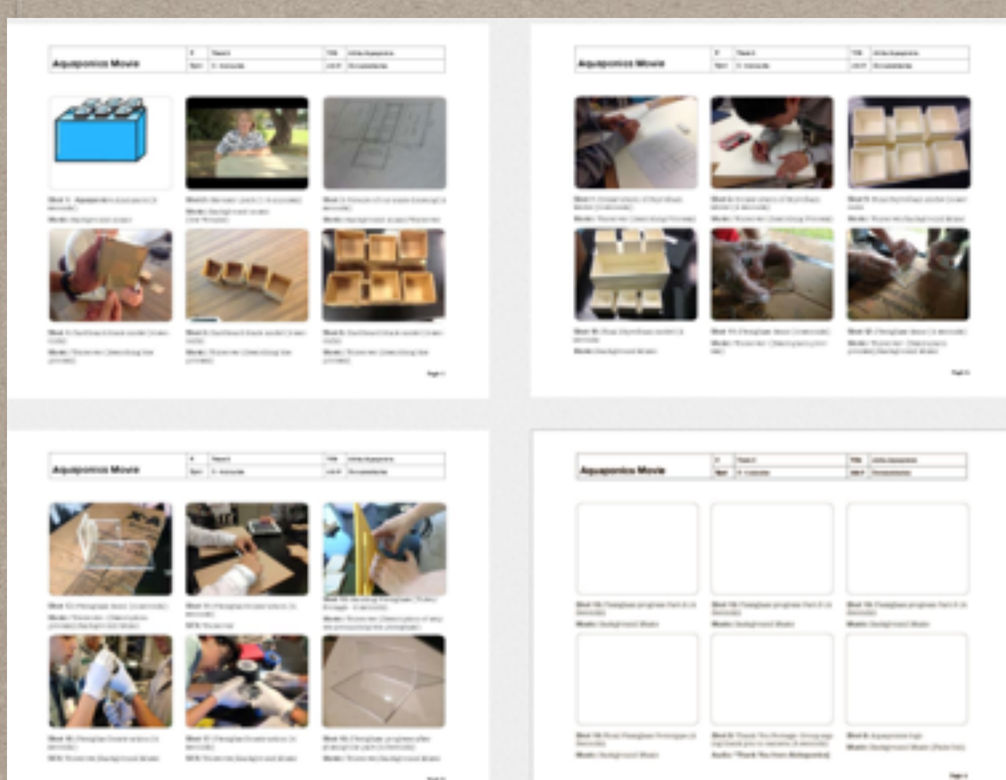


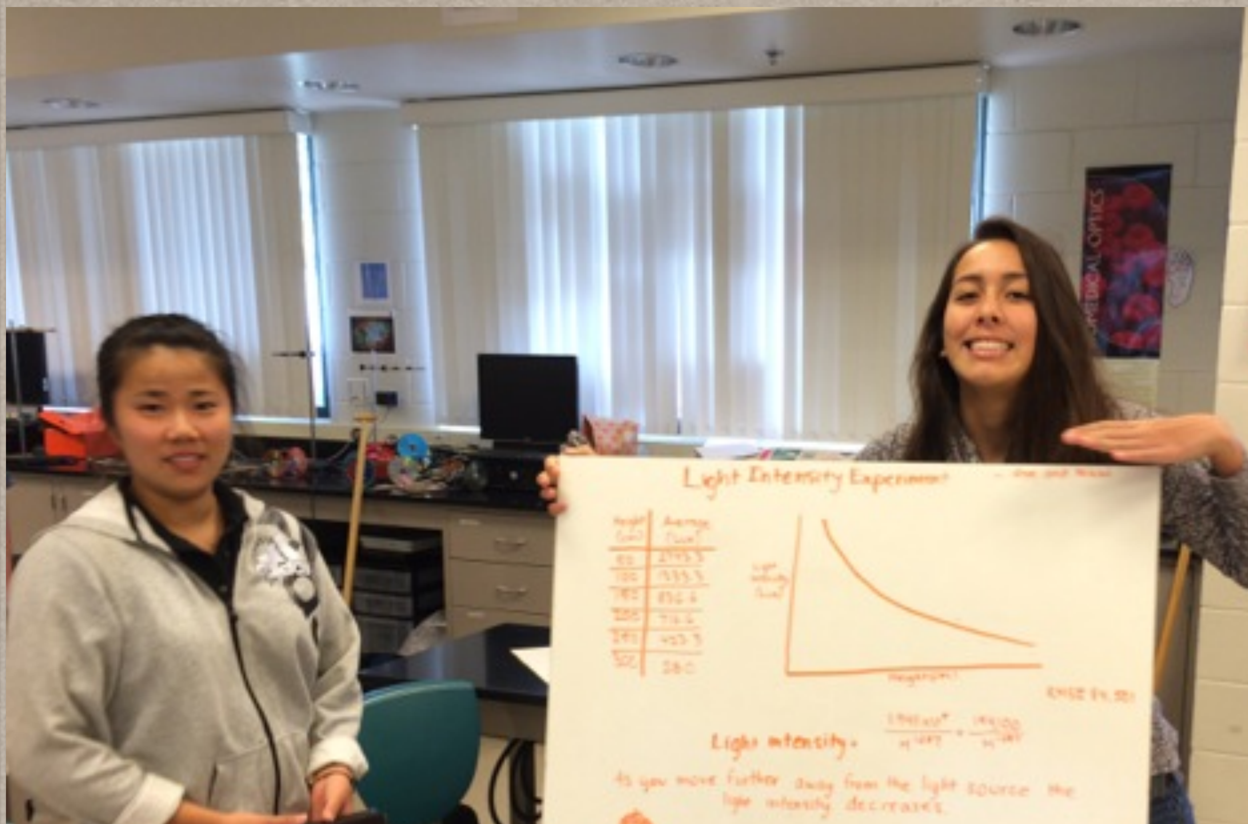
TECHNOLOGY IN THE SERVICE OF LEARNING

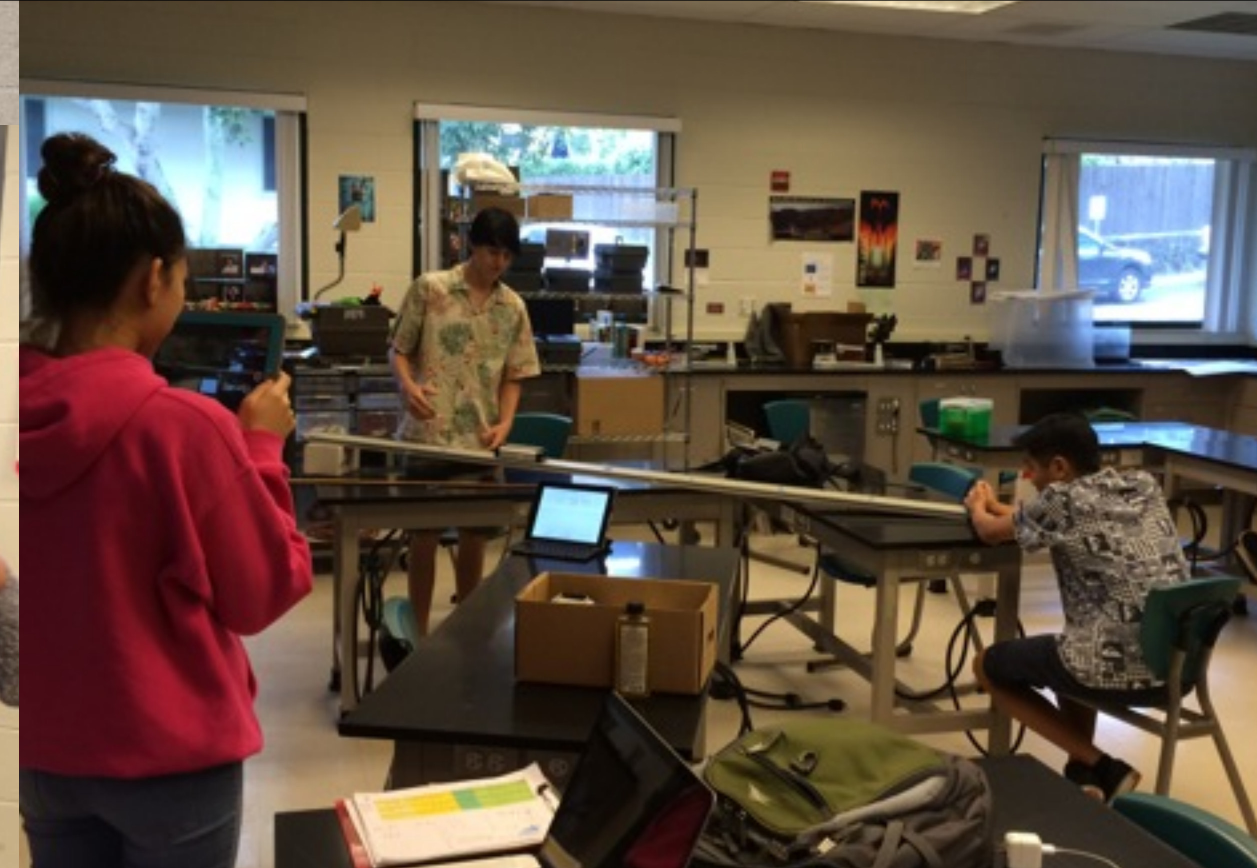


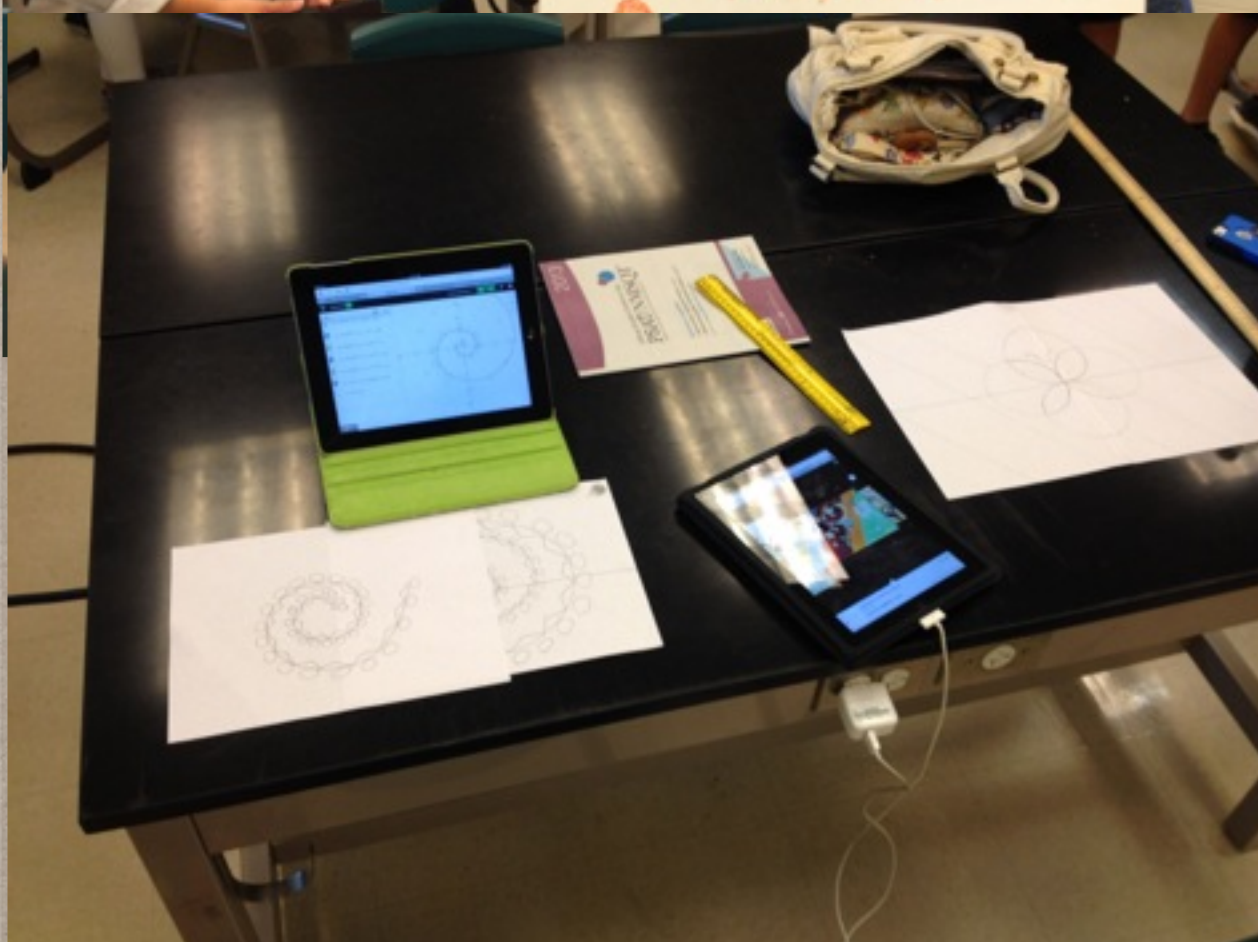







Light Intensity Experiment
Light intensity
As you move further away from the light source the light intensity decreases





The Water Fountain

Take a look at the pictures below. This is of one of the many water fountains you see on our campus. You can also see that it is plugged in, which means it is using a small air-conditioning unit to cool off water that you drink. How much electricity is it using to do this? And how much does it cost to run this over the course of a year?

The second photograph shows the information from the unit – notice that it uses 5 A at 115 V.

Calculation 1:

If this unit were running continuously, how much energy would use? How much would it cost to run it for one calendar year assuming it is plugged in continuously if electricity costs $.34 a kilowatt hour?
(You might remember that the power device uses is the product of voltage and current P = VI)

but wait – here's another way to view the problem:

Calculation 2:

A watt meter was plugged into the unit in the following data was gathered:

Length of time watt meter was plugged in: two hours and 47 minutes (2:47)

Kilowatt hours consumed during that time period: 0.14 kWHr

If this is the typical power use based on the data above, recalculate and figure out how much it would cost to run this device for a calendar year nonstop.

Reflect:

How do your two values in calculation 1 & 2 compare? Explain any discrepancies.