



About Me

Hello! My name is Mao Leonard.

I graduated from The University of Texas at Austin in Spring 2019 with a Bachelor's of Arts in Asian Cultures and Languages with a concentration in Japanese. My minor was mathematics. I am certified to teach 7-12 mathematics in Texas.

Starting August 2019, I will teach English at a middle school in the Tokushima prefecture in Japan through the Japan Exchange and Teaching Program (JET).

Photos

Explore my life as a Maker! Follow me on Instagram

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Maker Philosophy

The Beginning

In the beginning, I did not want to join UTeach Maker. I heard about what Makers already in the program were doing, such as creating a light-up cardboard sign and flying airships with helium balloons, and I did think that those activities were interesting. However, I did not think that I was qualified to be a Maker. I grew up knitting, crocheting, and beading, but I had no experience with woodworking or even using a power tool. Because I was too intimidated, I initially declined Shelly's invitation to join UTeach Maker. However, I applied because of her eagerness, and I joined UTeach Maker in December 2017.

Summer Reading Club

During the summer of 2018, I participated in a book club that Shelly started. I read an entry about making and responded to questions on an online discussion board. I had just joined UTeach Maker only 6 months prior to this, so I did not have my own definition of making yet.

I read chapter 2 from *Mindset: The New Psychology of Success* by Carol S. Dweck, which was about the differences between a fixed mindset and a growth mindset. People with fixed mindsets believe that you are born with traits that cannot be changed. For them, you have to be born smart to be smart. However, people with growth mindsets believe that you can get smarter. Reading this was an interesting experience because it felt like the author was writing about me. I could identify with all of the characteristics of having a fixed mindset. My goals were success and validation, and I would avoid challenging myself because I wanted to make sure I succeeded.

Success to me meant not making mistakes, and not making mistakes meant that I was smart. My responses to the

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1. Can you think of a time you faced a project or challenge with a fixed mindset?

"If things get too challenging - when they're not feeling smart or talented - they lose interest," is a quote that describes me well. Just like John McEnroe, I try to repair my self-esteem after a failure by assigning blame and making excuses. There have been times when I blamed the personality or attitude of the professor when I was not doing well in a class. I do this because I do not want to think that I am not smart enough to get good grades.

2. What were your thoughts and worries— about your abilities? —about other people's judgments? about the possibility of failure?

There are times when I am confident in my abilities and times when I doubt them, which I think is the same for everyone. I tend to compare myself to others and seek approval to feel smart. When there is a possibility of failure, I feel afraid. Sometimes this leads me to take the easier route instead of challenging myself. However, choosing to do difficult tasks and overcoming obstacles is more satisfying in the end.

Reading this chapter and responding to those two questions was a wake-up call. If I thought that success meant accomplishing tasks on the first attempt, then my students would be afraid to make mistakes. They would not raise their hands to try to answer a question if they thought they could be wrong. Me having a fixed mindset would surely negatively influence my students. My response to the third question of the reading discussion reflects this realization.

3. In what ways does this week's reading relate to your journey as a teacher, learner, and maker?

I think that I have a long way to go and a lot to learn as a future teacher. If I want my students to have a growth mindset, I need to have one also. Being in UTeach Maker has already started changing the way I think. Making is all about making mistakes, reflecting, and making adjustments, so I am learning to embrace failure.

Equity, Diversity, and Access

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school to work on their projects. Only 2 out of 19 students showed up. I thought that if I provided the equipment, my students would all have access to it, but I was wrong. When I later asked my students why they didn't come, some said they had work, and others said that they didn't have rides. By implementing a portion of my lesson

outside of normal school hours, I prevented a majority of my students from participating. In the future, I will make sure to have making happen during my class period.

Something that I have to keep in mind when introducing making is that my classroom is made up of diverse students. They each come from different backgrounds, so even if one student has experience woodworking, for example, I cannot assume that other students have the same experience. All students also work and learn at different paces. When I bring making into my classroom, my goal will be to create an environment where students do not feel intimidated. I will welcome students of all levels.

Making to Me

After being a Maker for 3 semesters, I am now able to provide my own definition of making.

*Making to me is to embrace a growth mindset
to create a personally meaningful product.*

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Maker Project

The following are all of the cool projects that I have worked on. Enjoy!

May 13, 2019

Featured Project: Music Rest

I have a Yamaha P-85 that I bought secondhand. It didn't come with a music rest, which means that I don't have a place to put my sheet...

Apr 19, 2019

"Get Well Soon" Card

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of my cohort to create a card...

Mar 14, 2019

Pi Day Banner

The Reagan ECHS math department and I wanted to celebrate Pi Day, so we thought of different ways to make that day enjoyable for both...

Mar 14, 2019

Pi Day Invitation Card

The Reagan ECHS math department and I wanted to celebrate Pi Day, so we thought of different ways to make that day enjoyable for both...

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Pi Day Shirts

The Reagan ECHS math department and I wanted to celebrate Pi Day, so we thought of different ways to make that day enjoyable for both...

Jan 3, 2019

Japanese Grammar Game

This game created on Scratch makes learning Japanese fun! I was asked by a Japanese professor at The University of Texas at Austin to...

Dec 14, 2018

Picture Frame

The spring 2019 semester was ending, which meant that my time as a peer mentor was also approaching

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Nov 2, 2018

My Hero Academia Pencil Stand

Purpose My dear friend Ruben's birthday was fast approaching. At the time, I was an intern at the makerspace at Magellan International...

May 3, 2018

Laser Engraved Cutting Board

As the spring 2018 semester approached the end, my fellow peer mentors and I wanted to show Shelly how much we appreciated her by...

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May 13, 2019



Featured Project: Music Rest

Updated: Jun 21, 2019

I have a Yamaha P-85 that I bought secondhand. It didn't come with a music rest, which means that I don't have a place to put my sheet music when I am playing.



I found a replacement music rest being sold online for \$29.99, but I didn't feel like spending that much. Then I thought, "Why don't I just make one?"

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My design was loosely based off of the original music rest. One big difference was how it was to be secured to my keyboard. My keyboard had two slots so that the music rest could be clipped inside them. The slots were slightly curved, and I could not figure out how to measure it. This is why I decided to create two small pieces that would fit into the slots instead of one big, curved piece.



Two curved slots where the music rest is to be secured

Clips

Prototype

I am not sure what to call each part of the clip, so I will the front part the "front support", the back part the "back support", and the part that clips into the slot the "leg".

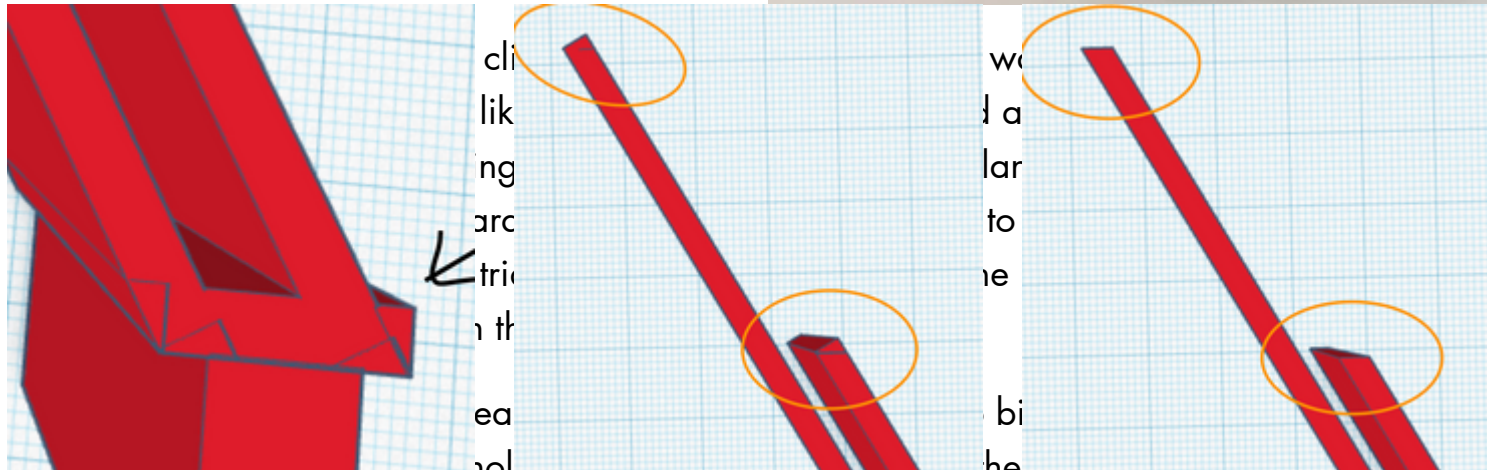
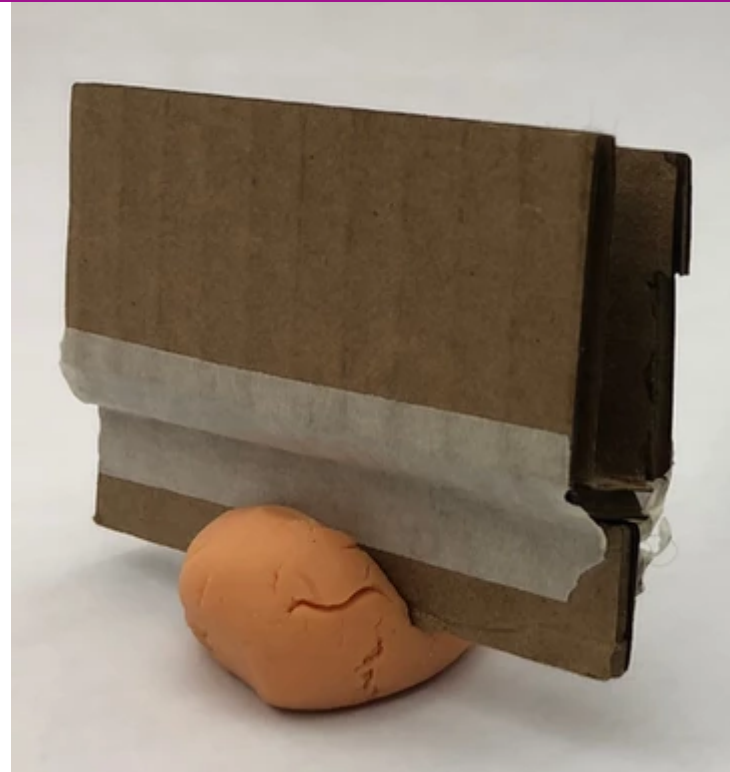
I knew that I wanted the clips to look like a football goal post when examined from the side. I created a prototype of the clips using cardboard. I realized that if I made the front and back

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both the wood and the sheet music.

Trial 1



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 sion. I also thought that the whole clip was too big. However, the slanted supports looked good.

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Trial 2

For the second trial, I made the width of the leg smaller and cut the size of the clip in half.

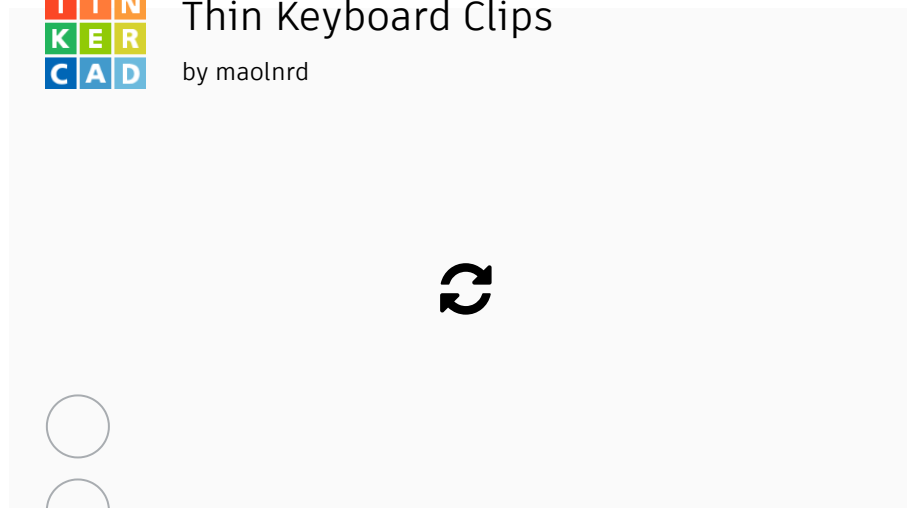


(/things/1nzrfqAAFyB)



Thin Keyboard Clips

by maolnrd



The width of the leg for this clip was still too wide, but it still worked!

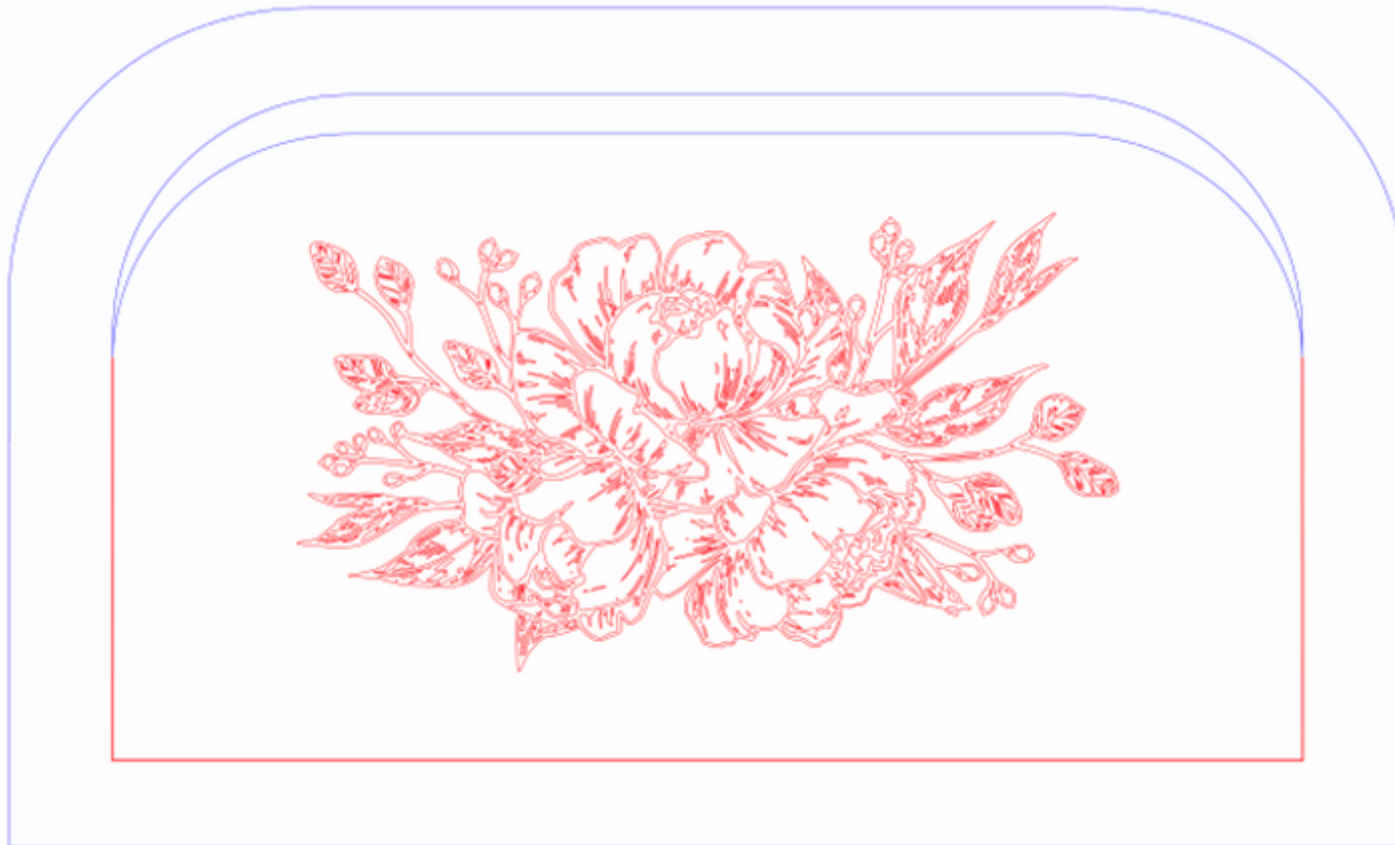
Wooden Music Rest

I created a design for the actual wood piece that would be put into the clips. It was going to be 12"x20". The

blue parts were to be cut, and the red parts were to be etched.

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I bought a 12"x24" piece of birch wood thinking it would be fine, but it turned out that the laser cutter that I was going to use could only cut materials up to 12"x20". I had to cut it with a table saw in order for it to work. I also had to adjust the width of the board because the machine's cutting size was actually less than 12"x20". I first cut out the shape of the board and the arc in the middle.

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After I confirmed that the size of the music rest was good enough, I went back to co.lab and etched the floral design. Because it was so detailed, it took an hour and one minute to complete the task.

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Although it was a long process, it was very rewarding. I love the way that it looks!

Reflection

When I look at how I worked on this project and compare it to how I created things before, I

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planning. However, I have accepted that making is a process, so I created a prototype to make my thoughts into something tangible. I am glad that I created a prototype for the clips because it showed me that my original idea was flawed. The back support would not have been able to hold the weight of the wooden music rest and sheet music. Jumping straight into 3D printing would have been a waste of time and resources.

Although I still do not have clips that work exactly the way I want it to work, I am not disappointed. I know that if I keep adjusting my design, I will eventually find one that perfectly fits the slots on my keyboard. I feel the same way about the wooden piece also. It doesn't look exactly like I wanted it to look, but the music rest does what it is supposed to do, so I am happy. I can confidently say that from the moment I started this project, I embraced a maker mindset.



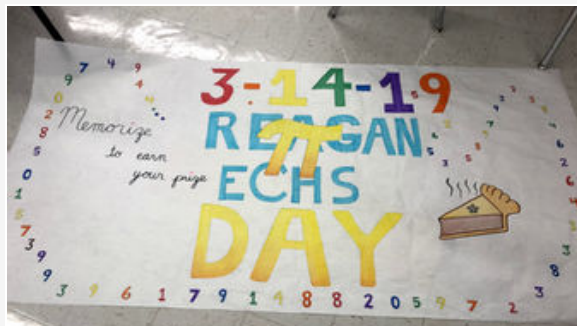
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"Get Well Soon" Card



Pi Day Banner



Pi Day Invitation Card

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Apr 19, 2019



"Get Well Soon" Card

Updated: Apr 29, 2019

My Maker mentor, Rich, got in an accident and broke his hip. When Shelly reached out to me and the rest of my cohort to create a card for him, I volunteered to make it.

I looked online for inspiration and found a design that I liked. I used Silhouette Studio to recreate the design and a Silhouette Cameo to cut it out using cardstock.

I wanted the words "get well soon Rich" to be attached to the white border so that I would not have to individually glue letters to the card. This was difficult to do because in addition to attaching the letters to the border, I also needed letters to be attached to each other so that it

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Completed "Get Well Soon" card

I achieved this by clicking on "Object" and then selecting "Convert to Path". Then I ungrouped the text so that I could separate the letters. This allowed me to individually weld letters together.

As the finishing touch, I cut out an adhesive bandage out of cardstock and glued it to the card.

The completed file can be found [here](#).



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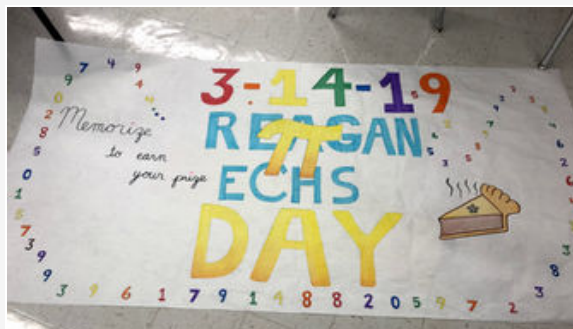
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Featured Project: Music Rest



Pi Day Banner



Pi Day Invitation Card

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Mar 14, 2019



Pi Day Banner

Updated: Apr 30, 2019

The Reagan ECHS math department and I wanted to celebrate Pi Day, so we thought of different ways to make that day enjoyable for both students and teachers. Here are the things that I created for Pi Day.

1. [Pi Day shirts for teachers](#)
2. [Pi Day contest invitation cards](#)
3. [Pi Day banner](#)

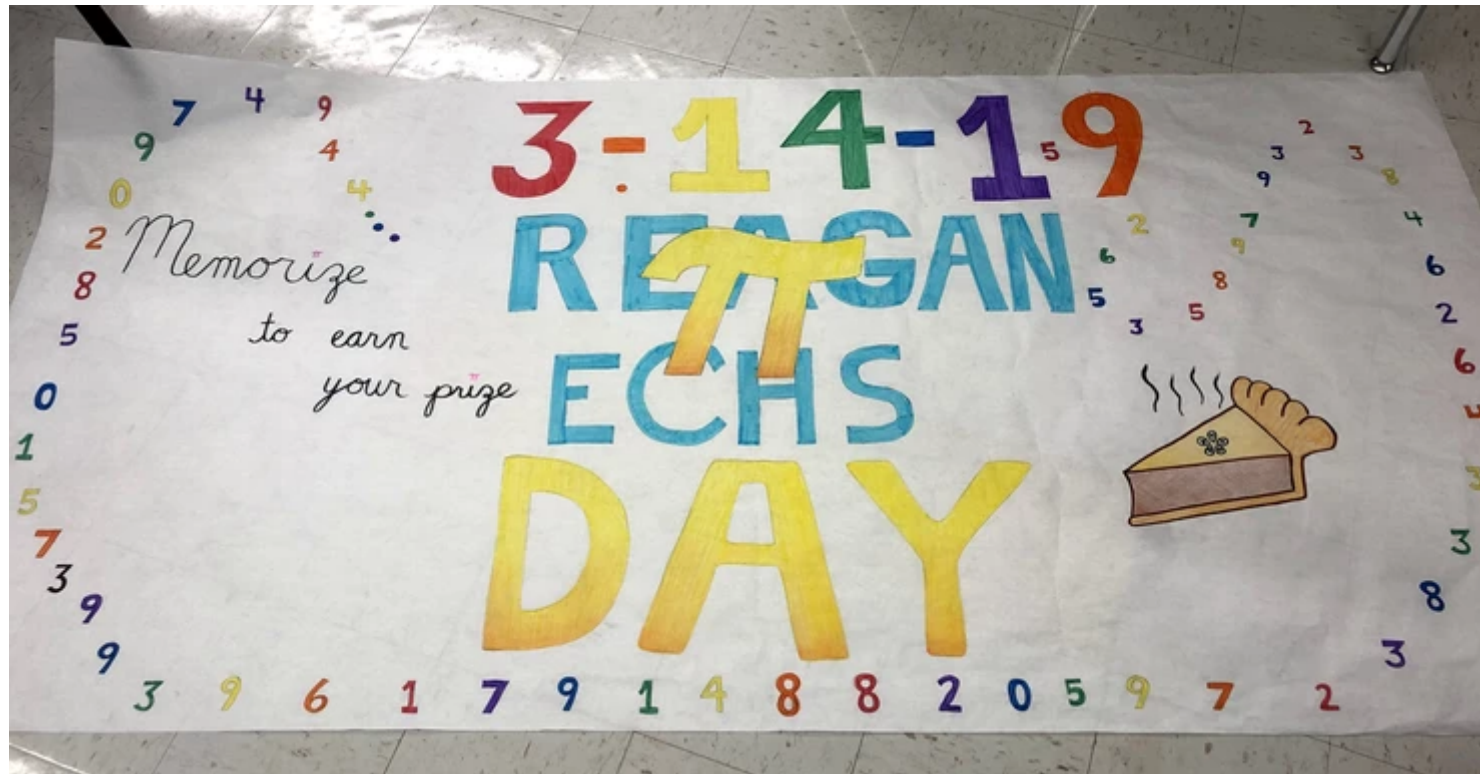
In this post, I will talk about how I helped create a banner to spread the word about the school-wide pi memorization contest.

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Pi Day Banner

In order to promote the school-wide pi memorization contest, another math teacher (a former UTeach student) and I teamed up to create a banner to hang on a wall. He sketched the design, and I colored it.



I think that this banner was a factor in the great turnout of the school-wide pi memorization contest!

To view the posts for the other Pi Day creations, please click on the links below.

1. [Pi Day shirts for teachers](#)

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3. [Pi Day banner](#)



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"Get Well Soon" Card



Pi Day Invitation Card

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Mar 14, 2019



Pi Day Invitation Card

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2. [Pi Day contest invitation cards](#)
3. [Pi Day banner](#)

In this post, I will talk about how I created a card to remind my students about the pi memorization contest.

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Pi Memorization Contest Card

Reagan ECHS planned to have a school-wide pi memorization contest. The math teachers at Reagan ECHS had all of their students write down as many digits of pi that they knew. The top three students from each math class were eligible to compete in the school-wide contest. The winner of the school-wide contest from each grade level won a pizza party for their math class.

I wanted my 9th grade Algebra I class to enjoy a pizza party, so I wanted to do everything I could to convince the three students eligible for the school-wide contest to actually participate in it. I decided to make invitation cards to remind them about the event.

All three students liked the anime *My Hero Academia*, which features All Might, the #1 hero. I thought that the three students would be more willing to participate in the pi memorization contest if I included a reference to the show. I created the cards using cardstock and a Silhouette Cameo.



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When I gave the cards to each student, they seemed excited since I included All Might in the design. In the end, two out of three students participated in the school-wide contest. One of the students memorized the most digits of pi out of the freshmen class, and he won our Algebra I class a pizza party!

Reflection

I need to adjust the settings of the Silhouette Cameo's blade if I want to create cards with small details. I accidentally ripped out pieces of the letters because they were not cut correctly.

To view the posts for the other Pi Day creations, please click on the links below.

1. [Pi Day shirts for teachers](#)
2. [Pi Day contest invitation cards](#)
3. [Pi Day banner](#)



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"Get Well Soon" Card



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Jan 3, 2019



Japanese Grammar Game

Updated: May 7, 2019

This game created on Scratch makes learning Japanese fun!

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I was asked by a Japanese professor at The University of Texas at Austin to create another game that students studying Japanese could use. This particular game allows users to practice two grammatical forms: the "sugiru" form, which indicates that a degree of an action or a state is excessive and the "tara" form, which is used for conditional expressions.

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To play this Japanese grammar game, [click here](#).



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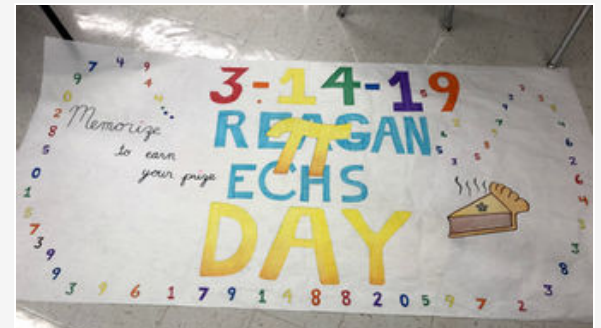
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Dec 14, 2018



Picture Frame

Updated: May 7, 2019

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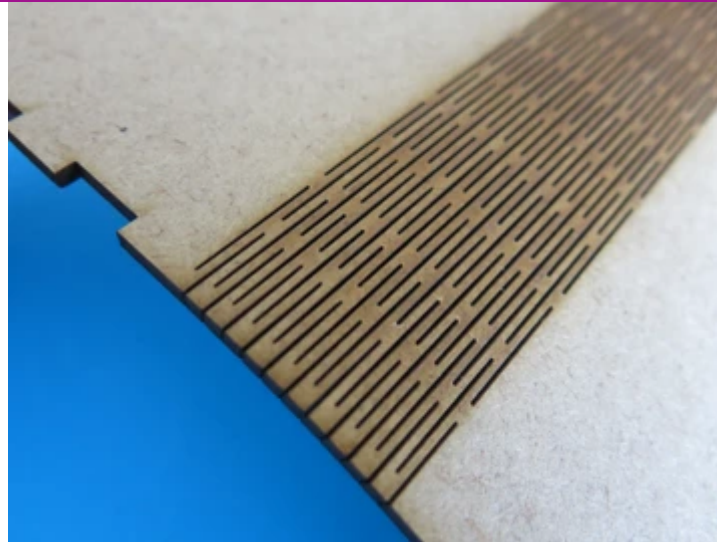
The spring 2019 semester was ending, which meant that my time as a peer mentor was also approaching its end. I wanted to make something for Shelly that showed her how much I appreciated her, so I decided to make her a picture frame with a picture of the peer mentors in it.

Design

I used the "perfect polaroid picture" template on Glowforge's website as a guide. The picture that I wanted to use was 4"x6", so I needed to adjust the size of the frame. Unfortunately, I could not simply stretch the width of the frame because of the living hinge on the back. However, I learned that you could actually [download an extension](#) that allows you to create

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Example of living hinge

In order to customize the picture frame even more, I decided to include the signatures of each of the peer mentors on the back of the frame. I had each person write their signature on a piece of paper, which I scanned and imported into Inkscape. I had never tried to etch anything that I drew or wrote, so this part was pretty exciting.

Cutting

I reached out to Lauren Siegel from MathHappens who generously allowed me to use her laser cutter. We had to make some adjustments before cutting the frame, but it turned out great!

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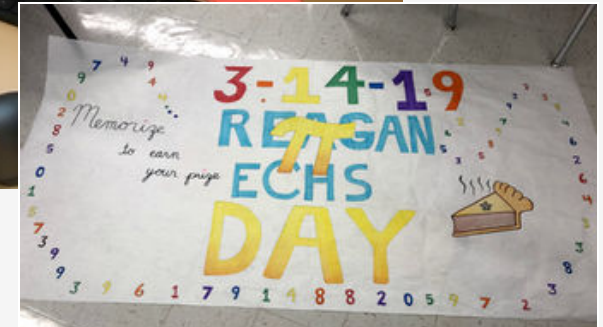
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"Get Well Soon" Card



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Nov 2, 2018



My Hero Academia Pencil Stand

Updated: May 1, 2019

Purpose

My dear friend Ruben's birthday was fast approaching. At the time, I was an intern at the makerspace at Magellan International School, which is managed by the lead UTeach Maker mentor, Patrick Benfield. Since I was surrounded by so many useful resources and technology, I decided to make a birthday present for him instead of buying one. I immediately knew that I had to create something related to *My Hero Academia*, which is an anime that he really likes.

Design

As I browsed the web, I came across a 3D printed [My Hero Academia logo](#) on Thingiverse,

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3D printed My Hero Academia logo on Thingiverse

angle, diameter, and height of the cylinders. If my angles were off, the slant of the pencils would not match the slant of the design. If the diameter and height of the cylindrical holes were off, the pencils would fall out of the pencil stand.

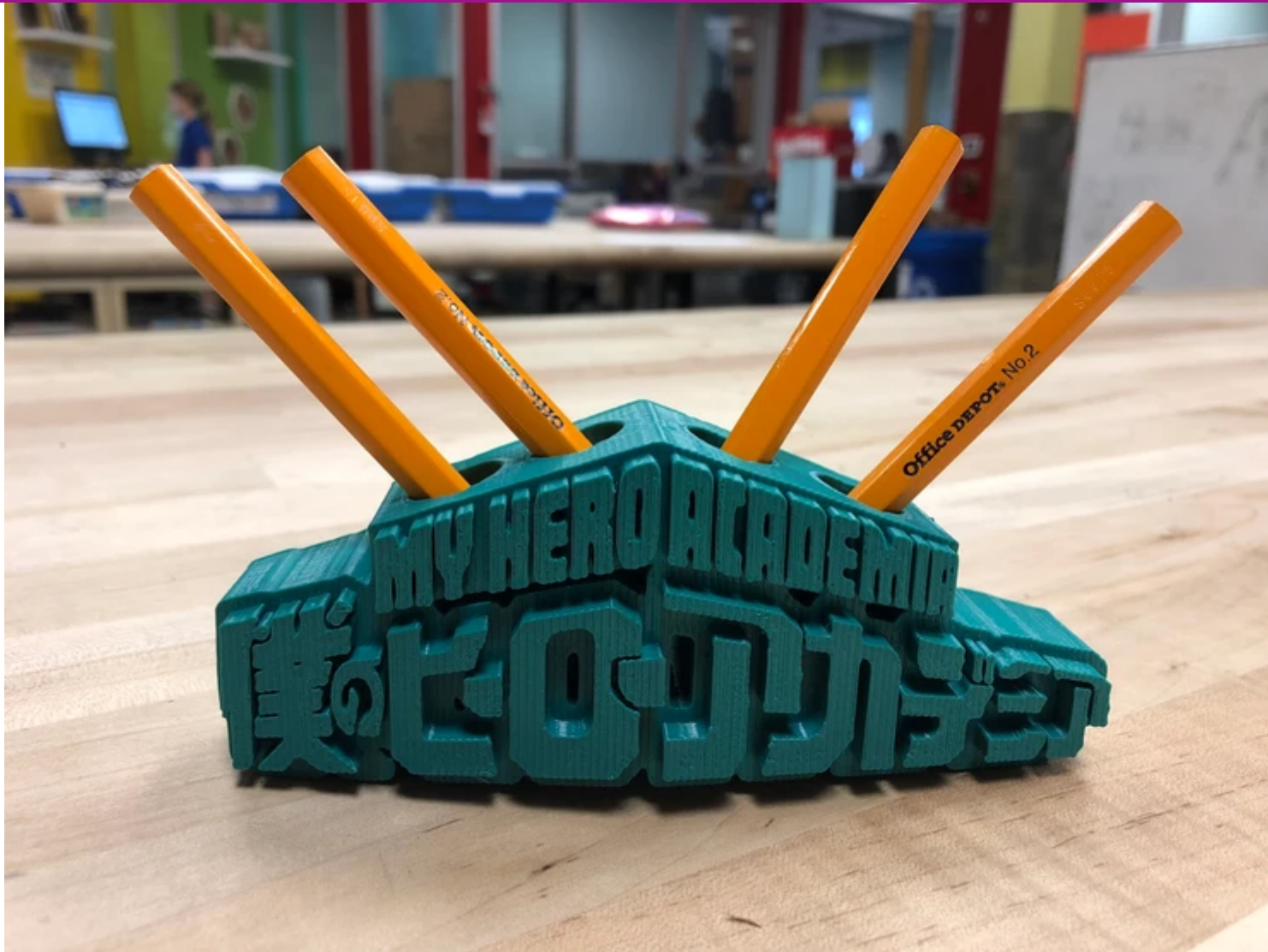
The final design can be seen below.

paper weight *and* a pencil stand.

I downloaded the file from Thingiverse and imported it into Tinkercad, which is an easy-to-use 3D CAD design tool. The change that I wanted to make was to create four cylindrical holes at the top of the design big enough to fit pencils. This was not an easy task because the top of the design was slanted like a roof of a house. Because of this, I had to keep in mind the

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Completed My Hero Academia pencil stand

Reflection

The middle two cylindrical holes intersect in the middle of the pencil stand. Because of this, if

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"Get Well Soon" Card



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May 3, 2018



Laser Engraved Cutting Board

Updated: May 1, 2019

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As the spring 2018 semester approached the end, my fellow peer mentors and I wanted to show Shelly how much we appreciated her by creating a personalized cutting board. I had learned how to use the laser cutter only two months prior to this project, but I volunteered to create the design.

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I wanted to create a simple design and decided to include her first initial and a wreath. It was hard to choose between the two designs above, but I chose the second one since it included flowers, which I loved. I imported the design into Inkscape, a free vector graphics software, and put the letter S inside of the wreath.

Then, I sent the file to the laser cutter to start etching the design onto the [bamboo cutting board](#). After the first attempt, I realized that it was hard to see the design because there was no outline. I adjusted the settings to make the laser cutter trace just the outline, and it made it easier to see the design. The video below shows the second attempt.

My fellow peer mentors and I presented her with this gift, and she loved it!

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I should have etched the design on the back of the cutting board instead of the front. Shelly can't use the front side because food might get stuck inside the crevices. Also, I should have checked to see if the bamboo cutting board was treated with any chemicals. It turned out that it was only polished with food grade mineral oil, so no harmful fumes emitted. However, it could have been very dangerous. Next time, I will be more careful by researching exactly what kind of material I am cutting or etching with the laser cutter.

Resources

If you would like to use my design, please feel free to do so! I created files for both wreaths. Please note that these files do not include the letter S.

[Wreath 1](#)

[Wreath 2](#)



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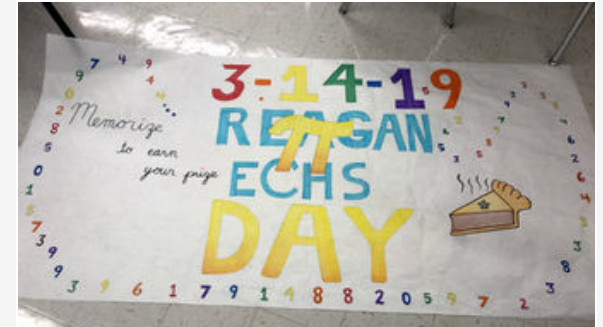
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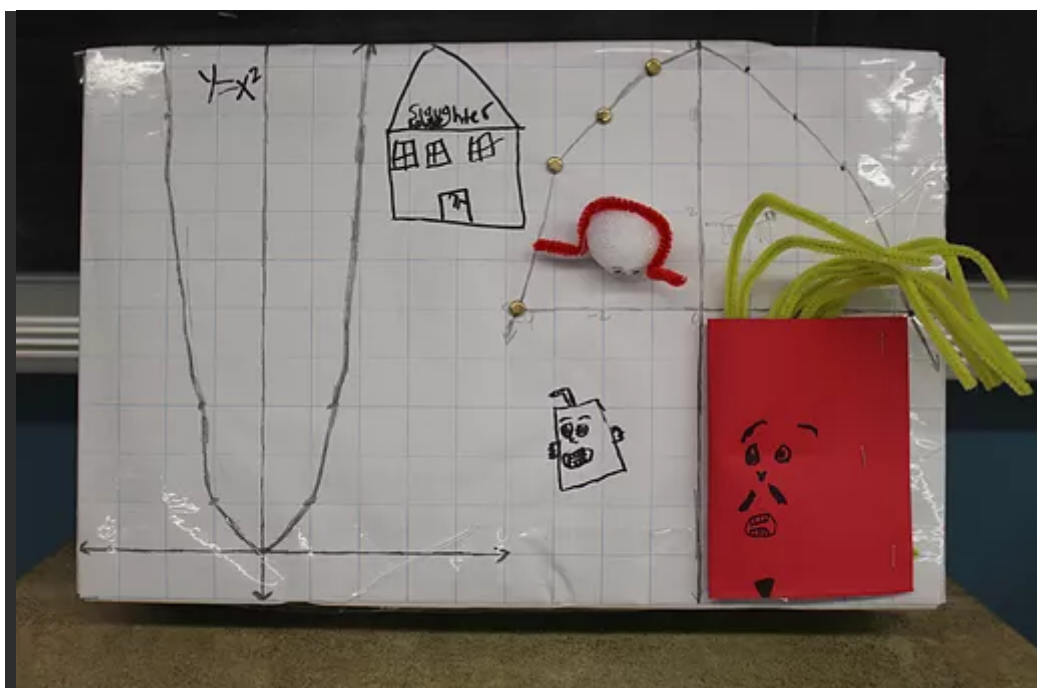
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Storytelling with Quadratic Transformations



Students' projects

Overview

I implemented a week-long maker lesson at Reagan ECHS about storytelling with quadratic transformations. This helped my students review quadratics before the STAAR test. Each student created a product that represented a transformation that occurred in the life of their favorite fictional character or their own life. They presented their products to their classmates and 12 invited guests, including apprentice teachers, my university facilitator, the director of MathHappens, and a former UTeach professor.

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TEKS

The Algebra I TEKS I addressed in this lesson were 6 A, B and 7 A, C. All of these TEKS were about quadratics.

Idea for Lesson

My original plan was to do a maker lesson that involved planting flowers in the shape of a parabola. However, I looked for other ideas after deciding that it was too time consuming.

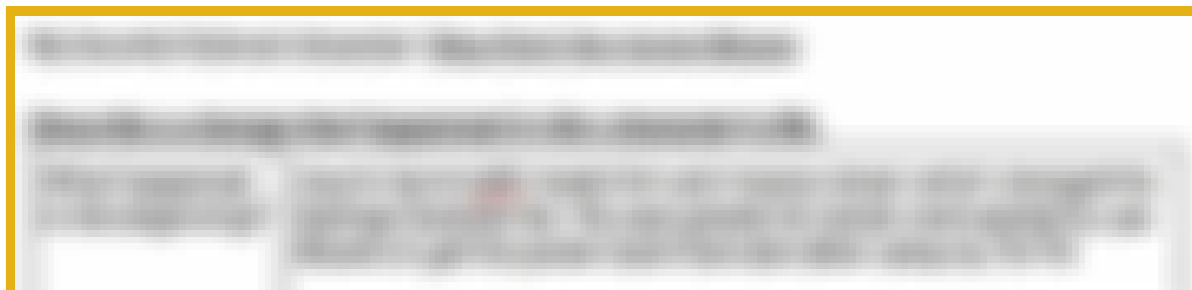
I was nervous because I had two months left before my showcase presentation, so I reached out for help. I brainstormed lesson ideas with Shelly, Stefanie, Kyla who is also a Maker, and my friend Marcus after the drone weekend workshop. Making art with quadratics and storytelling came up in the conversation, so I decided to combine the two ideas.

Lesson Implementation

Engage

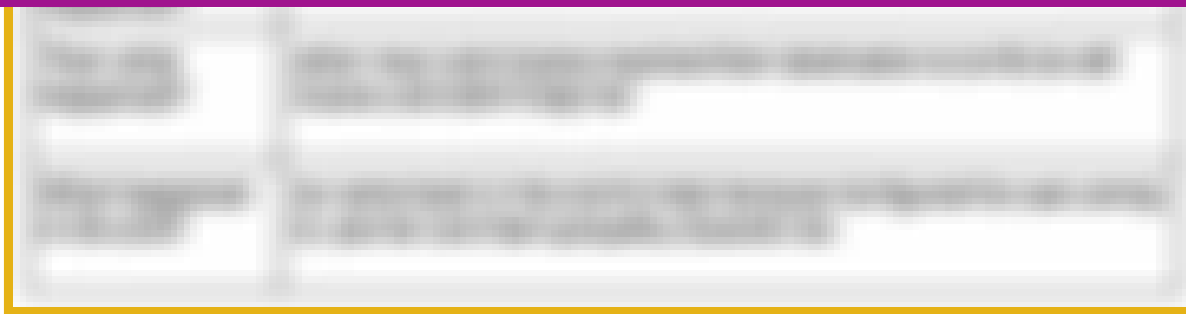
Before I introduced the storytelling project to my students, I asked them what they thought of when they heard the word "transformation". Many recalled that transformations applied to quadratics. Others mentioned where they heard that word outside of math class, such as the movie *Transformers* where cars change into robots.

My students then thought of their favorite fictional characters and described a change that happened in their characters' lives. Their descriptions included four events that led to the change. One student chose to describe the life of Maui, a character from the movie *Moana*.



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Student work describing a change that occurred in her favorite character's life

Because I began the lesson by talking about storytelling and not math, students remained curious about what they were going to do next.

Project Launch

I used the previous exercise to show how the word “transformation” applies not just in math, but also in life. The purpose of education is to change for the better, and this can be done by learning new information, new technology, new ways to express yourself, and new ways of solving problems. I then introduced the project as an activity that will help us change for the better.

The project was to create a product to help tell the story of a change that happened in someone's life. I gave students the option to either use the story they just wrote about their favorite characters or to describe a change that happened in their own lives. At first, I wanted all of the students to talk about their own lives since I thought it would be more personally meaningful, but I chose to give them a choice between the two.

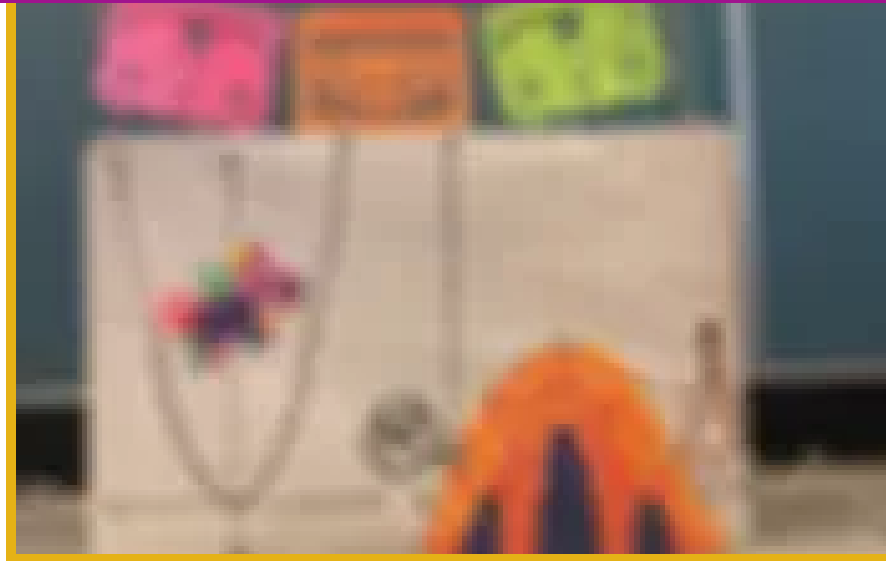
Each student received a cardboard box to use for their project, and they were required to include the following in their designs:

- Graph and equation of quadratic parent function
- Graph and equation of parabola that represents the change in their story
- Four metal brads
- Decoration

I showed an example that I created so the students could visualize what their products should include

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My example project about the change that occurred in the life of Miguel from the movie *Coco*

Additionally, I showed the students the rubric so that they knew what was expected of them. At first I wanted to just use the Elements of Making rubric. However it was the students' first experience making in the classroom, and I thought that rubric was asking too much of the students. So, I used the Elements of Making rubric as a guide instead. I think that as students get more used to making, I could use the Elements of Making rubric.

Elements of Making rubric

My rubric

Design

Students drew what they wanted their products to look like first so that they had a plan of action. Their designs included a parabola that represented their story. I knew that students would have a hard time choosing a parabola that is related to their story, so I mentioned that I chose a concave down parabola because I thought that it looked like the marigold bridge that Miguel

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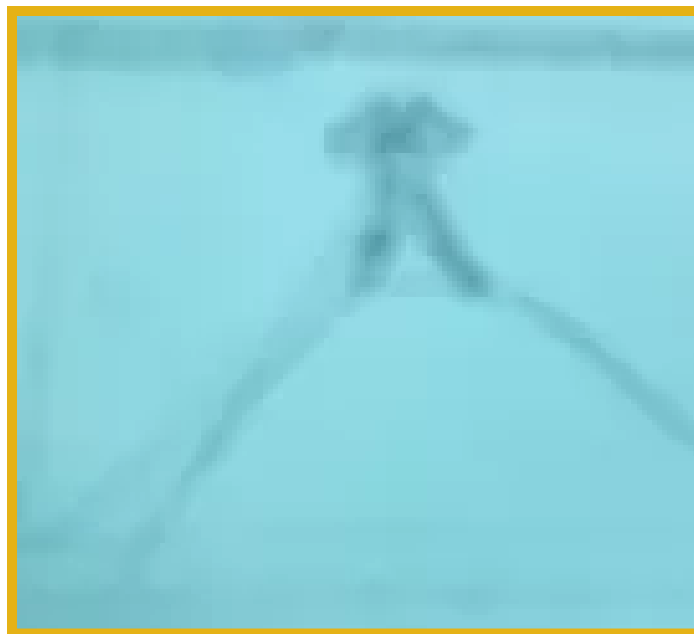


Marigold bridge from the movie *Coco*



Marigold bridge created with paper

This student chose a concave down parabola to represent how her character had to conquer many obstacles to get to where he is now.



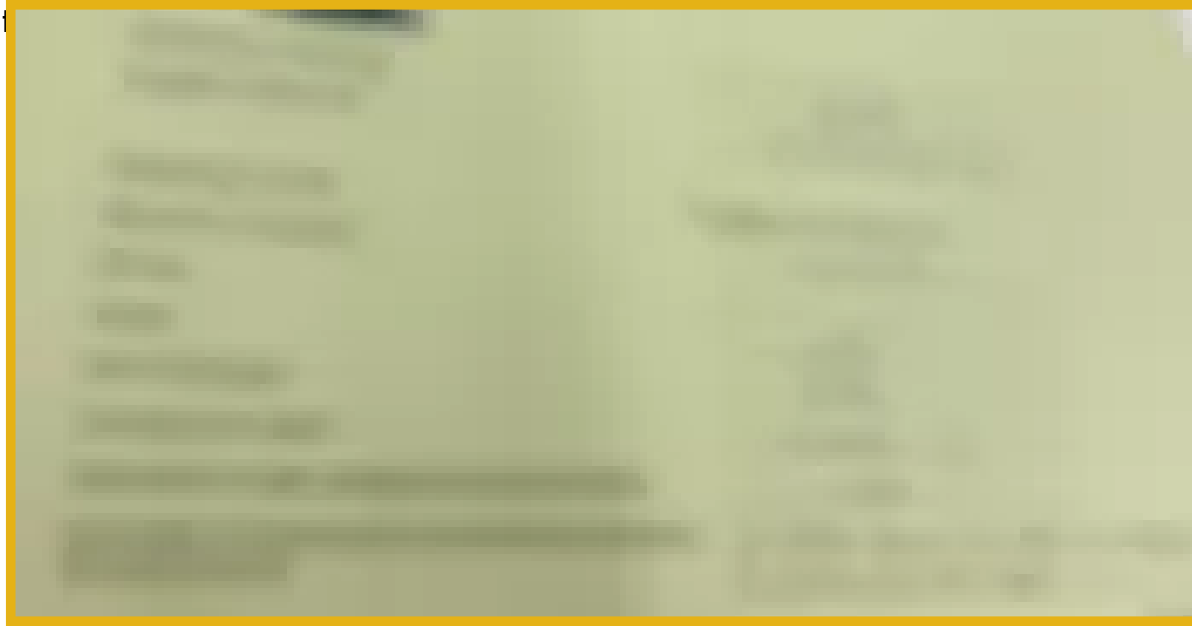
Student's desian

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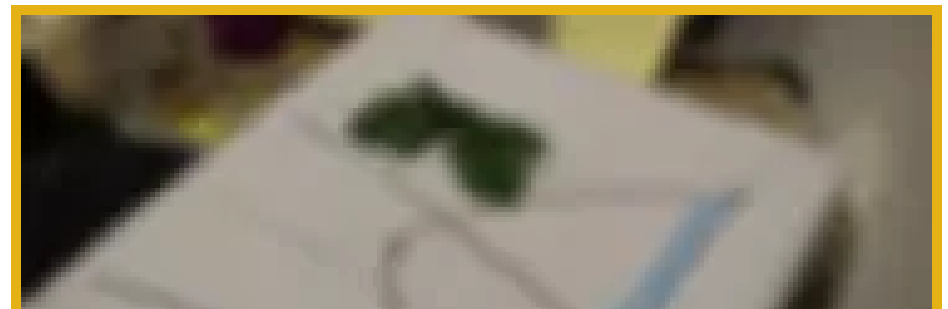
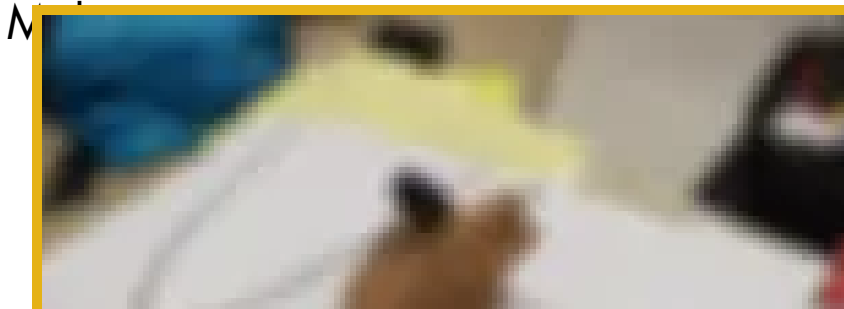
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After students finished their designs, they described the parabola that they chose by completing this worksheet. I had them do this because I wanted to make sure that they knew exactly how their chosen parabolas were transformations of the quadratic parent function. In addition to finding the equation in vertex form, they described key features of the parabola, such as the roots,

vertex, axis of symmetry, domain, range, and more. On this worksheet, they also selected four points on the parabola that showed where the event

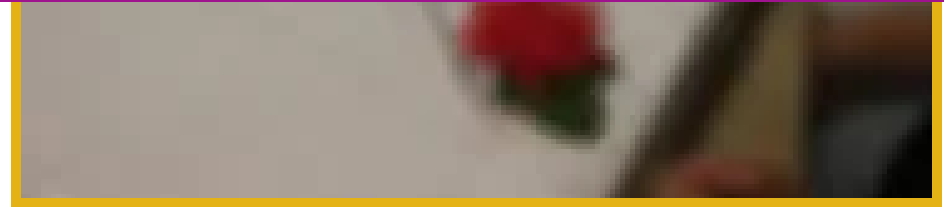
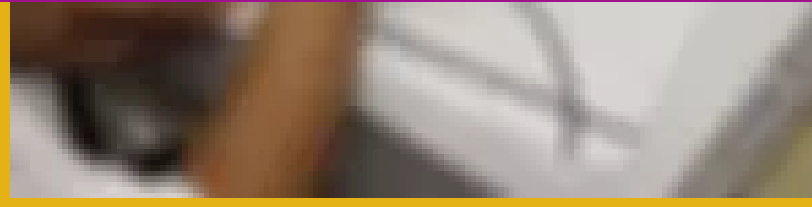


Student work describing the parabola she chose



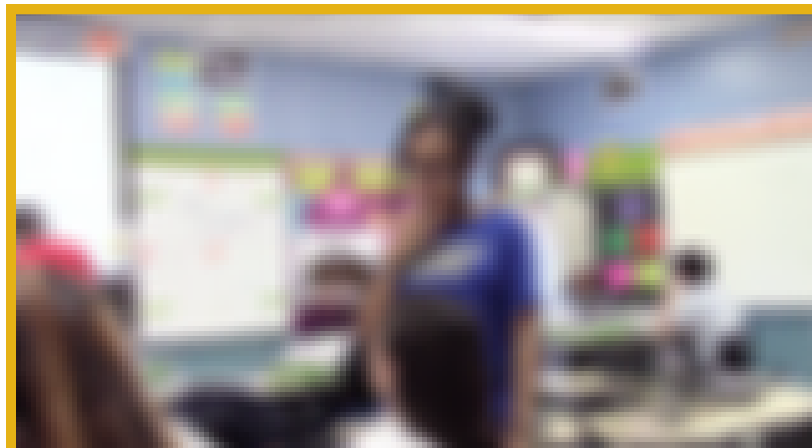
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Once students completed designing and describing their parabolas, each of them received a cardboard lid with grid paper taped to the top. They used their design sheet and descriptions to draw on the grid paper the graphs of the parent function and their own parabola. Students then used paper clips to puncture holes through the four points that they selected previously and inserted metal brads in the holes. After this, students began decorating using the craft supplies that I brought.

During the making process, the students began to work together without me telling them to do so. All of them were excited to start creating, but some of them were falling behind. When that happened, students helped their classmates by giving advice on how to plot points onto the grid paper, how to puncture holes for the metal brads, and how to neatly tape the grid paper on the cardboard lids. They also gave each other suggestions on what materials to use to bring their ideas to life. Additionally, I saw students who were having trouble drawing seek help from students who like to doodle in class. I was proud of them for collaborating and rewarded those students with stickers. My students love stickers, so that motivated them to continue working together.



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Student asking classmate for drawing advice
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Daily Reflections

At the end of each day, students reflected on their progress by writing about one thing that they succeeded in, one thing that challenged them, and how they would improve the next day. They then shared what they wrote with their group members and the rest of the class. Not only did this allow students to utilize metacognition, but this also gave them the opportunity to interact with their classmates.

Optional: Makey Makey

In order to challenge my students, I gave my students the option to use Scratch and a Makey Makey Classic in their artifacts. I originally planned to do a mini-workshop about how to do this, but we ran out of time during class. Two students volunteered to come to school early in order to do this.

I first showed them how a Makey Makey could be used to make a computer play sounds by touching bananas. This required the use of a Scratch program, which can be found below.

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Banana Bongos Program

The two students were intrigued by how bananas controlled the Makey Makey. They explored what other kinds of objects could control the Makey Makey and learned a little about conductivity. They realized that the metal brads that they used in their artifacts could also control the Makey Makey. They connected the brads to the Makey Makey using alligator clips and wrote their own code on Scratch. Each student demonstrated how their improved products work to three math teachers.

Student presenting her improved product

After this lesson, each student completed a reflection form. Their responses can be found below.

Makey Makey Reflection

Optional: Silhouette Cameo

I also wanted to give my students the opportunity to create custom stickers for their artifacts using a Silhouette Cameo. However,

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Practice Showcase

In order to prepare for the student showcase, each student did a 5 minute presentation for their group members. I displayed on the projector questions that could be asked during the actual showcase. The group members each selected a question to ask the presenter. Students told me that they felt less nervous after doing the practice showcase.

Student Showcase

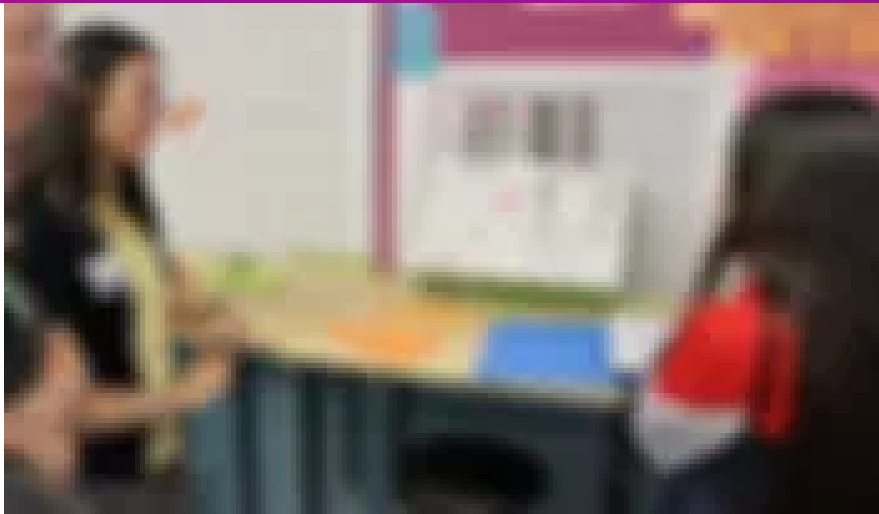


Student showcase flyer

Throughout the week, I sent out invitations for the student showcase to people I knew. 12 guests came to the student showcase, including apprentice teachers, my university facilitator, the director of MathHappens, and a former UTeach professor. During each half, 8 students stood in different areas of the room with their product and a folder that contained all of their work. To make sure that students who were not presenting at the time actually talked to the people presenting, I required each of them to complete 4 feedback forms. Guests also completed feedback forms.

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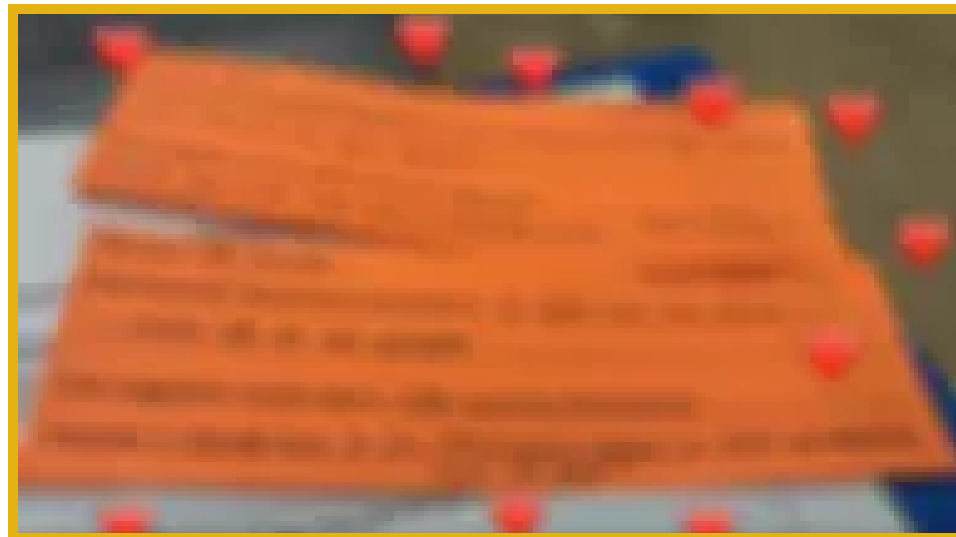
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Student presenting her work to me and a guest



Guests writing feedback forms for students



Feedback forms from guests

The student showcase was a success. Students had an opportunity to share something personally meaningful with classmates and guests. The guests also got to see maker education in action. I hope that the apprentice teachers who came and my

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Student Reflections

After reading all of the feedback forms they received from their classmates and guests, students completed an online reflection form. The students' responses can be found below.

Maker Lesson Reflection

Reflection

This was my first time implementing a maker lesson, and I think that it went well. The general feedback that I received from students was that they enjoyed the lesson, and they would like to do more activities like it. A few students consistently came to school early to work on their artifacts. However, there were a couple of students who seemed like they were not as interested in the lesson. One of them refused to keep working after a certain point because he thought that his artifact was decorated enough. I tried encouraging him to adopt a growth mindset and keep improving his design, but he pushed back. I need to think of how I can encourage students to continue to work.

The students were so focused on decorating their artifacts that I didn't have enough time to let them use a Makey Makey in their artifacts. I asked them to come before school or after school to add onto their projects, but only two of them came. When I asked the other 17 students why they didn't show up, some said that they couldn't because they had work, and others said that they didn't have rides. I thought that if I provided the Makey Makeys, all of my students would have access to it, but I was wrong. By implementing a portion of my lesson outside of normal school hours, I prevented a majority of my students from participating. This showed me that I need to be mindful of what students lives outside of the classroom are like. The next time I need to have my students come in before or after school, I will make sure that I will give them the resources to be able to come, whether that is providing bus money or being flexible with my schedule to fit theirs.

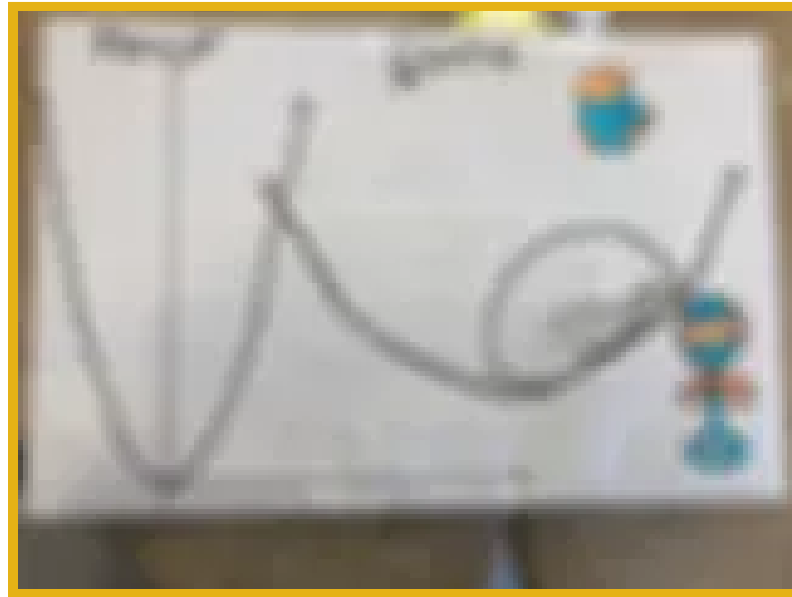
I originally wanted all of my students to tell a story about a change that happened in their own lives. However, after spending four months with my students, I knew that there were some students who preferred not to talk about themselves. After giving my students the option to choose between the two types of stories, all of them chose to talk about their favorite characters except for two students. To be honest, I never would have thought that those two would be willing to talk about themselves. I learned

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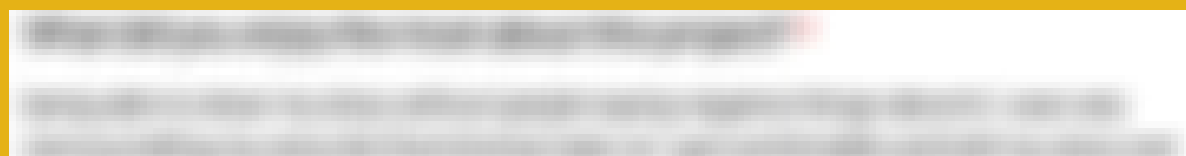
four months prior to this lesson.

The other student who chose to talk about her life explained that she became pregnant at 14, got cheated on by the father of her baby, and went through the pregnancy alone. She said that she is now happily providing for her 10-month-old son. She even took her explanation a step further and said that if she extended her concave up parabola, it would show her graduating from high school and going to college to become a pediatrician.



Student's project talking about a change that happened in her life

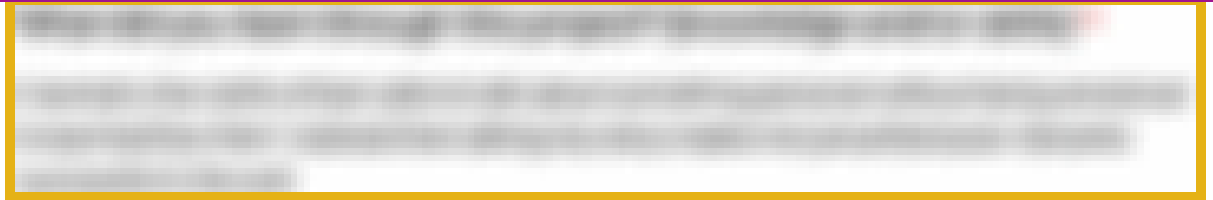
According to her reflection, this maker lesson provided a platform for her to share something personally meaningful. It allowed her voice and her life story to be heard without people making negative comments. It was incredibly brave of her to share an intimate part of her life with her classmates and to the guests who were strangers to her. Receiving feedback about how people were so proud of her, instilled confidence in her. I asked her if she would be willing to try making again, and she said yes.



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Student's feedback about her experience making



Although this lesson required a lot of time to plan and implement, I would do this again. It showed students that math and creativity do not have to be separated. It allowed students to practice skills important in life, such as planning, writing, and public speaking. It also benefited my cooperating teacher and the guests who came to the student showcase because they had the opportunity to see maker education in action. My cooperating teacher told me that she planned on having her students present more because she saw how beneficial it was to students' understanding of the mathematical content.

Revisions

There are some changes that I made to my lesson during implementation and changes I would make before implementing it again.

1. Online Submissions

I planned to have my students write down on paper their stories, but I was asked by the inclusion teacher to do an online assignment instead. She said it was because it would be easier and faster for students to type their stories instead of writing by hand. This worked well because I think that I wouldn't have been able to read some students' handwritings.

2. Growth Mindset

I expected my students to know about growth mindset since there are posters around the school explaining and promoting it. However, I found that many of them did not know what it was. There was a student who stopped working after he thought his artifact was good enough. I think that he did not want to struggle if he didn't have to. If he knew what growth mindset was, he would have been more motivated to improve his product, even if he thought it was good enough.

The next time that I implement this lesson, I would start by showing them a video about what growth mindset is.

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3. Makey Makey

Only two students had the opportunity to include a Makey Makey in their artifacts. I think that if my students had one more day to work, all students would have been able to use a Makey Makey. The next time that I do this, I will extend my lesson by a day.

4. Silhouette Cameo

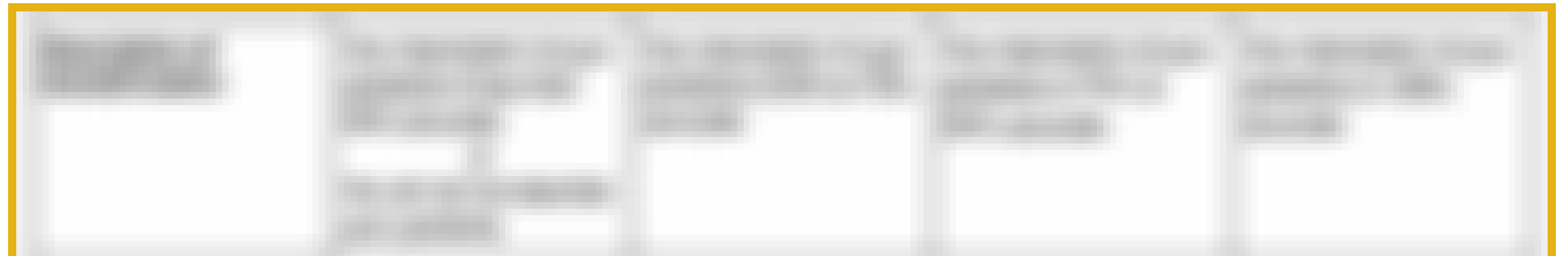
The reasons why I could not introduce the Silhouette Cameo to my students was because we ran out of time and I could not download the software onto the students' Chromebooks. The next time that I implement this lesson, I will make sure that I bring laptops that can download the software.

5. Rubric

The rubric that I created only listed 3 rating scales, which meant that students could earn a 0, 1, or 2 for each criterion. The expectations were too high for some criteria, including the criterion about students' descriptions of their parabolas. The rubric that I had gave students no points for students whose descriptions of their parabola was less than 80% accurate. This didn't seem fair because they should at least get some credit for showing up to class and trying. I modified the rubric so that there were 4 rating scales and change the description of this criterion.



Original criterion description



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I also modified my expectations about providing feedback to classmates during the student showcase. I replaced the photo release form criterion with a criterion about the final reflection.

[New Rubric](#)

Resources for Making in the Classroom

Making can require a lot of money, and it can be even more expensive when you try to bring making into the classroom. It is difficult to have enough tools and resources for every student. Although it would be nice if every teacher interested in maker education could have access to high-tech equipment such as a laser cutter or a 3D printer, it is not realistic.

The following are resources that I think would be useful for people who are starting out as maker educators.

- Scratch is a block-based visual programming language. I like this because it is free and easy to use, even for kids. Since all of the blocks that you will need are already on the screen, it eliminates the need to memorize anything.
- Makey Makey Classics are the tools that my students used to make their artifacts play sounds. Students can make their own digital projects on Scratch and interact with them using Makey Makeys. Just in my lesson, Makey Makeys were used to talk about conductivity, narrative arcs, and coding.

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MAKER LESSON PLANNING GUIDE

Name of lesson: Storytelling with Quadratic Transformations		Duration: 5-7 days, 90 min each
Subject/Course: Algebra I	Teacher(s): Mao Leonard	Grade Level: 9
Interdisciplinary connections: English, engineering, chemistry		
Key Knowledge and Understanding (content standards)	<p>(6) Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The student is expected to:</p> <p>(A) determine the domain and range of quadratic functions and represent the domain and range using inequalities;</p> <p>(B) write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form $f(x) = a(x - h)^2 + k$, and rewrite the equation from vertex form to standard form $f(x) = ax^2 + bx + c$; and</p> <p>(7) Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. The student is expected to:</p> <p>(A) graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry;</p> <p>(C) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a, b, c, and d.</p>	
Elements of Making (to be taught and assessed. Please describe how the lesson addresses each element)	<p>Makers create a personally meaningful product Students will create a product that shows a change that occurred in their own lives or the life of their favorite fictional character. Students will personalize their products by using craft materials, custom stickers, and a Makey Makey Classic.</p>	<p>Makers engage in iterative design & fabrication Students will first create a sketch of what their product will look like. They will continue to modify their designs to create a functional product. After receiving feedback from classmates, they will fix their products.</p>
	<p>Makers demonstrate a Maker mindset Students will take risks in numerous ways. Students will</p>	<p>Makers collaborate and connect with community Students will share their stories with classmates. Students</p>

	<p>use a Makey Makey Classic and a Silhouette Cameo, both of which they have no experience in. They will try to incorporate new technology even if that means that they will make mistakes. Students will also take risks by sharing a personal story about themselves to classmates and community members. Students will ask the teacher for help. Students will collaborate with classmates.</p>	<p>who want to use a Makey Makey Classic will work with a partner to create designs that allow them to easily share it. Students will give feedback to classmates and make changes to their designs based on feedback that they receive.</p>
	<p>Makers present work publicly Students will present their work to invited members of the community. They will explain how they created their products from start to finish. They will ask the audience to complete a feedback form, which they will use to describe how they will improve the product.</p>	<p>Makers utilize content specific knowledge and skills Students will describe their chosen parabola. Their description will include an equation in standard form, an equation in vertex form, the ordered pairs for the roots, the ordered pair for the vertex, vertical and/or horizontal shift, domain range, and the axis of symmetry. Students will also describe whether or not the parabola is concave up or concave down; and wide or narrow. Students will create a table of values and graph their parabola.</p>
<p>Lesson Summary How will the lesson be introduced? What are students being asked to make, build, or invent? How does it connect to their lives/community?</p>	<p>The lesson will be introduced by talking about how the word “transformation” can apply not just in math when talking about quadratics, but also in life. Students will think about their favorite fictional character and describe a change that occurred in that character’s life. Students will create a product that helps tell that story, or they can choose to talk about their own lives.. The product made out of cardboard and grid paper must include the graph and equation of the parent function, the graph and equation of a parabola that best represents their story, four metal brads, and decoration. Students get to share their interests and life experiences with the class.</p>	
<p>Public Presentation of Work</p>	<p>Individual and/or team products to be presented: Each student will create a product that describes a change that occurred in their own life or the life of their favorite fictional character.</p> <p>Specific content and skills to be assessed: Students will be assessed on their descriptions of their equation in standard form, equation in vertex form, the ordered pairs for the roots, the ordered pair for the vertex, vertical and/or horizontal shift, domain, range and the axis of symmetry. Students will also be assessed on their descriptions of whether or not the parabola they chose is concave up or concave down, and whether or not their parabola is wide or narrow. Students will be assessed on their ability to create a table of values and graph their parabola.</p>	

How will the products be made public and who will students engage with?

Members of the community will be invited to the classroom. Students will present their worksheets and products to them to describe how they created their products. Students will ask the audience to complete a feedback form, which they will use to describe how they will improve their product.

MAKER LESSON RESOURCES

**Resources
Needed**

Facilities:

- Classroom

Equipment/Materials/Safety:

- Two [bags of crafting supplies](#)
- Eight [Makey Makey Classics](#)
- One [PixScan cutting mat](#)
- One [VISEMAN craft weeding tool set](#)
- One folder with pockets per student
- One paper ream box lid per student
- Six rolls of packaging tape
- Six rolls of copper tape with conductive adhesive
- Alligator clips
- Conductive paint by Bare Conductive
- Markers
- Cotton balls
- Pipe cleaners
- Stickers
- [Paintbrushes](#)
- One [Silhouette Cameo starter bundle](#)
- Laptops compatible with Silhouette Studio
- [Brads](#)
- One [50mL conductive paint jar](#)
- Tissue paper
- Felt
- Paper clips
- Two bananas
- Play-Doh
- Grid easel pad paper
- Hot glue sticks

	<ul style="list-style-type: none"> ● Hot glue guns ● Name tags ● One worksheet per student: Teacher’s version of fictional character’s story ● One worksheet per student: Fictional character story ● One worksheet per student: Personal story ● One worksheet per student: Description of parabola ● One worksheet per student: Product design #1 ● Two worksheets per student: Product redesign ● One worksheet per student: Preparing for Presentation ● One worksheet per student on green paper: Feedback Form ● Three worksheets per guest on orange paper: Feedback Form ● One worksheet per student: Reflection worksheet ● One worksheet per student: Makey Makey ● One per student: Presentation ● One rubric per student: Rubric
	<p>People/Community Resources: Community members to invite to student showcase</p>

MAKER LESSON SEQUENCE

Estimated Time	Description of Lesson Segment <i>*Include a description of what the teacher does and what the students do in each segment</i>	Checkpoints/Formative Assessment Questions/Opportunities for Reflection	Specific resources and skills needed for this segment. <i>*Include safety considerations</i>
10 min	<p>Teacher will mention how the class has been learning about quadratic transformations. Teacher will ask students what they think the word “transformation” means. Students will share that “transformation” can mean “change”.</p> <p>Students will think-pair-share about their favorite fictional character. Teacher will also share her favorite fictional character. <i>“My favorite character is Miguel.”</i></p>	<p>“What does the word “transformation” mean to you?”</p> <p>“How can you describe a change that happened in your favorite fictional character’s life?”</p>	<p>One copy of Teacher Fictional Character Story</p> <p>Doc cam</p> <p>Change the teacher’s favorite fictional character to someone who students know.</p>

	<p>Teacher will use this worksheet to tell a brief story about a change that happened in the character's life.</p> <ol style="list-style-type: none"> 1. <i>“Miguel loves music, but there is a ban on music in his family. This ban was caused by his great-great-grandfather leaving the family to pursue his career as a musician.”</i> 2. <i>“Miguel goes to the Land of the Dead in search of his Ernesto de la Cruz. He thinks Ernesto de la Cruz is his great-great-grandfather and will give Miguel his blessing to pursue music.”</i> 3. <i>“Miguel finds out that Ernesto de la Cruz is not his great-great-grandfather, but he is the man who killed Hector, his real great-great-grandfather.”</i> 4. <i>“Miguel gets sent back to the Land of the Living with his deceased family's blessing. Miguel helps his great-grandmother reveal the truth about her father, and his family finally approves of music. Miguel learns the importance of family.”</i> 		
20 min	<p>Students will write down on this worksheet how that character changed over time. Their descriptions will include four events.</p> <p>Students will share what they wrote with group members and the class.</p>	<p>“What happened in the beginning? What happened to your character in the middle of the story? What happened in the end?”</p>	<p>One copy of Fictional Character Story worksheet per student</p>
5 min	<p>Teacher will explain that the reason why students went through the previous exercise is to show how transformations happen not just in math, but also in life. The purpose of education is to change and transform. We change to become better versions of ourselves and learn new information.</p> <p>Teacher will introduce the project to students. The project is about exploring quadratic transformations and personal transformations. Teacher will explain that</p>		

	<p>through the project, students will learn real-world skills that they don't usually have a chance to learn because of class assignments and tests. Some of the things students will learn are using new technology, new ways to express yourself, and new ways of solving problems.</p> <p>Teacher will explain that working on this project is a change for all of us. The class will move away from textbook problems and instead, incorporate creativity.</p>		
10 min	<p>Teacher will show a low-tech product that she created. The following is a description of the product:</p> <ul style="list-style-type: none"> • Cardboard lid with grid paper taped to the top • Graphs of quadratic parent function and a parabola that isn't the quadratic parent function • Metal brads through each of the four points on the non-parent function parabola • Decorated with stickers, cotton balls, pipe cleaners, etc <p>Students will interact with the teacher's product. Students will share observations about the product.</p> <p>Teacher will explain that the metal brads show when the events she described in this worksheet occurred in the character's change.</p> <p>Teacher will explain that their product must:</p> <ul style="list-style-type: none"> • Have a graph of the quadratic parent function • Have a graph of a parabola that they think best represents their own change or a fictional character's change • Be personally meaningful 		<p>Cardboard lid that fits the following description:</p> <ul style="list-style-type: none"> • Cardboard lid with grid paper taped to the top • Graphs of quadratic parent function and a parabola that isn't the quadratic parent function • Metal brads through each of the four points on the non-parent function parabola • Decorated with stickers, cotton balls, pipe cleaners, etc
25 min	<p>Students will decide if they want to describe a change in a fictional character's life or their own life.</p> <p>Students who want to write about themselves will use the Personal Story worksheet to describe a change in their own</p>		<p>One copy of Personal Story worksheet per student</p> <p>Some students may not want to talk about their lives, so give them the</p>

	<p>lives. Their descriptions will include four events. Teacher will ask guiding questions, such as, “Where did you/your character start? What happened to you/your character in the middle of the story? Where did you/your character end up?”</p> <p>Students who want to use the description of how their fictional character’s life changed will revise what they wrote.</p> <p>Students will share what they wrote with classmates. Students will give and receive feedback and revise their descriptions accordingly.</p>		<p>option to talk about a fictional character’s life.</p>
<p>10 min</p>	<p>Teacher will ask students to summarize their story. “Is it a happy (concave up story or a sad (concave down) story? Did events happen quickly (narrow) or slowly (wide)? Were events bad in the beginning (below the x-axis) and then it turned good in the end (above the x-axis)?”</p> <p>Students will draw a parabola that represents their description on the back of the Personal Story worksheet. Students will write down why they chose that parabola to represent their story and will share it with classmates.</p>	<p>How does the parabola you chose represent your story?</p>	
<p>10 min</p>	<p>Teacher will explain that students will get into groups and reflect on what they accomplished today. This will be an activity that they do at the end of every day.</p> <p>Teacher will demonstrate how to reflect as a group. Each person must talk about how they succeeded today, what challenged them today, and how they will improve their product tomorrow.</p> <p>Students will gather into groups of 4 and reflect on their work. Students will then write down what they shared on the Reflection worksheet.</p> <p>Teacher will take pictures of students’ work.</p>	<p>What did you succeed in today? What challenged you today? How will you improve your product tomorrow?</p>	<p>One copy of Reflection worksheet per student</p>

Day 2

25 min	<p>Students will write a description of their chosen parabola using the Description of Parabola worksheet in the following ways:</p> <ul style="list-style-type: none"> ● Equation in standard form, vertex form ● Table of values ● Ordered pairs of the roots ● Ordered pair of the vertex ● Maximum or minimum ● Axis of symmetry ● Domain ● Range ● Concave up or concave down ● Wide or narrow compared to the parent function ● Vertical or horizontal shift compared to the parent function ● Ordered pairs of the four points when the events took place 		One copy of Description of Parabola worksheet per student
20 min	<p>Students will look at what kinds of materials are available to brainstorm ideas.</p> <p>Students will draw a detailed sketch of what their product will look like using the Product Design #1 worksheet. Students will share their sketches with classmates and exchange ideas. Students will revise their sketches. Teacher will give students a stamp of approval after she checks their designs.</p>	How can you improve your design?	One copy of Product Design #1 worksheet per student
35 min	<p>Students will use grid easel pad paper to draw the quadratic parent function and their parabola using the table of values they created.</p> <p>Students will tape the graph paper to the top of their lids. Students will choose four points on their parabolas and poke a small hole through those points. Students will insert metal brads through each of the points and spread the brads' legs to</p>		<ul style="list-style-type: none"> ● At least one grid easel pad paper per student ● At least six rolls of packaging tape ● At least four metal brads per student ● Stickers ● Cotton balls

	secure them in place. Students will begin to decorate their products with stickers, cotton balls, drawings, pipe cleaners, etc.		<ul style="list-style-type: none"> ● Pipe cleaners ● Markers ● Hot glue sticks ● Hot glue guns
10 min	Students will gather into groups of 4 and reflect on their work. Students will then write down what they shared on the Reflection worksheet .	<p>What did you succeed in today?</p> <p>What challenged you today?</p> <p>How will you improve your product tomorrow?</p>	One copy of Reflection worksheet per student

OPTIONAL MAKEY MAKEY

3 min	<p>Teacher will use two bananas, a Makey Makey Classic, three alligator clips, and this Scratch project to introduce students to the device. The first alligator clip will connect the “Space” input to the first banana. The second alligator clip will connect the left arrow input to the second banana. The third alligator clip will be connected to the “Earth” input.</p> <p>Students will hold the alligator clip connected to the “Earth” input and touch the bananas to make drum sounds play through the computer.</p> <p>Students will share observations.</p>	<p>What are your initial observations?</p> <p>How do you make the sound play?</p> <p>Are there other ways to make the sound play besides touching the bananas?</p>	<ul style="list-style-type: none"> ● Two bananas ● Three alligator clips ● One Makey Makey Classic
10 min	<p>Each student will receive a Makey Makey worksheet. Students will be split into groups of 3. One student per group will access this Scratch project using a computer. Each group will receive a Makey Makey and two alligator clips.</p> <p>Students will follow the instructions on the Makey Makey worksheet to see what other objects will make sounds play.</p>	<p>What are similarities between all of the objects that made the computer play a sound?</p>	<ul style="list-style-type: none"> ● One copy of the Makey Makey worksheet per student ● Makey Makeys ● Computer ● Metal brads ● Copper tape ● Conductive paint ● Fabric ● Wooden pencil
7 min	<p>Students will share their findings with the class.</p> <p>Teacher will explain that conductivity is the ability for an object to allow electric current to flow, and objects that are good conductors tell the Makey Makey to make the computer play sounds.</p>		

	Teacher will have students explain how electric current flows when the circuit is closed.		
5 min	<p>Teacher will show how she used a Makey Makey to add to her artifact. This product will have a Makey Makey Classic attached to a computer with this Scratch project. Alligator clips will be connected to the Makey Makey Classic and the legs of the metal brads. When the metal brads are touched, audio clips of her explaining her story will play. The audio clips will also play when students touch the conductive paint and copper tape.</p> <p>Students will share observations.</p>	<p>How is the Makey Makey connected to the project?</p> <p>What are different ways to make the sounds play?</p>	<p>Cardboard lid that fits the following description:</p> <ul style="list-style-type: none"> ● Cardboard lid with grid paper taped to the top ● Graphs of quadratic parent function and a parabola that isn't the quadratic parent function ● Metal brads through each of the four points on the non-parent function parabola ● Decorated with stickers, cotton balls, pipe cleaners, etc ● Makey Makey Classic attached to a computer with this Scratch project ● Alligator clips connected to the Makey Makey Classic and the legs of the metal brads
5 min	<p>All students will create an account on Scratch. Students will create a project by clicking on the "Create" tab.</p> <p>Teacher will display her computer screen using a TV or a projector.</p> <p>Students will create a code that tells the Makey Makey what sound the computer should play.</p> <ul style="list-style-type: none"> ● Click "Events" on the left, and then drag the block "when <u>space</u> key pressed" ● Click "Sounds" on the left, and then drag the block "play sound __ until done" underneath the "when <u>space</u> key pressed" block 		

	<ul style="list-style-type: none"> Go to the “Sounds” tab at the top to pick sounds from the library or record their own audio Do this three more times, but use the dropdown menu to change “space” in the block “when <u>space</u> key pressed” to a different key. They must choose only space and arrows 		
10 min	Students will look at their stories and use the Makey Makey worksheet to write down what key will make what sound play and why to stay organized.		
30 min	Students will work on their code on Scratch. Students must share Makey Makeys with classmates.		<ul style="list-style-type: none"> 8 Makey Makeys
15 min	Students will present to their classmates. Each student must complete at least two feedback forms.		
10 min	Students will complete a reflection online .		

OPTIONAL: SILHOUETTE CAMEO

5 min	<p>Teacher will show students stickers that she created using the Silhouette Cameo.</p> <p>Each student will receive a laptop with Silhouette Studio downloaded on it.</p>		<ul style="list-style-type: none"> Silhouette Cameo Computer with Silhouette Studio software Vinyl
25 min	<p>Teacher will demonstrate how to create a circle-shaped sticker with “hi!” cut out.</p> <p>Teacher will connect her computer to a screen and open Silhouette Studio.</p> <ul style="list-style-type: none"> Adjust the page size and cutting mat size to 12”x12” Select the “Drawing Tool” button on the left side and select “Draw an Ellipse” While holding the Shift key, left click and drag to create a circle Click the “Select” button on the left side and click 		<ul style="list-style-type: none"> Silhouette Cameo Computer with Silhouette Studio software Vinyl <p>Safety: The weeding tools are sharp. Students must sit in a designated area when using the weeding tools. All tools must be placed back inside the case.</p>

on the circle

- Change the color of the circle by clicking above the “Select” button



- Click the “Text” button on the left side
- Click the workspace and type “hi!”
- Change the text color to a color different than the circle
- Move the text to be on top of the circle
- Click on the “Text Style” button on the right side to adjust the font and size of the letters
- Highlight the circle and the text
- On the toolbar, click “Object” > “Modify” > “Subtract”
- Move the design to the top left of the page

To cut design

- Turn on Silhouette Cameo and connect it to the computer
- Place a 12”x12” vinyl sheet onto the cutting mat
- Press “Load” on the Silhouette Cameo
- On Silhouette Studio, press the “Send” tab at the top
- Click “Cut”
- Change material to “Vinyl, Glossy”
- Click “Send”

NOTE: Only the teacher will cut this sticker. Students will only practice.

Teacher will demonstrate removing negative pieces (the letters and the !) that aren’t part of the design from the vinyl by safely using the weeding tools.

Students must sit in a designated area when using weeding tools. All tools must be placed back inside the case.

50 min	Students will design their own stickers on Silhouette Studio and send the designs to the Silhouette Cameo.		
10 min	Students will complete an online reflection.		

Day 3

80 min	If students want to change their design, they will redesign their product using the Product Redesign worksheet . Students will continue to decorate their products.		<ul style="list-style-type: none"> Two copies of the Product Redesign worksheet per student
10 min	Students will gather into groups of 3-4 and reflect on their work. Students will then write down what they shared on the Reflection worksheet . Students will share what they wrote with group members and the class.	<p>What did you succeed in today?</p> <p>What challenged you today?</p> <p>How will you improve your product tomorrow?</p>	

Day 4

BEFORE CLASS	Teacher will print out students' stories.		
20 min	Teacher will announce that students will practice presenting to prepare for the student showcase. Students will decorate their products.		
15 min	Teacher will explain that members of the community will come to the classroom to look at their products. To prepare for the presentation, students will first present to their classmates. The teacher will provide students with a list of topics to talk about and possible questions that they may be asked.		Presentation topics

	Students will get into groups of 3. Each student will have 3 minutes to present their artifact. For the remaining 2 minutes, the other two students will each choose a question from the list to ask the presenter.		
35 min	Students will finish working on their artifacts.		
10 min	Students will gather into groups of 3-4 and reflect on their work. Students will then write down what they shared on the Reflection worksheet .	What did you succeed in today? What challenged you today? What are you excited to share tomorrow during the student showcase?	
10 min	Students will each receive a folder to show during the student showcase. Students will put papers in the folder using the fasteners in this order: <ol style="list-style-type: none"> 1. Story 2. Design(s) 3. Description of parabola 4. Reflection Students will turn in folders to the teacher.		

Day 5: Student Showcase

BEFORE CLASS	Teacher will choose which students will present during which session. Half of the students will be in the first session, and the other half will present after them. After choosing who will present during the first half, teacher will place those students' projects on desks that are pushed against the wall. Place a name tag and four green feedback forms into the pockets of each of the students' folders.		
8 min	Students will each collect their folder. Students will put on their name tags. Teacher will explain that they are expected to complete at least four green feedback forms for their classmates. Students will write their names in the "reviewer" section of		<ul style="list-style-type: none"> ● Feedback Form

	the feedback forms.		
5 min	<p>Guests will introduce themselves.</p> <p>Teacher will explain that half of the students will present during the first 30 minutes, and the other half will present during the last 30 minutes. Teacher will place a stack of orange feedback forms for guests to complete and give to presenters.</p>		<ul style="list-style-type: none"> • Feedback Form
30 min	The first half of students will present.		
30 min	The second half of students will present.		
5 min	<p>The students and teacher will thank the guests for coming.</p> <p>Students will read the feedback that they received.</p>		
20 min	Students will complete a final reflection online. They will describe their making experience and how they would make adjustments to their artifacts based on the feedback they received.		

The Elements of Making Matrix

Makers....	SUPPORTED	EMERGING	DEVELOPING	SOPHISTICATED
Create original, personally meaningful products	<p>Maker engages in a task provided by an outside source and/or builds a product from a pre-existing model or template.</p> <p>Personal meaning is not a relevant factor in product creation.</p>	<p>Maker refines a task provided by an outside source and offers some modification to a pre-existing design or template.</p> <p>The design is connected to personal interests or experience in limited ways.</p>	<p>Maker chooses from a possible set of tasks or defines their own task. Maker offers noticeable modification to a pre-existing design or template.</p> <p>The modified design is connected to personal interests or experience. Maker can articulate this connection.</p>	<p>Maker defines their own task and creates a personally meaningful product that is either completely original or provides significant modification to a pre-existing design.</p> <p>The design is deeply connected to personal interests or experience. Maker articulates the personal connection with clarity. Personal motivation pushes the maker to go over and above project expectations.</p>
Engage in iterative design & fabrication	<p>Maker given step-by-step procedures for product creation. Feedback is limited. No revisions are attempted.</p> <p>Maker is directed to specific tools, materials, and safety procedures.</p>	<p>Maker given general procedures for product creation. Feedback is provided and the maker is directed to make specific modifications.</p> <p>Maker given a limited choice of tools. Maker begins to develop an understanding of selected tools, materials, and safety procedures.</p>	<p>Maker provided with limited procedures and given support when needed. Maker is provided with feedback at several points and uses this feedback to decide on modifications and refine their designs.</p> <p>Maker selects own tools. Maker demonstrates an understanding of tools, materials, and safety procedures as well as some skill in fabrication.</p>	<p>Maker engages in independent problem solving and regularly asks thought provoking questions of themselves and others. Maker solicits support and feedback as needed. Maker develops models and works through multiple iterations of the product design.</p> <p>Maker demonstrates a deep understanding of tools, materials, and safety procedures. Maker shows improving fabrication skills and the end product displays high quality craftsmanship.</p>
Demonstrate characteristics of a maker mindset	<p>Maker introduced to characteristics of a maker mindset including but not limited to being playful, having a growth mindset, seeing failure as instructive, and embracing collaboration.</p>	<p>Maker identifies one or more characteristics of a maker mindset and reflects on those areas. Maker is given specific reflection prompts.</p>	<p>Maker displays several characteristics of a maker mindset. Maker reflects on those areas throughout the project. Maker is given broad guidelines to facilitate reflection.</p>	<p>Maker displays characteristics of a maker mindset. Maker shows flexible thinking and a willingness to try new strategies throughout the making process. Maker demonstrates persistent effort and uses missteps as opportunities for growth. Maker consistently reflects on their work.</p>
Collaborate and connect with community	<p>Maker directed to collaborate with others during the process of design, reflection, redesign, or presentation. Maker is given a template or prompts to facilitate discussion and idea sharing.</p>	<p>Maker provided with opportunities to collaborate with others during the process of design, reflection, redesign, or presentation. Maker is given broad guidelines to facilitate discussion and idea sharing.</p>	<p>Maker solicits opportunities to collaborate with others. Evidence of collaboration is present in multiple facets of the project including design, reflection, redesign, and/or presentation.</p>	<p>Maker solicits opportunities to collaborate with others both inside of the classroom and in the broader maker community. Evidence of collaboration is present in all facets of the project including design, reflection, redesign, and presentation.</p>
Present their work publicly	<p>Maker presents their work to someone else. Maker is given a template or specific prompts to support the discussion of their work and to seek feedback.</p>	<p>Maker presents their work to a group. Maker is given broad presentation guidelines to support the discussion of their work and to seek feedback.</p>	<p>Maker presents their work to multiple groups. Maker engages with the audience, can discuss the progression of their project, and seeks feedback on their work. The presentation includes a prototype or functional product.</p>	<p>Maker presents their work in multiple forums including a presentation in a public space. Maker engages with the audience, is articulate and can describe the making process from start to finish. Maker seeks and responds to feedback. The presentation includes a high-quality product and documentation of prior iterations and designs.</p>
Utilize science & engineering	<p>Maker given all connections to the science content and disciplinary core ideas.</p> <p>Maker provided with a specific science or engineering practice to include in their work.</p>	<p>Maker provided with possible connections to science content and disciplinary core ideas.</p> <p>Maker directed to science and engineering practices as defined by NGSS and asked to select a relevant practice to highlight in their work.</p>	<p>Maker is guided in forming connections to science content and disciplinary core ideas and can articulate connections.</p> <p>Maker demonstrates several science and engineering practices as defined by NGSS. Maker can identify these practices in their work.</p>	<p>Maker independently draws complex connections to content, articulates ties between their work and disciplinary core ideas, and forms interdisciplinary links to domains such as the arts, humanities, and mathematics.</p> <p>Maker demonstrates excellence with regards to multiple science and engineering practices as defined by NGSS. Maker can describe these practices and identify them in their work.</p>

Product Rubric

	Not Yet Competent	Competent	Sophisticated
Product	Your design is missing more than 1 item from the list in the “Sophisticated” column.	Your design is missing 1 item from the list in the “Sophisticated” column.	Your product includes: <ul style="list-style-type: none"> <input type="checkbox"/> Graph of parent function <input type="checkbox"/> Equation of parent function <input type="checkbox"/> Graph of parabola of your choice <input type="checkbox"/> Equation of parabola of your choice <input type="checkbox"/> Metal brads <input type="checkbox"/> Decoration
Description of transformation	Your description of your parabola is less than 80% accurate.	Your description of your parabola is 80% to 90% accurate.	Your description of your parabola is $\geq 90\%$ accurate.
Collaboration	You do not exchange ideas with classmates at all. <i>or</i> You do not reflect on your progress with classmates at all.	You exchange ideas with classmates sometimes. <i>or</i> You sometimes reflect on your progress with classmates.	You exchange ideas with classmates frequently. <i>and</i> You reflect on your progress with classmates daily.
Personalization	The product is not personally meaningful to you.	The product is connected to personal interests or experiences.	The product is deeply connected to personal interests or experiences. <i>and</i> Personal motivation pushes you to go over and above project expectations.

Presentation Rubric

	Not Yet Competent	Competent	Sophisticated
Folder	Your folder is missing more than 1 item from the list in the “Sophisticated” column.	Your folder is missing at most 1 item from the list in the “Sophisticated” column.	Your folder includes worksheets about: <ul style="list-style-type: none"> <input type="checkbox"/> Story <input type="checkbox"/> Description of parabola <input type="checkbox"/> Design <input type="checkbox"/> Daily reflection <input type="checkbox"/> Classmate feedback form
Presentation	<p>You did not present your work to your classmates and to community members.</p> <p style="text-align: center;"><i>or</i></p> <p>You do not answer questions that classmates and community members have about your work.</p>	<p>You present your work to either your classmates or to community members.</p> <p style="text-align: center;"><i>or</i></p> <p>You answer some questions that classmates and community members have about your work.</p>	<p>You present your work to your classmates and to community members.</p> <p style="text-align: center;"><i>and</i></p> <p>You answer all questions that classmates and community members have about your work.</p>
Feedback	You do not ask for or respond to feedback from classmates and community members.	You ask for feedback from classmates and community members, but you do not respond to it.	You ask for and respond to feedback from classmates and community members.
Release form	You do not turn in a completed photo and video release form.		You turn in a completed photo and video release form.

What did you enjoy the most about this lesson?

What i mostly enjoyed from the makey makey lesson is trying out the makey makey and connecting it with my product/project and test things out

it was fun working with journee and you and i thought the magical paint was really cool.

What did you learn through this project?
(knowledge and/or skills)

What i learned through this project is energy flow
and conductivity through the metals

i learned that metal or not some objects could be
good conducters.You can present projects with
sounds invloved.

What about this project challenged you?	Have you had any experience coding at all before today?
How to connect the makey makey with the project and adding the sounds to match each part of the story	No
no it wasn't really challenging because ms linear helped me through the whole process(i think i spelled your name wrong)	No

Based on the feedback you received from classmates and guests, how would you improve your project?

Um that it was awesome and nothing was wrong but from the teachers is to connect the equation with my presentation

i would want to work on my drawing skills because jurnee had to help me and the things i drew weren't as nice looking.

What suggestions do you have for Ms. Leonard?	Other comments:
Don't leave us please	Ps:Don't leave us
if she continues to be like this then she'll be a great teacher in the near future,as long as she don't turn mean like some teachers.	nothing

Student number	Please describe how you created your project.
1	i started off thinking of a story to tell. Then i described my parabola and came up with my own equation for my parabola. Next i got my box and started to decorate it all the sides . I didnt wanna go all out but the guests really liked it.
2	i related it to a personal story in my life which made it difficult to present to people i didn't know. i was scared and worried that they were gonna judge me. i chose my parabola to fit the points in my story and the events that happened
3	Kept adding more stuff to represent the movie and tell more of what Judy hopps go through in the movie and how she made her dream as a cop come through and over came everyone doubting her that she can be an cop
4	i drew a cliff and three different patrick to represent many different parts of my parabola and i poked a hole in the box then i outlined my parabola with sharpie then i decorated my box with patricks and a cliff i drew a parabola
5	we thought of our favorite character the first day and went over the story and how the characters changes throughout the movie.We thought about how we can get a parabola out of it.We drew an example of our parabola on the green paper.
6	Everyday I worked on the figurines and adding small details. I feel like I should've worked on more on the whole box itself instead of just those two figurines. I used construction paper where I drew the body and used other colored construction paper for the outfits and hair.
7	first I was thinking about some movies that has influenced me in anyway then I created my equation then picked off some important events which are important points on my parabola then found the vertex
8	i was just trying to make my parabola and other drawings and all so by making something out of nothing it was different for me cause it usually a problem equation and thats it not really try and see how it wold end up like so i just started to really think about it

9	i was working hard and making sure it went well with every detail and every day i had to stay focus and had to watch a movie about my project just to learn more and then i had to do a lot of math things so yeah every detail was fun to do.
10	i created my project by choosing my favorite character then creating my parabola and drawing the pictures in the parabola i chosed that parabola because maleficient had horns so i decided to drw horns around the parabola
11	i used the paper , the pencil, the equation and the desmos calculator.I draw the parabola of the graph.when i got the graph i can start draw my project.and i put the y intercept and x intercepts.put the vertex and solution.and i also draw my favorite soccer player.
12	I made my project with the graphic with the decoration and with my story about mulan.
13	I made a spider-man parabola and also a graph. I also colored my box and put a spider man toy on it.
14	The first few days I i kept modeling my graph on a piece of paper and found what points i would be using. Then i started putting my parabola on a big graph paper and once we're done with that yo put it on one of the boxes. After that i just decorated my box however i wanted it to look.

What did you enjoy the most about this project?	What did you learn through this project? (knowledge and/or skills)
The most i like about my project is the way i decorated it and how i came up with my own equation for my parabola.	i learned i can make up my own equation only through hard work. i also learned i could make my own parabola.
being able to share my story without people saying negative things about it, i was very nervous telling my story the first time but later on i got comfortable and told my story over and over with confidence	i learned a few skills of being able to talk about something personal without being emotional it was hard but then i realized that talking my story makes me proud because i became successful in the end
Making all the props and decorations and making everything connect together and made one where you can see what the project about	How to understand more and the a value and c value and how the equation represents the equation by its features
the most i enjoyed about making this parabola is just drawing was the most favorable part in this process of making this project .	the thing i learned from this parabola is communication skills with others felt way more confident talking to the guest when we practiced yesterday
i enjoyed drawing and coloring in the parabola and just enjoyed my parabola box developing as the process grew.	i learned on how to make a parabola out of a movie or a personal story which is cool and i learned how to draw pine trees.
I enjoyed crafting and being able to make the characters come to "life" it was like working with puppets where I get to tell the story at my own pace. I really liked explaining the finer details to people like why I chose the C value as 10 because those were the first two numbers of one of the heroes that had fallen.	I got to learn and realize the whole meanings of and parts of the parabola and getting to explain myself and the project to others.
being able to share why i chose my movie and parabola with STRANGERS and ms.Leonards funny friends also the creative things i was able make for my parabola	That when I present I need to add more details and be less shy. i needed more things added to my project
i enjoy the project cause it was something new i really never try and i was candidly excited to work on it i really was a new thing for me	i learned that i say like a lot and that i should practice on my presentation cause of how much i just get stuck and get confused

<p>Well I the answer to that is mostly everything except for the math part cause of all the parts of doing my project i DID NOT ENJOY THAT ONE BIT.</p>	<p>Well the things that i learned from this project where how to mix art and math and this project made me look up a lot a stuff first was the movie then the math to do it and so this project was teaching me a lot of stuff.</p>
<p>trying to find what character to chose and trying to put all the details in it and drawing them try to color some of it</p>	<p>i learned to talk to people and work my best to draw my desing in the parabola i learned to find a equation of a parabola just by looking at it</p>
<p>I feel like the graph, these are very confused,But i look again again and i can decided.</p>	<p>i learn about parabola,and the graph.when we see the equation of slope are positive it is will be the graph are concave up and we have negative slope will be concave down.</p>
<p>enjoy making the two graphics and put the decoration and work every day in the project</p>	<p>I learned more of the graphics I learned the maximum point, I learned to use a graph that was the same with standard form.</p>
<p>I enjoyed drawing and the creativity involved on the project. I also enjoyed making my own parabola.</p>	<p>I learned how to make a graph and become more creative. I also learned how to draw better.</p>
<p>expressing my favorite super hero character and getting to draw and be more creative.</p>	<p>Through this project i learned more about parabolas and to be more creative on more projects like this.</p>

What about this project challenged you?	Based on the feedback you received from classmates and guests, how would you improve your project?
This project in general was a challenge to me. i didnt think i could do any of this but yup i did it.	i would improve my story like more details and tell more about what the points mean. i would also speak up louder and get over the shyness. im glad everyone liked my decoration around the box. it was kind of difficult to prepare.
what challenged me the most was talking about without becoming emotional and i was scared that i was going to get a bad comment because of the choices in made	i would improve it by adding more pictures and writing my equations right then talking more about the parabola instead of my story i would also add how people can overcome anything no matter how hard life gets
Making everything connect with the movie and the math part connect with the project look like the movie	To talk more about how the parabola connect with the movie and describe how the points connect and represent to the movie well and that to talk more about how the story went with the props that i made and to also face towards them
the thing that challenged me the most was poking the holes to represent points and putting the tape and drawing the parabola	based on my feed back i would need to chose one thing for the y-axis to represent and learn that i should make my patrick fatter i made him skinning and should show that the parabola represent two thing
drawing the hawk was really hard and picking the four points was hard because i wanted it to e specific.	i forgot to draw the errows at the bottom which was totally my fault and i would want to draw some more characters from the movie to make it look more cool with more details. i would add more details to explain to people too.
It would be having to work on everything because I had to work on the meaning of the parabola and then having to work on the figurines for my hero academia.	I've been told to speak louder and make more details to make it more eye catching and having to know the parts and functions of the parabola. I have to work more often to realize where the points go and mean
FIGURING OUT MY PARABOLA AND BEING ABLE TO create my cute little piggy that i really put my heart into	ADD THE POINTS I NEEDED TO ADD TO MY PARABOLA PRESENTING THE MY BEAUTIFUL PROJECT WAY BETTER AND Drawing way more things on my project board and im really tired of typing so i hope i have enough words now
the challenge was the hole project i thought it wold of just ben like a problem and that it nothing new	i would impoverish my project by righting more notes down and drawing working harder make more progress on my work i haven't completed and to try and foucause cause and not distract my self and stop playing whit friends

<p>It was the math part trying to figure everything about it was challenging me cause i had to figure out what numbers to put and find out why i chose them which in the end i need to work on</p>	<p>hey most of what they gave me was positive i would do more if i had a chance and i gotta admit i was sort of hoping for some negative things but thankfully i did not get ANY! Although they did give me a few tips on how to make my next project better in which this case i will do much better.</p>
<p>something that challenged me is trying to find my equation and trying to draw my sesing in the parabola and trying to finish in time</p>	<p>i will improve my project by putting more desings in my project and try to finish coloring it and putting the name of my character that i choosed as the title and putting the x and y axis on my graph</p>
<p>how to graph and how to find the vertex that is challenged me.and concave down and concave up those are challenged.</p>	<p>in my parabola,they really like to watch and they says interesting.i got the comment for the guests,i like they respond because this my new thinking new idea and new improve.</p>
<p>nd a story that I like a lot and that I feel rlaciona with eya and draw the graphics</p>	<p>decorate more, use complete sentences, shuffle capital letters, use point at the end of the sentences, decorate more the project use more color</p>
<p>The biggest challenge was drawing and making the parabola. It was also hard to choose the colors for my project.</p>	<p>I would try to do a better drawing and make a wider parabola. I would also try to make the story better.</p>
<p>What really challenged me during this is trying make up my mind of what to turn the parabola into.</p>	<p>I would draw my character a little better and change my parabola a little better too.</p>

What suggestions do you have for Ms. Leonard?	What other suggestions do you have for Ms. Leonard?
<p>i think this project was awesome but not the talking part . i think i couldve done better if i wouldve felt what it would be like to stand in front of strangers and tell them about my story.</p>	
<p>she could give the students some truthful feedback on their posters</p>	
<p>DON" T LEAVE US</p>	
<p>i do recommend her doing this project with her future students it a very fun project have more guest for the project</p>	
<p>everything was great and yes she should have her future students do this project. Really fun working with her!</p>	
<p>DONT' T LEAVE US</p>	
<p>UH NOTHING REALLY JUST MAKE IT MORE FUN AND ENOUGH TIMEEE</p>	
<p>probably should tell them or segest them to do something to help them out and make it easy for them</p>	

<p>PLEASE please do more of these Ms. they are fun and final words are PLEASE DO MORE thank you.</p>	<p>I don't know how would she make it better my advice would be give them more time but that is my opinion.</p>
<p>she can make it better by giving her students more time to do this project</p>	<p>she can make it better by helping each student or seeing what they are doing to keep them doing their project</p>
<p>this is best,because this project are very important to future of math.</p>	<p>this is best,because this project are very important to future of math.</p>
<p>explain more the issue give more time to finish.</p>	<p>put a lot of effort because the skill and the desire to do what he wants</p>
<p>More supplies</p>	<p>more time</p>
<p>It would probably be a little better if we had more time to work on it.</p>	<p>i dont really think it needs any improvements</p>

Other comments:	If Ms. Leonard hosted a custom sticker making workshop, would you be interested?
	Yes
	Yes
	Yes
	Maybe
nah	Maybe
It was nice and fun having this project	Yes
AWESOME	Yes
	Yes

No more comments from me	Maybe
	No
Ms.Leonard is the best teacher.	Yes
no	Maybe
	No
	Yes

Product Rubric

	Not Yet Competent	Fairly Competent	Highly Competent	Sophisticated
Product	You design is missing all items from the list in the “Sophisticated” column.	Your design is missing more than 1 item from the list in the “Sophisticated” column.	Your design is missing 1 item from the list in the “Sophisticated” column.	Your product includes: <ul style="list-style-type: none"> <input type="checkbox"/> Graph of parent function <input type="checkbox"/> Equation of parent function <input type="checkbox"/> Graph of parabola of your choice <input type="checkbox"/> Equation of parabola of your choice <input type="checkbox"/> Metal brads <input type="checkbox"/> Decoration
Description of transformation	Your description of your parabola is less than 50% accurate. <i>or</i> You do not describe your parabola.	Your description of your parabola is 50% to 70% accurate.	Your description of your parabola is 70% to 90% accurate.	Your description of your parabola is $\geq 90\%$ accurate.
Collaboration	You do not exchange ideas with classmates at all. <i>or</i> You do not reflect on your progress with classmates at all.		You exchange ideas with classmates sometimes. <i>or</i> You sometimes reflect on your progress with classmates.	You exchange ideas with classmates frequently. <i>and</i> You reflect on your progress with classmates daily.
Personalization	The product is not personally meaningful to you.		The product is connected to personal interests or experiences.	The product is deeply connected to personal interests or experiences.
Effort	You do not meet project expectations.		You meet project expectations.	Personal motivation pushes you to go over and above project expectations.

Presentation Rubric

	Not Yet Competent	Fairly Competent	Highly Competent	Sophisticated
Folder	<p>Your folder is missing more than 2 items from the list in the “Sophisticated” column.</p> <p style="text-align: center;"><i>or</i></p> <p>Your folder does not include any items.</p>	<p>Your folder is missing 2 items from the list in the “Sophisticated” column.</p>	<p>Your folder is missing at most 1 item from the list in the “Sophisticated” column.</p>	<p>Your folder includes worksheets about:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Story <input type="checkbox"/> Description of parabola <input type="checkbox"/> Design <input type="checkbox"/> Daily reflection
Presentation	<p>You did not present your work to your classmates and to community members.</p>	<p>You present your work to either your classmates or to community members.</p>		<p>You present your work to your classmates and to community members.</p>
Provide Feedback	<p>You provided 1 to no feedback slips to classmates.</p>	<p>You provided 2 feedback slips to your classmates.</p>	<p>You provided 3 feedback slips to your classmates.</p>	<p>You provided 4 or more feedback slips to your classmates.</p>
Reflection	<p>You do not reflect on your experience with the project.</p>		<p>You reflect on your experience with the project, but it lacks details.</p>	<p>You reflect on your experience with the project in detail.</p>

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Community

The following are the ways I connected with the Maker community.

May 19, 2019

Maker Faire Bay Area

Apr 14, 2019

May 10, 2019

Reagan ECHS Internship

Mar 5, 2019

May 4, 2019

Maker Faire Austin

Feb 17, 2019

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Printmaking and e-
Textiles

CO.LAB

Mathematical
Bookbinding

Dec 10, 2018

Oct 31, 2018

Magellan International
School Internship

Vinyl Cutter Workshop

Reflection

After interacting with the Maker community, especially those who are not college students, I learned I am an incredibly fortunate person to have the resources that I have available to me now. For example, if I want to work on a project, there are many places that I could turn to, such as the Foundry in the art building at UT and the UTeach workroom in Painter Hall. I realized that not everyone has the luxury of having easy access to a place where they can make.

Patrick Benfield and the rest of the CO.LAB team has begun to combat this issue by creating a collaborative space

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classroom.

I think that as someone who initially did not want to join the program because I was intimidated, I can relate to students who doubt their abilities. For this reason, I would first start by trying to create a non-intimidating environment that welcomes people of all levels. I would do this by having my students explore what growth mindset is and what steps they could take to adopt that mindset. By doing this, they would see that failure is an essential part of learning, so they would not feel bad about not accomplishing tasks the first time. I would also give my students low-tech and high-tech options so they can ease into the world of making at their own pace. After they become comfortable with the idea of making, I would encourage them to challenge themselves and try new things.

Another way I would try to promote making is by acting as a role model. As a female STEM and maker educator, I have the power to positively influence my students' views on mathematics and making. I would share my story about how I became a Maker, which hopefully would inspire them to try making. Basically, I would tell them, "If I can do it, you can do it too."

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