Arami Rosales

Mouse trap cars!

5/6/2019 0 Comments

neering Design course, I had students create mousetrap cars! Students designed their side planes in inventor and used a drill press to manufacture their parts. They also crated custom wheels in inventor and laser cut..

Arami Rosales

needed to to accomplish their goals here. Fostering their curiosity has made them into makers and its made me incredibly happy to be the one to show them how exciting science and engineering can be.

0 Comments

Print Making and e-Textiles

4/14/2019 0 Comments

The last time I created my own stamp, I was in elementary school and it was for a mother's day gift. This time, it was used as a Maker aspect integrated into a circuits lesson with a focus on historical figures in STEAM.

nt engineer that gave us alternating current. I found an image I liked here and traced it on carbon paper making a sort of image before this step.

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told by taping on him.

0 Comments

Drones, Drones, Drones!

3/10/2019 0 Comments

This Maker Weekend Workshop focused on drones and the integration of drones into curriculum. I thought it was a lot of fun but I had a hard time figuring out where the making was at first. But then we broke out into stations, learning about different aspects of drones: effects of different propellers, constructing your own drone, creating and electromagnet! These stations showed how drones can be interdisciplinary and used in the classroom.

Arami Rosales

3/5/2019 0 Comments

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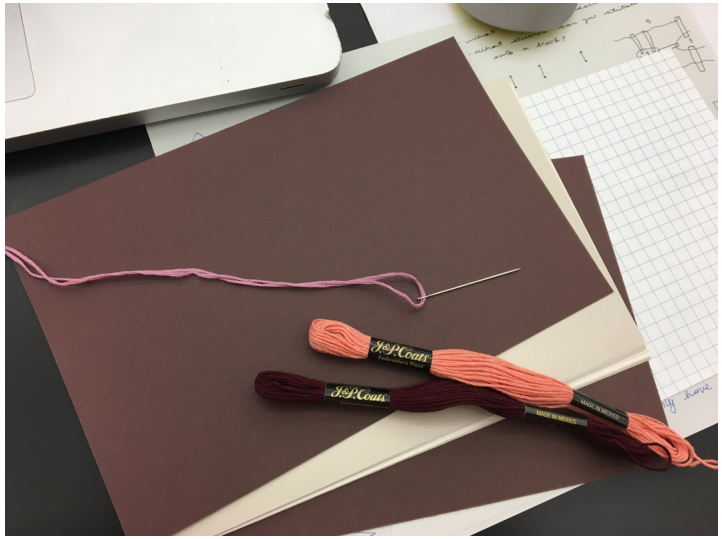
This is an amazing facility that will allow access people who probably have never experienced making in the classroom or at home because of lack of resources and funding. This will encourage more underrepresented adults to being making and hopefully introduce making to their children.

To find out more about Co.LAB Community Makers, please visit their website found here.

0 Comments

Mathematical Bookbinding

2/17/2019 0 Comments



At this weekend workshop, we learned the history and technique of bookbinding and how to integrate it into math lessons. Natalie was incredibly wonderful and showed us a tool she created to help design bookbinding so that they are achievable. Her tool can be found here.

Sewing and embroider helped me out with this project and all of the different bindings everyone else went with.

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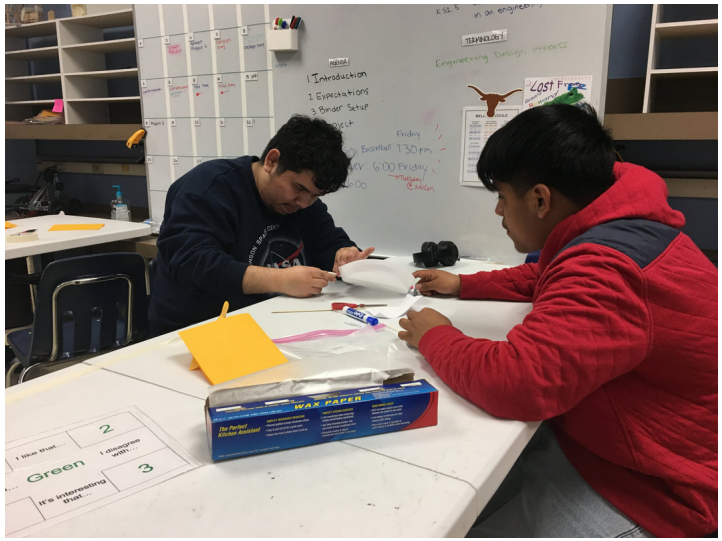
0 Comments

Making in the Classroom

2/11/2019 0 Comments



As a student teacher at Reagan Early College Start, I wanted to bring in more Making into the Introduction to Engineering Design (IED) course. IED heavily focuses on computer aided design (CAD), which is a form of making, but I have found that many students didn't see it that way.

To begin my time with them, I wanted them to understand the engineering design process away from CAD so that develop a true understanding for engineering before taking it back to a digital space.

Arami Rosales

2/2/2019 0 Comments

This was the last round of qualification matches for the season. The team did their best but unfortunately did not qualify to advance to the finals. However, they did learn a lot about the process in making award-winning notebooks, presentations, and booth setups. Hopefully this will help inspire them to set their expectations for themselves even higher next season!

0 Comments

Making Shirts!

2/1/2019 0 Comments

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For our FIRST Technical Competition, we wanted to have team shirts -- however, we found that a simple shirt would run us up to $500! As a cheaper alternative, we decided to make our own. As the co-coach, I took on this responsibility so the team members could focus on improving their robot design and practice driving!

Luckily, Reagan has a vinyl cutter and a t-shirt heat press so all it took was a little bit of research on how to use both. I had a fun time learning how to make these shirts and the end result turned out pretty well!

0 Comments

FTC Scrimmage at Vandergrift

1/31/2019 0 Comments

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lifting mechanism designed to work during both autonomous and driver controlled periods of competition.

More about FTC can be found here.

0 Comments

Dobie Middle School

1/25/2019 0 Comments

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Robotics competition robots from previous years.

0 Comments

<<Previous

Arami Rosales

Hi! I'm Arami. I am an Engineer - in - training / teacher - in - training! I love making and being creative. I love taking photos and hope to showcase my Maker experience on this website.

If you have a comment or concern, please email me at aramy@sbcglobal.net

For more information about UTeach Maker please visit this site.

Archives

Categories

Arami Rosales

Arami Rosales

Everyone can be a Maker, your curiosity just has to be fostered.

Arami Rosales

That's me circa Fall 2018 before my very unfortunate haircut. I made that waterfall necklace over the course of several days and it was a pain in the butt. Even though it wasn't perfect, and even though I don't have many occasions to wear such a statement piece, I am very happy that I didn't give up on completing it.

ining (EIT), a teacher-in-training, and most importantly a Maker. These identifications are rather new to me. When I was I always thought that to be an engineer you had to grow up taking electronics apart and putting them back together, and

Arami Rosales

like I lacked an inherent skill for tinkering. It made me wonder if my students felt the same. This encouraged me to reach out and try to understand my student's personal views of themselves as Makers.

I don't think I every associated myself with engineering until I entered middle school. In middle school, I found my passion -- Science Olympiad. Science Olympiad is a national science competition where teams of 15 students compete against other schools in 23 different events ranging from academic tests to engineering. SciO made me realize that even though I never tinkered as a child, I was still capable of teaching myself how to create and engineer. It allowed me to explore different fields and styles of engineering. It made me more confident with the idea that I could be an engineer some day. It allowed me to take ownership and agency of my educational direction.

I participated in SciO form 7th to 12th grade. In that time I learned about the engineering design process, managing failure, and team work, but the greatest thing I learned from SciO happened after graduating high school. After graduating from high school and entering college, I continued to work with SciO teams in Austin as a Mentor. I was so grateful for what Scio gave me, that I wanted to give something back. Working with passionate and motivated students made me realize that teaching was something I wanted to do. I loved engineering but teaching students how to solve an engineering problem is so incredibly rewarding.

When I heard about UTeach Maker, I knew I had to get involved. I love engineering and I love teaching, being a Maker just made sense. To me, Making means building/constructing/creating anything. It is taking something that you have imagined and creating it so it exists in the physical/digital world. I think Making happens every day. From latte art to construction sites, every day we are making something new.

When I was in SciO, I found that I felt more connected with the physics behind engineering because I was the builder. I was the one who owned a design, I was its creator. That ownership gave me the drive to continue to learn and push my design to be better. I think this ownership could go a long way in the classroom too. Having finished Classroom Interactions where I taught a project-based-lesson, I think Making is integral to teaching.

Though it might be impossible to make every lesson hands on, I would love to incorporate all styles of making into my physics classroom. I don't want my students to be limited to motors and levers. I want my students to understand that all people are have the ability to make. Art and science can go hand in hand.

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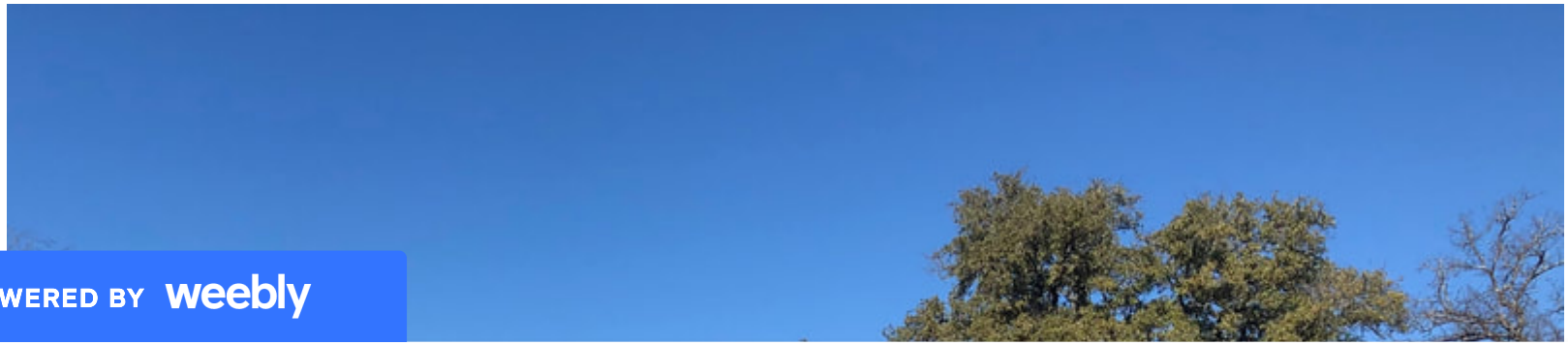
Community

I first acknowledged myself as a Maker through after school extracurricular activities: Science Olympiad and Robotics. As a Maker and an educator, this was the place where I wanted to extend my abilities and create a community. I wanted to give back to the organizations that truly made me the Maker I am today.

I was fortunate enough to be able to work with Reagan Early College High School's First Technical Challenge Robotics Team #5764 The Blue Sabers. This robotics team was an interesting assortment of sophomores, juniors, and seniors experiencing different stages in life. Some kids came from stable households and others didn't. Some were part of the "popular" group while others weren't. These kids were all very unique but the things that brought them together were their interest in robotics, their competitiveness, and their creativity.

I am so grateful that Reagan is able to support this type of community. Outside of this extracurricular activity, which is free for the students to participate in, many wouldn't have had the opportunity to experience Making anywhere else. 88% of the students attending Reagan are economically disadvantaged. Their families have to finance necessities before curiosities that could spark their child's interest in STEAM.



Arami Rosales

FTC Team 5764 from Fall 2018 to Spring 2019

Though being able to offer this experience to students after school is amazing, many students cannot attend after school programs because they have to work in order to [illegible]e of their siblings. This is why I am so passionate about bringing Making into the classroom. Being a FTC Coach was an [illegible]dents the same access to making as my robotics kiddos.

Arami Rosales

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Maker Projects

Creating a Maker project was somewhat tricky for me. I had a hard time identifying what could **count** as a Maker project. I am a jeweler by trade -- I do both metal work and delicate beadwork. Though these are both things that require a high level of skill (and time... and money...) I didn't see them as worthy as being a Maker project. It annoyed me a bit. These are skills I have been developing over the years yet I didn't want to show them off as a Maker project because I was afraid of being judged.

For some reason, I had it set in my mind that a Maker project had to include electronics or the use of high tech machinery. Beading in comparison felt laughable so in the end I went with the embroidery project I created for my Physics by Inquiry final. It was a copout and at times I still feel as though I was not true to myself. Though I do love the embroidery project, it wasn't 100% me. I want to believe that everything can be making but I didn't take it to heart... so at least here I can display some of the work I wish I were brave enough to show off to the rest of my Maker community.

Embroidery

Embroidery has been a new hobby of mine. I discovered it at the first Maker Playground when one of my peers brought their project to show off. It was beautiful and definitely inspired me to try it out.

Over the next several months I played more and more with types of stitches and materials that can be used to create beautiful designs. I find the process to be soothing.

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When I was in an awkward phase of deciding what to do with my life, I decided to take a metal arts class at my local community college. In this course, I learned the basics of jewelry making: how to use a saw and file, how to transfer designs, and how to polish a finished product.

When we were in class, our professor often worked on his own projects and I saw him making this copper bangle. It was a simple forged bangle but making it just right took a lot of effort, so of course I wanted to try my hand at it too.

Other Projects

These projects are not as fleshed out as my Maker projects but are projects very dear to my heart.

Beading

ung with really easy patterns. None of my old jewelry was pretty enough to wear out of the house, but I still own it. Seeing
g and weaving skills. I still make mistakes but having the confidence to continue to push myself and my designs. I have the

Arami Rosales

Arduino Mega

During my UTeach internship at Travis High School, working with Mrs. Reyes' robotics and engineering course, I gain brief insight into Arduino based curriculum. I have heard about Arduinos but I never had played with them, so as a TA I felt a little useless. For my main Maker Project, I want to use the Arduino Mega 2560 as the main focus of any design.

To start, I purchased the Elegoo Mega 2560 Most Complete Kit which can be found here. Using this kit, I am following the MOOC Introduction to the Internet of Things and Embedded Systems offered on Coursera. Hopefully, by familiarizing myself with Embedded Systems and the Arduino, I can come up with a great project.

Arami Rosales

Embroidery

For my Physics by Inquiry class we were required to create some sort of device showcasing what we learned about circuits. Below is a description of my product -- and embroidery project using a TinyLily to power blinking LEDs -- which I presented too my peers.

The Materials

LilyTiny bard x2: https://www.sparkfun.com/products/10899
LilyPad LED Pink (5pcs) x2: https://www.sparkfun.com/products/14010
LilyPad Coin Cell Battery Holder w/ Switch x2: https://www.sparkfun.com/products/13883
Conductive Thread: https://www.sparkfun.com/products/13814
Coin Cell Battery
Embroidery hoop and supplies found at Joann's Fabrics.

The Product

Wearable or sewable circuitry is pretty new in the grand scheme of electronics. When we were first given the opportunity to select a project, I knew this was the avenue I wanted to take. I decided to incorporate sewable electronics into my hand embroidery projects which we're getting kind of stale.

All of my hand embroidery projects have been of flowers so I figured that adding in LEDs somewhere might spice things up a little. When I found LilyPad I was instantly drawn to the pink LEDS they had available and I went from there. My design was inspired from my first embroidery project: a large central flower surrounded by smaller florets. Finding a place to add in LEDS seamlessly was a bit trickier. I wanted them to feel natural whilst still showcasing the incorporation of electronics with a traditional hand-working technique. The design I came up with can be seen in Figure 1:

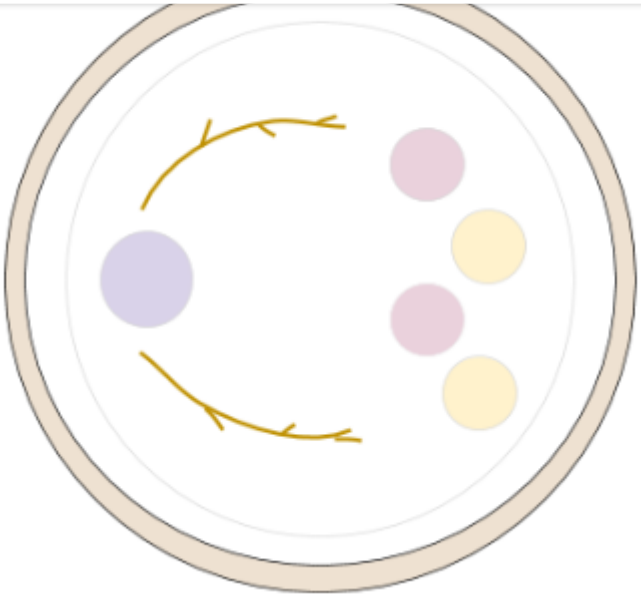


Figure 1: Original embroidery project design

Instead of using standard embroidery fabric, which is usually tightly woven fabrics, I wanted to use a lighter cotton material that had a nice print to it. I had never worked with this fabric type before, so when I began embroidering, I found that I hit my first road bump. Since the fabric was very light and the weave wasn't very tight the weight of the material I was embroidering cause too much sagging. I had to find a way to stabilize the material or switch over to a more plane (but traditional) embroidery fabric.

Since I didn't have stabilizer, I decided to double up my fabric. In hindsight, maybe a third layer would have been nice too. I was able to get enough stability that my flowers looked quite nice. The flowers are done using a woven wheel stitch, the small blue accents are a french knot, and the branches are a chain stitch. These are all very basic techniques but I've only been hand embroidering for a few months.
Once my design was complete, I decided to tackle the placement of my electrical components. I figured that the pink LEDs would look like cherry blossoms off my branches, so I was set on using them there. However, I didn't know where I wanted my battery and microcontroller. Figure 2 shows the final layout of my electrical components.

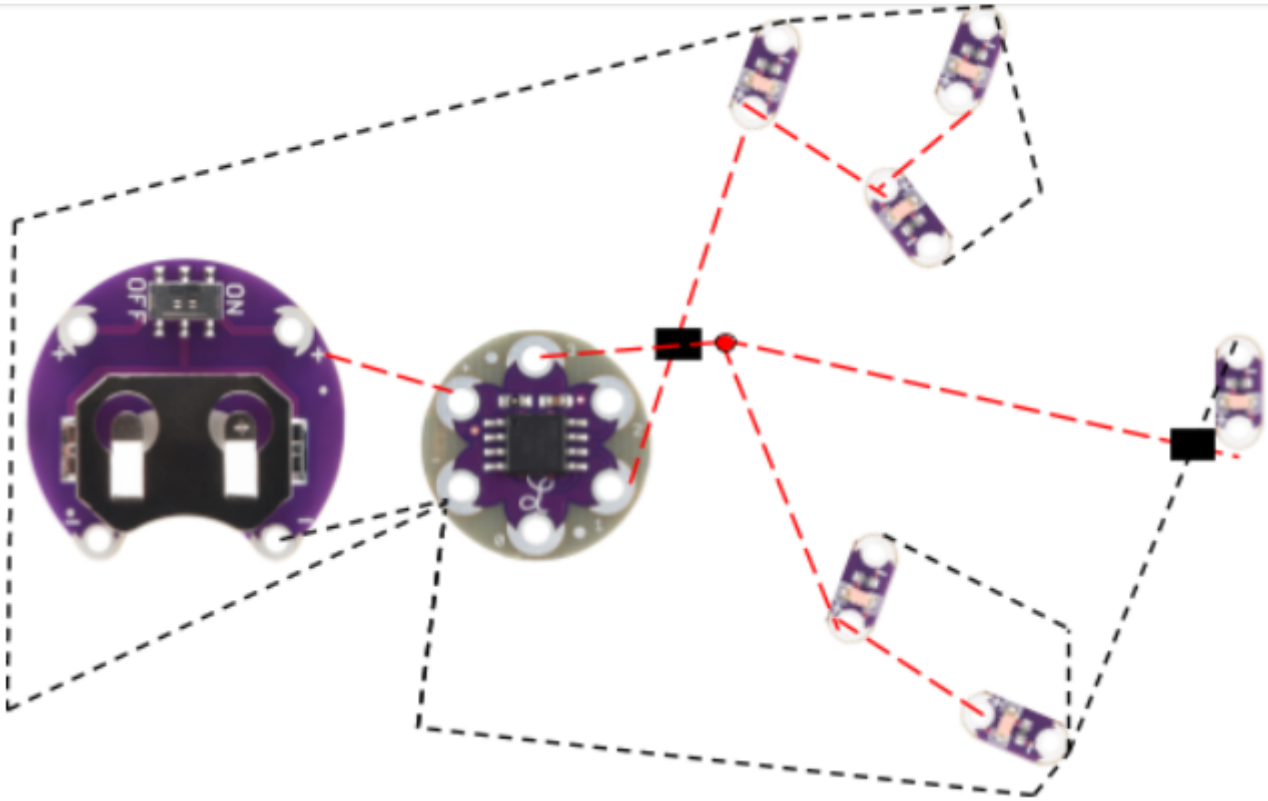


Figure 2: Layout of electrical components.

If I were smarter about it, I would have laid out my LEDs and found a nicer way to sew them in. Instead, I went straight for the sewing because I was too excited to sit there and plan things out first. The second layer of fabric ended up coming in handy here too. Not only did it add stability, but also gave me a place to sew in my conductive thread so it wouldn't be visible on my design.

I got all of my pieces connected and my battery inserted, but when I flipped the switch, nothing happened!

I took a step back and used my leftover electrical components to figure out where I went wrong. I first sewed in my battery holder and my microcontroller but instead of sewing in my LEDs, I used wires to make sure that my connections were correct. This can be seen in in Figure 3.

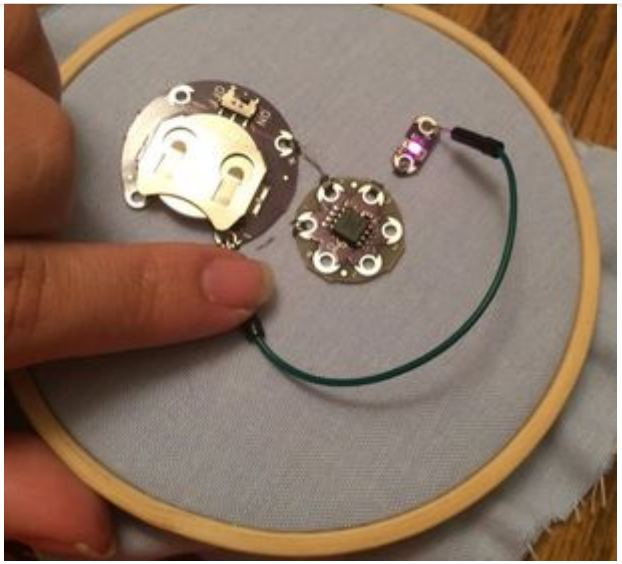


Figure 3: Testing to make sure the LED worked. In this picture I'm touching the negative lead of the LED to the negative lead of the battery cell holder, but I also tested it on the negative lead of the microcontroller too.

The difference between this trail and the first was that I added duct tape (the best tool for all of engineering) to my conductive thread to act as an insulator. That's all it took, a bit of duct tape!

Going back to my original project, I did the same thing of insulating my wires to make sure there was no shorting. This can be seen in Figure 2 represented by the black squares in the image. All it took was a simple fix, and the lights began to blink!

The Components

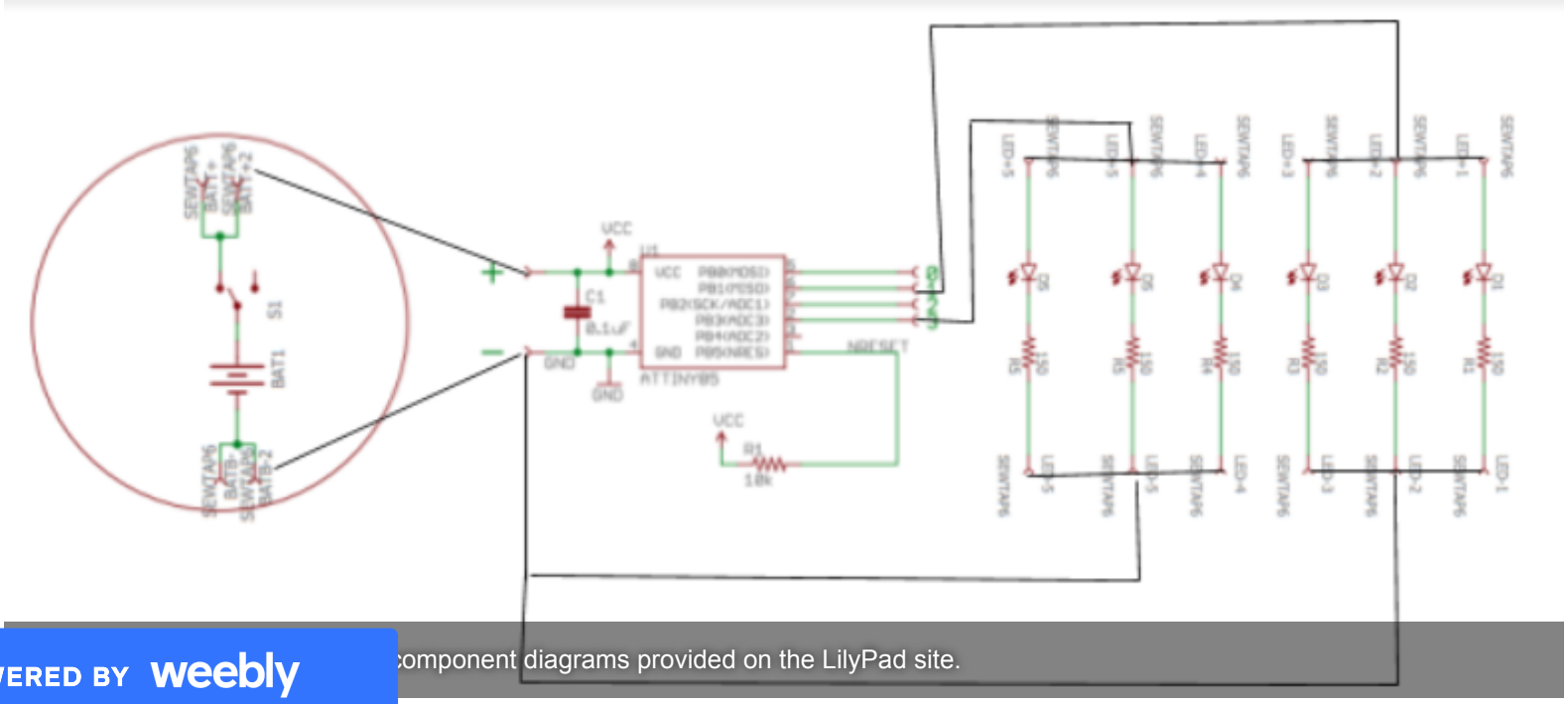
LilyPad offers a wide range of sewable electronics. I was most interested in incorporating the TinyLily into my project because it offers great diversity and an ability to take the learning a step above. The TinyLily is a microcontroller that is programmed with different settings that will allow your lights to blink at different rates. It can also be reprogrammed, though I did not have the SparkFun ISP Pogo Adapter necessary to do this.

on my trial run embroidery hoop as seen in figure 4. I found that by running each of the four positives lead of the LEDs to

I had two groups of three LEDs each. The three LEDs in these groups were connected in parallel with all positive terminals leading to a positive terminal on the microcontroller (1) or (3). Then their corresponding negative terminals would be connected and attached to the negative lead of the microcontroller (-). The two groups are in parallel with each other. The final schematic of the design can be found in figure 6 with larger individual components seen in figures 7, 8, and 9.

I chose to keep my lights in parallel instead of in series, because I didn't want to run the risk of the entire branch dying out because of a single dead LED. I also wanted to make sure that each LED was as bright as possible, so keeping them in parallel would ensure that they received the same voltage as the battery. Because LEDs have direction, I had to keep that in mind when forming my connections, keeping positive to positive, because diodes only allow current to flow in one direction.

The largest variable was the TinyLily microcontroller. The microcontroller contains a resistor that allows for the variation in light output. I don't know exactly how it works. Because of this microcontroller, I'm not sure exactly how to calculate the current or voltage running through each LED, especially since resistance is variable (to allow for the fading of light).



omponent diagrams provided on the LilyPad site.

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Metal Art

Forging a Metal Bangle

Arami Rosales

Materials:

- AWG 0 or 2 bare copper wire
- Silver or Copper solder

Tools:

- Jeweler's saw
- Set of files
- Rubber mallot
- Steel bracelet mandrel
- Torch
- Ball-peen hammer

Measuring

Bangle bracelets are usually a solid piece with no moveable parts. They should easily slip on to your hand and fit loosely around your wrist. To ensure that the bangle will slip over your hand, use a tape measure to measure the circumference of the largest part of your hand when your pinky and thumb are touching (see image to the right). This will give you the smallest inner-diameter that will fit around your hand.

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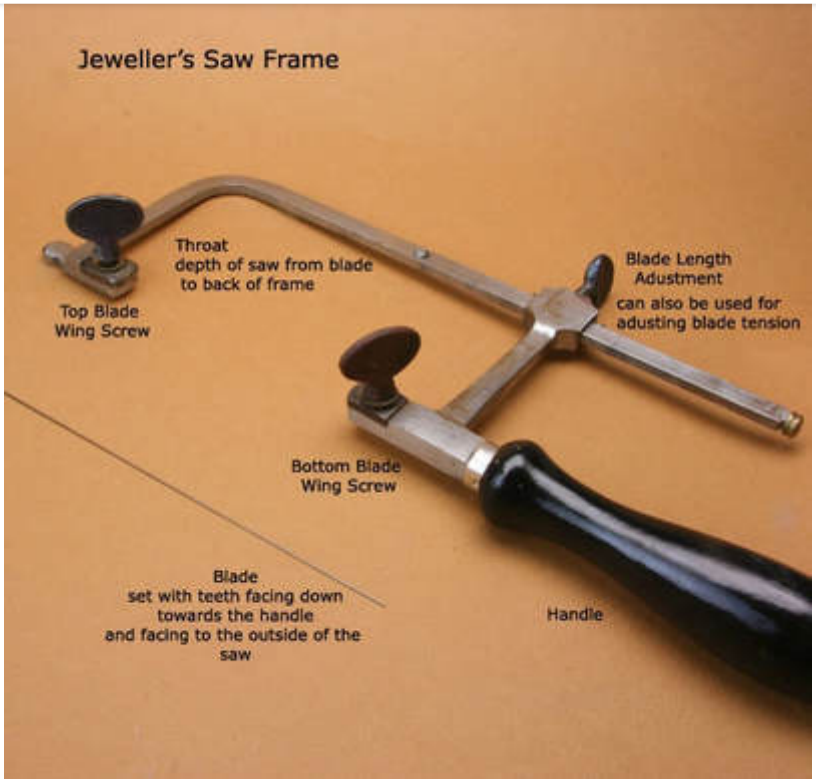

Sawing

Jeweler's saws usually consist of an adjustable frame and thin blades with downward facing teeth. These saw blades are incredibly fragile and snap very easily if not used properly. When handling a saw, ensure that your wearing safety glasses are are properly alert.

For this bangle, cut a section of the bare copper wire half a centimeter larger than the measured inner circumference. This will give you room to ensure that the ends of the copper wire meet for a proper solder point.

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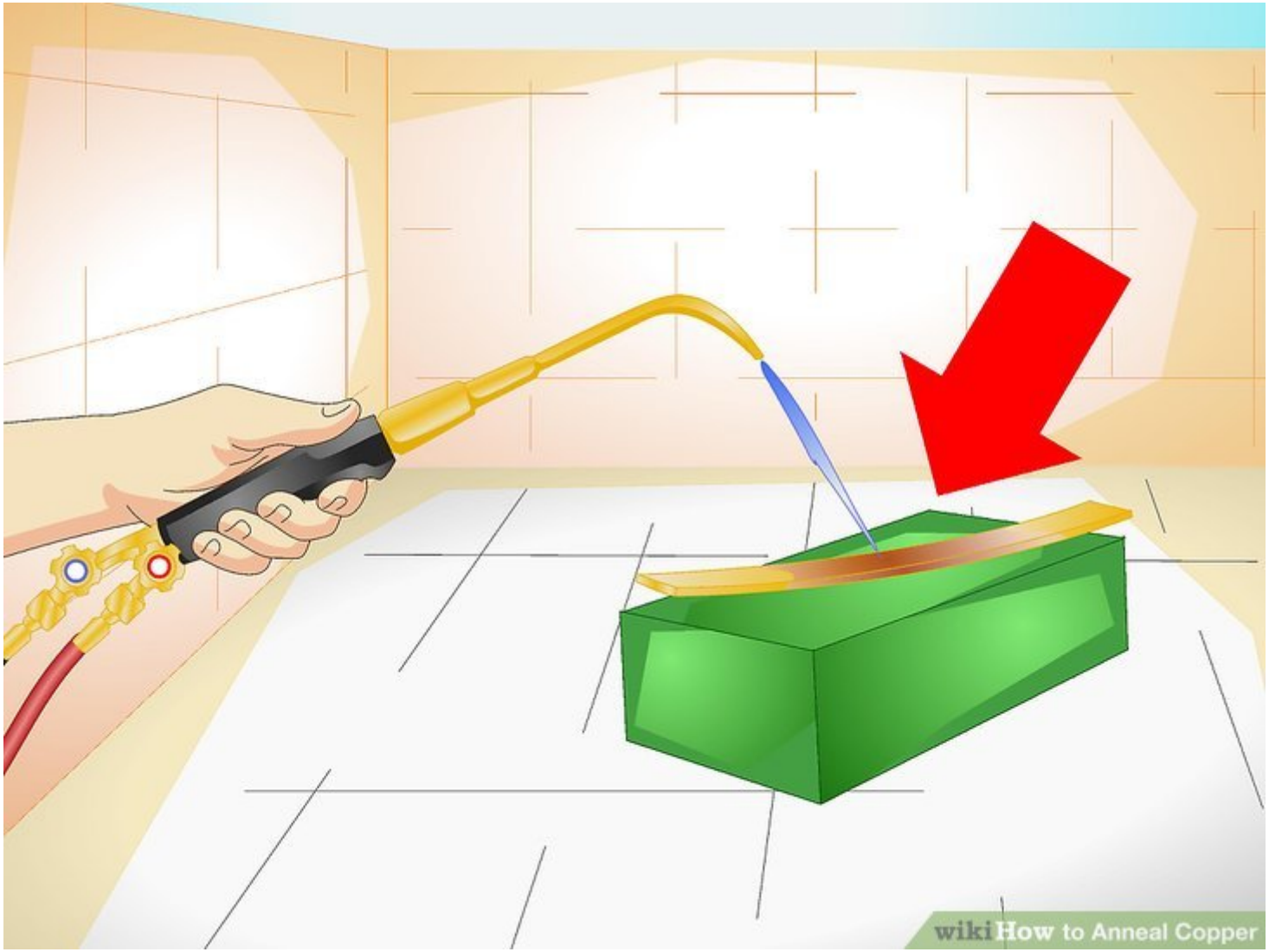
Annealing is a process used to soften metal, making it more malleable. It is done by heating the metal up (usually to the point where it reddens) and allowing it to cool slowly. In workshops, this is done by moving a torch flame evenly across the surface of the metal. For silver and copper, the cooling process can be accelerated by quenching the metals. Note that different types of torches (propane, acetylene, butane) will heat the metal at different speeds. Always follow safety procedures when using a torch and make sure you know the location of and the operation of a fire extinguisher before starting.



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Now that the copper wire has been annealed, it is soft enough to form into a roughly circular shape so that the two ends meet. The ends should be completely flush with each other, so if one end is not smooth and flat, use the file to fix it. The shape does not matter right now, as we are just trying to form a rough loop.

Using silver solder will show the seam as it is a contrasting color to the wire, so one could opt to use copper solder instead. Note that silver solder has a much lower melting point than copper solder, and such, will melt much quicker. In order to solder, lay down a bit of soldering flux, and a small piece of solder. Using your torch, make circular motions heating up the metal around the solder. This will ensure that your solder does not fly off. Once the older flows to fill the gap, you are ready to allow your bangle to cool once again.

Place your loop on a circular bracelet mandrel. These mandrels are usually incredibly heavy so use caution when handling them. Using a rubber mallet, start shaping your bangle into a circular shape by evenly pounding on all sides of bangle. This will give you a nice, chunky, bangle. However, in order to get a forged look, use your ball-peen hammar to form an almost square like outer section.

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Annealing usually lives your metal discolored and ugly. To finish this piece off, we are first going to remove the discoloration. This is done by placing the bangle into an acidic bath called 'picking solution.' When removing the bangle form the solution, it is important to use copper tongs as the acid bath can cause a chemical reaction with other metals. Place the bangle into a basic solution to neutralize the bath, wash off, and path dry.

For a nice shine, using a polishing wheel and red rouge polishing compound, buff for a high shine finish.

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The History of my Beading Life

out of the house. The beads never laid how I wanted them to or the fit was wrong... but I never quit on it and I never threw a piece away. As I started to grow up, my ability to manipulate small beads and follow patterns increased. I became more confident in myself and tackled harder, and more time consuming, projects.

What I loved about this was that it forced me to learn how to be patient with a project. Sometimes a design didn't look beautiful until the end so I was always encouraged to finish a project.

Pendants

After becoming more confident with basic string beading and netting, I worked my way up to cabochon pendents. Cabochons are usually domed on one side and flat on the other but I didn't have any in my beading collection. Working on these pendents helped me push my creativity a bit further by identifying different beads I could replace cabochons with. I had to learn to work with the material at my disposal and how to alter designs to fit the shape of my "cabochon".

These pendents were a pretty big stepping stone for me.

Arami Rosales

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Rings are a challenge. Sizing rings is always a bit tricky. I first started to identify how to size a ring by creating simple bands with lattice or flat right angle weave. I found that the bead size impacts the ring band size and worked from there. Sizing became more complicated, however, when you added a large, intricate, weaved design as the center piece. Using the skills I learned from bracelet making, and the basic rings I had created before, I was able to modify designs to make craft rings suited to my taste and in my size!

Necklaces

Necklaces were very intimidating tome at first. They require a significant amount of dedication of materials and time. I started with basic right angle weave bib-style necklaces. Though they were time consuming, the patters were simple and repetitive, making them relatively easy to complete. For more intricate designs that included bead weaving, and using beads of different cuts and sizes, I had to take into account how those differences would influence the entire shape of the necklace. For the most part, a lot of this was trial and error. A lot of time was also spent on youtube watching loads of jewelry designers tutorials.

My most intimidating piece was a black bib necklace with a cascading affect. Keeping track of what bead when ware and working out the math to make sure each strand fell exactly where I wanted it to was difficult but it is the piece I am the proudest of.

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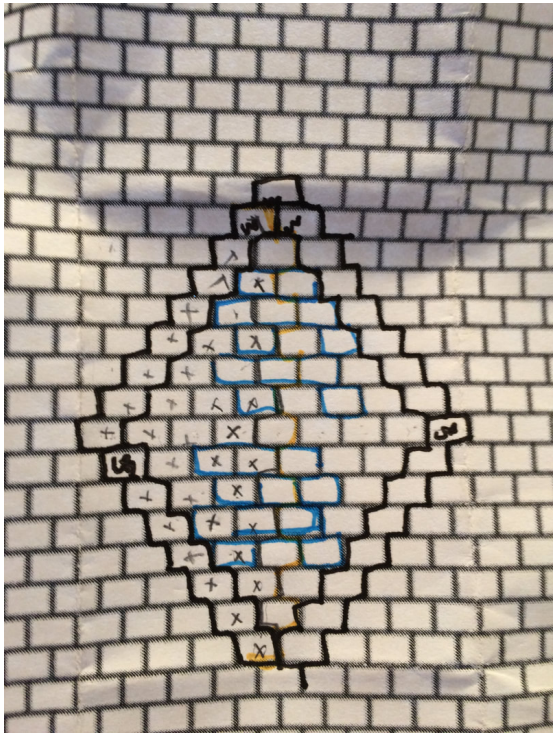

To take my beading further, I decided to tackle 3D shapes. For Christmas this year I made puffy star ornaments. Creating a pattern for the ornament itself was a challenge, but creating the pattern for the personalization was even more difficult.

I used brick-grid paper to draw out the design I wanted and used it to ensure I was weaving in the correct color bead into the ornament. The biggest hurdle was realizing that the "RR" had to be beaded in two separate halves and then weaved together.

Overall, I am incredibly proud of this design. It took several tries to ensure the customization was done correctly but I'm glad I kept pushing through the obstacles. My mentor was very happy with his gift!

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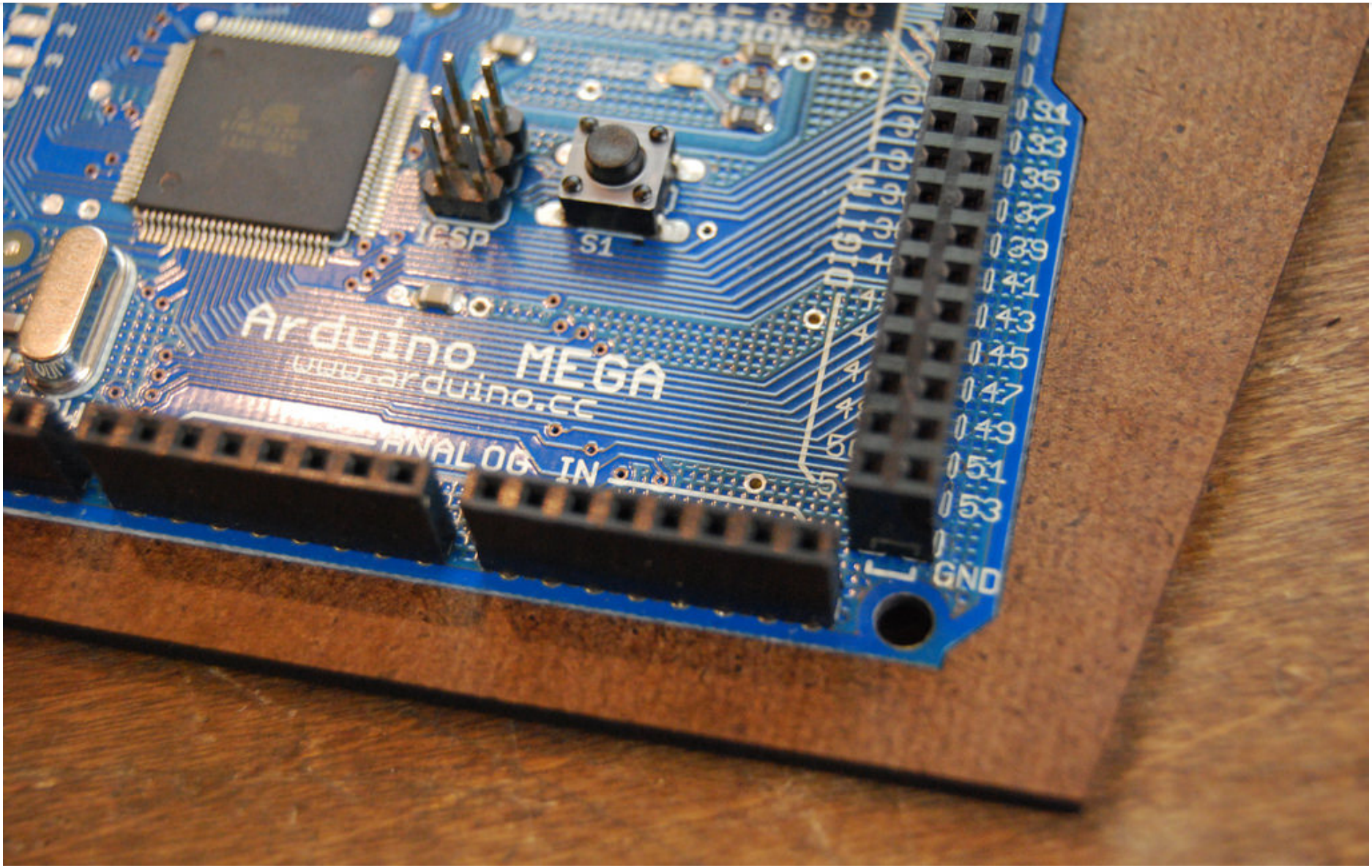
The Arduino Mega

Arami Rosales



Arami Rosales

6/27/2018 0 Comments

Not too long ago I purchased an Arduino Mega 2560 from Elegoo Industries and promptly left it to sit next to my desk for far too long. Today, I decided to give it a go. The kit I purchased form Elegoo is pretty great. It has loads of sensors and buttons and things to play with, but having no understanding of Arduino at all, I decided to start from step 1 of their resource guide -- making a light on the board blink.

Getting started wasn't too bad. Arduino has some prepackaged code you can download and play with. Getting familiar with the coding is probably going to be my biggest struggle. Instead of commas or period you end "sentences" with semi-colons and you have you have make sure you have a setup function to tell the board what you are programming and what you want it to do. This all wasn't too bad.

The language used to write programs (also referred to as "sketches") reads like simple english and is based off of C/C++ functions... Maybe it would be useful to try to learn C but right now, I'll just stick to running through the examples Elegoo has... hopefully some of the language grammar will stick.

Anyways, the first program is to write a code that makes the L-LED blink. Writing the code wasn't too bad because it is written out and explained directly in the manual, so a deep understanding of the code wasn't necessary. I was able to write out the code just fine and it looked like this:

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I kept getting the same error over and over again. At this point, I was rather tempted to quit altogether. I had installed the software as explained, I wrote the code exactly as directed, but still no luck. I spent a some time trying to search the internet for different solutions to my problem but nothing really helped. I kept reading things about "system profiler" and "ports" but nothing really made much sense to me. I wonder if this frustration has caused other people to give up on these types of things.

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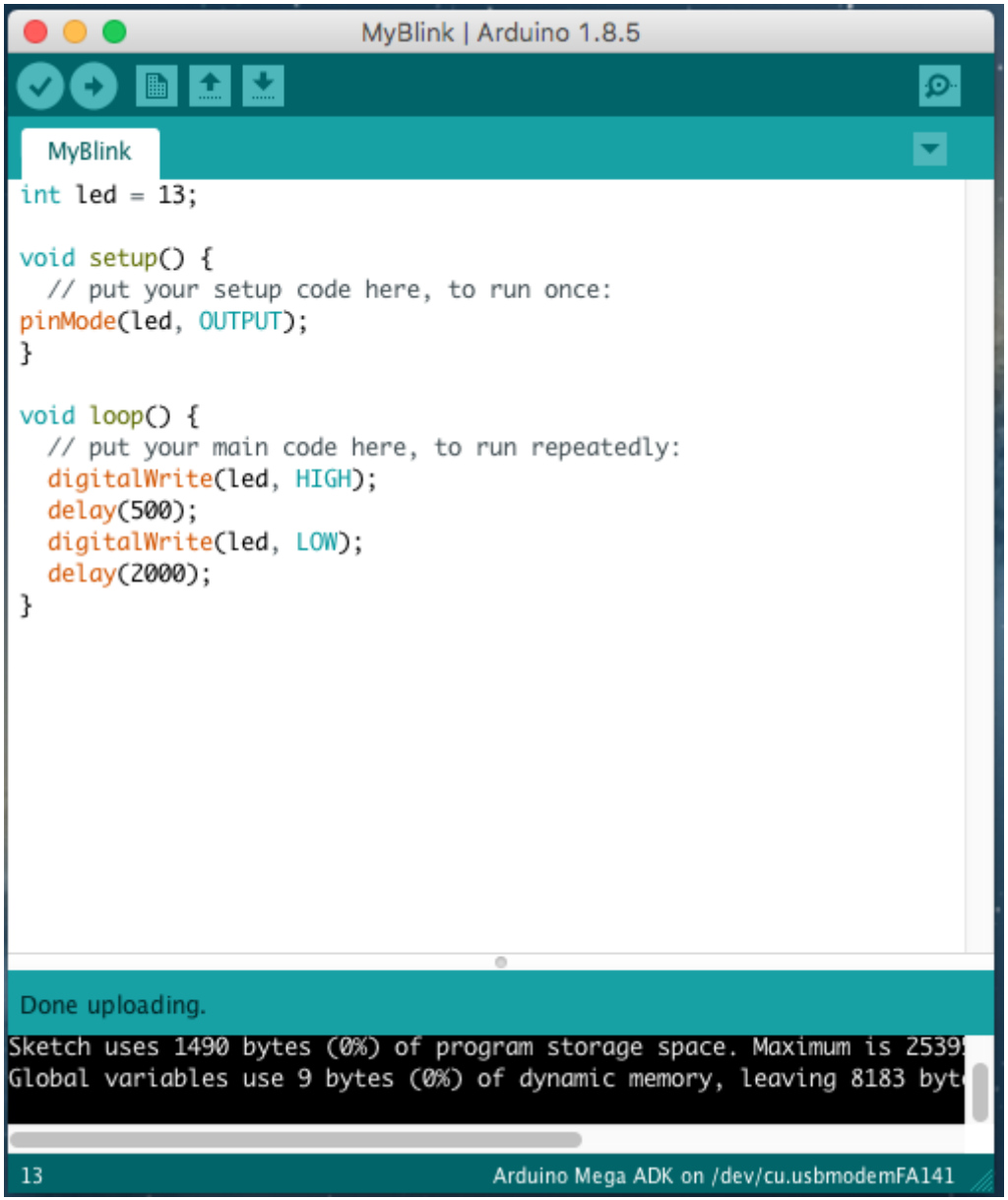

and was not necessarily a high level project. I did just follow written direction, however, this small project did teach me

Arami Rosales

0 Comments

The Art of Arduinos

This blog is meant to help me keep track of my progress in understanding the Arduino Mega.

Archives

June 2018

Categories

All

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Arami Rosales

Maker Lessons

Creating a lesson plan that not only covers the required state standards but also allows for student ownership over their own education is incredibly time consuming but every bit worth it. During my time as a UTeach student, I worked on creating 3 different Maker lesson plans to implement in different classrooms with different groups of students. Each of these lesson plans took weeks of preparation to create, went through multiple rounds of revisions, and experienced same day alterations! They each strived to have students create an end product that represented their understanding of the topic at hand while giving students the ability to create a unique and personalized item.

Implementing these lessons was also tricky. Project based lesson plans can take a long time to facilitate in the classroom. Most of these lessons that I've created take 3 or 4 class days to deliver the bare minimum of the experience and up to 7 for the whole shebang. A lot of academic calendars simply can't fit these types of lessons in. Additionally, each of these lesson plans has a set of materials required along with it. If a teacher does not have the funding for these materials, projects like these might not be possible.

I was lucky enough to be in an environment where time and money were not the end-all-be-all of teaching. This might not be the case when I enter my own classroom, but it was an incredibly valuable experience to see my students flourish while working on these lessons.

Student Teaching

During my Apprentice Teaching semester at Reagan Early College High School, I had the pleasure of working with Mr. Eric Shaffer teaching Introduction to Engineering Design. This course is a Project Lead The Way class and had been taught with an emphasis on digital making using computer aided design.

Most students did not value the experience of digital making. They did not see how it could be applied to their lives. So I took a step back and started from scratch. First, I showed them that they are Makers -- building their resilience against failure by having them complete small projects using tools and supplies they are used to. Then we traveled outside of their comfort zone by using power tools to make mousetrap cars.

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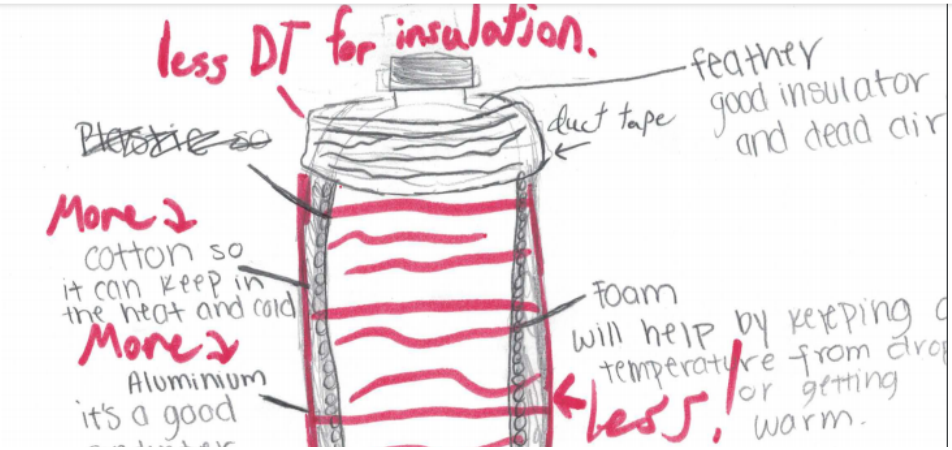

Project Based Instruction

Project Based Instruction and Making go hand in hand. In order for students to understand the significance of the laws of thermodynamics, they first made their way through 3 stations. Each station allowed the students to take data and analyze it in order to draw conclusions about different types of heat transfer.

Once students had a firm grasp of the methods of heat transfer, they were tasked with designing and building a thermos out of recycled or household items. The images on the left are of two such designs. The students then constructed their designs and tests their ability to retain heat!

More about this lesson can be found here.

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Classroom Interactions

My Maker Education Lesson Plan was created in Classroom Interactions and delivered to Mr. Gurany's on-level physics class.

You can find the lesson plan for teach 1 here. This lesson focused on the understanding of magnetic field lines. This lesson also taught students how to create their own electromagnets.

Lesson 2 can be found here. In this lesson, students learned about MagLev Trains and were challenged to build their own.

Additional Roles as a Maker Educator

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Reagan Engineering and Design Internship

This semester (fall 2018), I have had the pleasure of working with Reagan's engineering department. Here, I have worked with a freshman class in their Introduction to Engineering Design course. In this course the students have focused on learning how to navigate Inventor.

I have also been working with seniors on their capstone course. They have been challenged to design and build anything that can be programmed using a raspberry pi. The seniors have decided to build a retro-arcade!

Travis High School Internship

At Travis High School, I had the opportunity to TA for Mrs. Reyes' engineering classes. In these classes, students worked on a variety of different projects raining from Arduino programming to wood working. It gave me tremendous insight into the incorporation of Making in the classroom.

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Mentoring

My teaching experience began with mentoring LASA Science Olympiad which eventually turned to me mentoring Kealing and Anderson Science Olympiad... Which eventually lead to me mentoring Kealing BEST Robotics.

The Integration of Making into Project Based Instruction

The Course

Project Based Instruction is a course that UTeach students take the semester before Apprentice Teaching. In this course, we learn about the importance of project based instruction and the integration of PBI into transitional classrooms. Over the course of the semester, we complete several readings about PBI, conduct classroom observations, write a PBI lesson, and teach that 3 day PBI lesson in a real high school classroom.

My experience with PBI was a bit different than most. I was given the opportunity to teach my 3-day lesson to 3 sections of students instead of just a single class. This gave me a lot of opportunities to see where improvements could be made in the lesson an in my own personal teaching style.

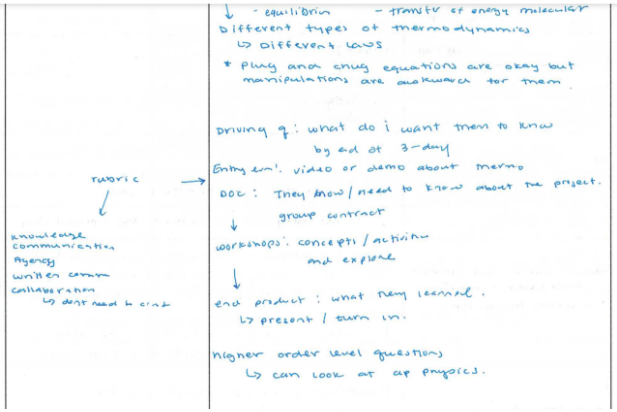
experience, the pre-service science or math educator will be able to:

1. Describe the essential features of PBI.
2. Ensure that all students have an opportunity to learn by creating an equitable and inclusive learning environment that takes advantage of students' funds of knowledge and perspectives.
3. Design and teach a multiple day lesson that includes objectives that are clear, relevant, meaningful, culturally-relevant and is consistent with the essential elements of PBI.
4. Design a two-week unit of instruction for use in a secondary math and/or science course that is (a) aligned with the TEKS, (b) supports campus goals and district goals, (c) includes an assessment that is congruent with the objectives of the unit, (d) culturally-relevant, and (e) consistent with the essential features of PBI.
5. Participate in the teaching practices of planning for engagement with core ideas and science or mathematical processes, supporting on going changes in student thinking, and using tools and routines to foster productive talk, reading, and writing.
6. Integrate opportunities for students to read during lessons and foster reading comprehension by using pre-reading strategies, interactive reading strategies, and facilitating text-based discussions.
7. Evaluate and critique a unit of instruction in terms of its alignment with the essential elements of PBI and then make suggestion for way to improve it.
8. Create a significant portion of their preliminary portfolios and demonstrate beginning competency as measured by applicable teacher certification standards, including the Code of Ethics and Standard Practices for Texas Educators (see https://austin.uteach.utexas.edu/current-students/portfolio)

The Start of the Lesson

In order to create our lesson, we first met with our mentor teacher at Manor New Tech High school. She provided us with the topic we were to tackle with the students: The Four Laws of Thermodynamics. I had two amazing partners who allowed me to suggest we turn this lesson into a Maker Project for the students. Focusing on creating a mind-on, hands-on, project we began tossing out possible ideas before settling on the creation of insulated mugs.

With our central product created, we began formulating our lesson plan. A draft of our lesson plan with annotations indicating necessary corrections can be found here. The main feature we missed in our initial draft was the inclusion of scaffolding events that could be used to help students better understand how heat transfers. However, with those included, a lesson plan that integrated Making and PBI was created.



The Driving Question

What materials should be used to keep liquids hot ?

The students were first given the driving question which would motivate the 3-day lesson: "What materials should be used to keep liquids hot?" Having the students constantly see this driving question allowed them to frame each activity according to the project at hand. In order to make this lesson both PBI and Maker, the students would learn about heat transfer and apply that understanding to the making of a device that would be tested and analyzed for its efficiency.

Day 1: Scaffolding Events

Before students could construct insulated travel mugs, they first needed to learn how heat transfers. They accomplished this by visiting three stations and running small experiments that highlighted either convection, conduction, or radiation. Here, the used multiple types of technologies to measure temperature. They used vernier temperature probe, temperature guns, and standard thermometers to understand how different tools perform best under certain conditions. With this knowledge, students were able to discuss where each of these heat transfers might occur in a travel mug and how they might be used to conserve heat.

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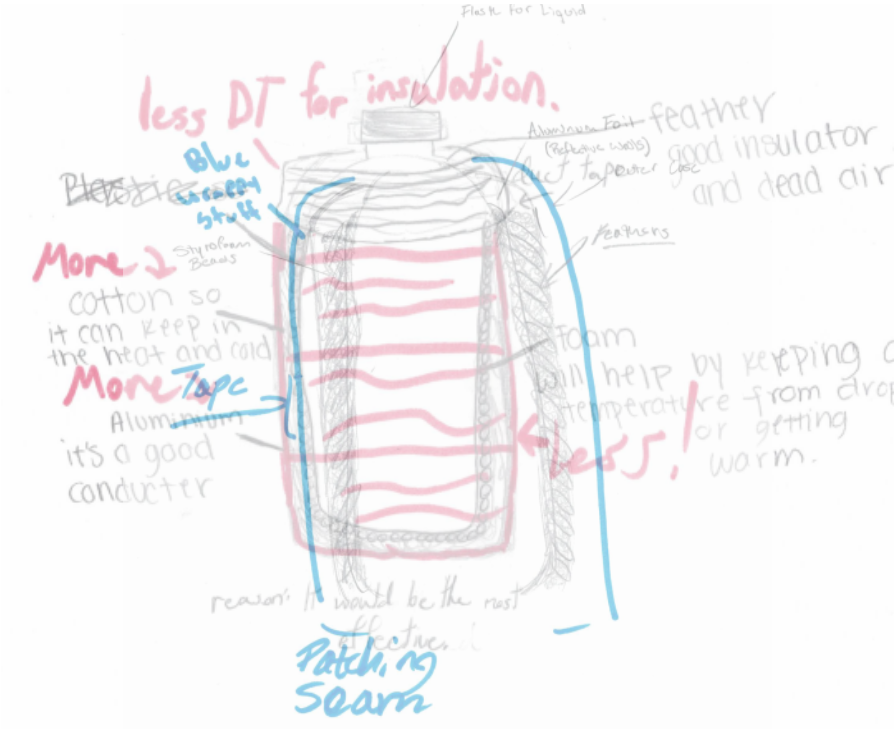
1. Set up 2 thermometers each 50 cm from identical hot plates but on opposite sides of the heat sources.

2. Set up the fan to direct air flow across one of the hot plates towards its thermometer.

3. Turn on the hot plates and fan and begin recording temperature at 1 minute intervals.



Day 7: Test and Redesign

Day 2: Design and Construction

After a brief discussion on what students explored at each station (how heat travels through convection, conduction, and radiation), students designed their first attempt at an insulated thermos. They were given household materials to use including plastic bottles, foil, tape, packing peanuts, etc. Their designs required to have descriptions of how they believed each material would impact their design.

On the third day the students tested their designs. Using a hot plate to heat water up to 70C, we poured in the hot water in their their insulated thermoses and placed a temperature probe inside the bottle. The students recorded the temperature of the water for 10 consecutive minutes. We compared their data to that of hot water placed in an open Styrofoam cup, a regular cup, and a YETI. The students discussed the how their designs differed from each of these containers and how or why these containers might be popular. They also redesigned their thermoses based on the most efficient designs seen in class.

What I would do differently

Overall, the students seemed to have learned a lot about how heat transfers and how that might impact thermoses. However, I feel as though more could have been done to make the connection between the scaffolding events and the materials used to build the thermoses. For instance:

- At the radiation station, instead of just measuring the temperature inside a plane glass jar, measurements should also have been taken for a jar covered in foil and a jar covered in insulation.
- At the convection station, the students could have tested how the water was affected by having a lid over the water.
- At the conduction station station, conduction of heat in plastic, in glass, in insulation, and in foil could have been done.

Having them see how heat directly transfers in the materials they were using to design their travel thermoses would have allowed them to make a deeper connection between the Making portion and the PBI portion of this lesson.

A discussion on access

I was very lucky to be invited into a classroom where Project Based Instruction was not only a tool that the cooperating teacher used to engage students, but a teaching philosophy the entire campus believed in. This atmosphere allowed to explore new and innovative ways to teach a difficult subject and enabled us to spend several days working on a project. Though I want this to be how I teach every one of my classes, I do worry about its ability to be transferred into every classroom. Some districts have very set teaching schedules and others do not have the resources for projects. One of my goals is work within my confines to ensure that every one of my students has the ability to flourish as a Maker.

Digital resources

Makerspaces.com - MakerSpace resources
Make: - Maker projects and educational resources
nd art projects
earning

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Reagan Seniors Capstone Projects

As part of my internship at Reagan Early College Start High School, I was allowed to oversee the senior capstone projects for their engineering course. To ensure a smooth process throughout the semester, I first created a structure for students to follow. We discussed the engineering design process, the importance of documentation, and how different sub-groups come together to achieve the same task.

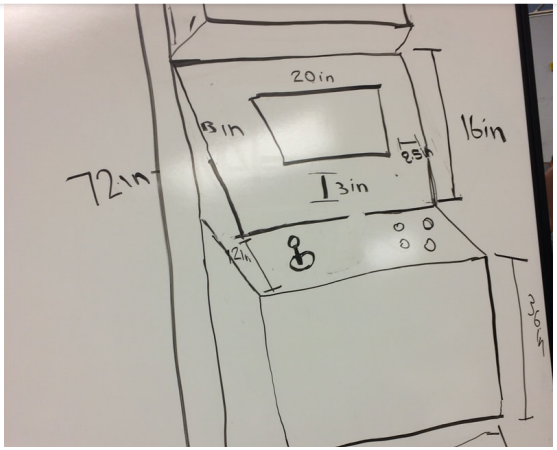
The purpose of this project was to have seniors challenge themselves to use all of the knowledge they had acquired over 3 years in the engineering pathway program to create a "decoration" of sorts that could be displayed in the school to showcase what students in the program can accomplish by the end.

I asked the students to first divide into 3 separate teams. Each team was allowed an hour to discuss what they might want to build for their final project. They had ultimate freedom aside from the following conditions:

1. Projects must include electronic components and may be operated using a Raspberry Pi.
2. The project must be displayed in the Old Mall, the central courtyard of the school.

It was amazing to see the creativity students showed in coming up with different projects. Teams jumped from a giant inflatable snow globe, to a Christmas house front, to arcades, light shows, and more. In the end, the students settled on a retro-arcade, a fireplace, and a Christmas tree.

To ensure team accountability, each group elected a project manager who would keep the team focused and on track. They also elected to subdivide their groups into mechanical and electrical sub-units if they thought it was necessary. With each student given a role within their group, they were released to complete research on their project in order to create a detailed drawing to work off of and a materials list.



It was amazing to get to work in the Reagan Maker Space with these students. Even those who were less inclined to work in class were actively engaged in their project. Allowing each time to choose their own challenge also helped create a sense ownership in their design. These students walked into the Maker Space each day eager to work and being there to guide them in the creation of their designs, the use of the the tools, and in the programming of the Raspberry Pi was amazing.

The Tools

The Reagan Maker Space is equipped with two 3D printers, a laser cutter, two mills, and standard tools such as band saws and drill presses. Many students never have access to these tools so creating a space in schools where students can come in and learn how to use them is such an excellent investment.

Working with these students allowed me to not only refresh my shop skills, but also work on learning how to teach students to be comfortable working in the shop. Having students who are confident in handling tools and who understand safety precautions that must be taken are imperative to running a safe Maker Space.

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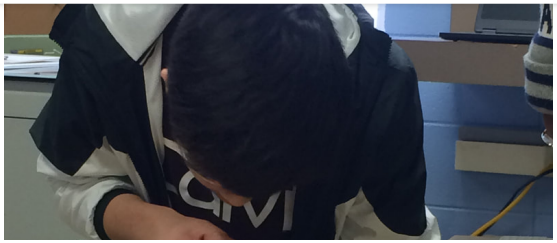

The Programming

A challenge I had to overcome was learning how to operate a Raspberry Pi along side my students. I had never used a Raspberry Pi before, and honestly had no intention of ever using one. I disliked programming because I thought it was more trouble than what it was worth, but this internship forced me to confront it. I spent 4 hours on my day off sitting in the Maker Space fighting with the Raspberry Pi trying to install retro-pi -- keeping track of every one of my failures so I could answer any questions my students had when they were facing the same challenge I had.

The integration

Since the each group had created sub-teams, towards the end of their projects, they had to figure out how to integrate the electrical and mechanical components. This step forced students to work out how each sub-team could access their product without getting in the way of the other.

Over all, each group navigated this challenge pretty well and used it as a learning experience in team cooperation and communication. Set deadlines were created and accessible periods were determined for each sub-team.

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The final products were a great success. Two teams used Raspberry Pis to operate their devices. Each team displayed their product in the Old Mall.

The students official final was to reflect on what this process meant to them. Many stated that they learned leadership and accountability. Some wrote about the design process and how their project transformed over time. And a few wrote about the new tools they learned how to use.

Overall, allowing students to self-direct their Making allowed them to each take away individual lessons that they will carry with them forever.

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Now that my Maker Showcase Presentation has passed, I want to take some time to reflect on some key questions I wanted to address and how I actually addressed them. My initial responses are in black and were written before I delivered my showcase. The responses in blue are a how my answers have changed after giving my presentation and watching another presentation from a member of my cohort.

What is you Maker philosophy and how has it evolved?
Everyone can be a Maker, your curiosity just has to be fostered.

I used to believe that Making was only done when you took a thought and turned it into something tangible like a painting or a bound book. Over the course of this experience in Maker I have come to find that Making is so much more. I have learned how to appreciate digital making and how to integrate making into the classroom. I also came to learn that Making includes both failures and successes. The process of Making is not linear and often involves an iterative process.

What do you feel is the role of Making in education? What are the opportunities and the barriers?
Students learn best when they can take ownership of their work. When they are excited about a project, they will be more engaged in their learning. Making is the best thing that can be integrated into STEM classes!

However, there are some barriers to Making in the classroom. Cost of supplies, access to tools, and time are the greatest barriers to Making. I think is the most critical. If the curriculum allows teachers flexibility to create and administer Maker lessons, the teacher has to:

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- Access space for Making
- Create a timeline for a Maker Project

Mao Leonard, a member of my cohort team, mentioned a barrier that I had not thought of -- accessibility. Even if we as educators have all of the time and resources we need, extending the enrichment to before or after school could limit the number of students participating in Making. Many of our students come from economically disadvantaged households and therefore either work part-time jobs or babysit while their parent attend their second or third job. They are unable to experience Making anywhere else except for in the classroom. Our classes, in some cases, are the only place a student can feel ownership of their own creation and I think that makes it even more worthwhile.

In what ways have you plugged in to the Maker community and how will you continue this after you graduate?
Reagan Early College High School has a machine space that was originally founded as a MakerSpace, however, students outside of robotics rarely use it. I have encouraged more of my students to use the shop by allowing them to choose a final project that either required access to the MakerSpace or one that didn't.

I also co-coached the Reagan Robotics team and attended several FIRST Tech Challenge events. I participated in FIRST when I was in high school, but didn't feel like a Maker at the time. Being on the other side of things has changed that. Watching my students tinker with possible solutions, make prototypes, douse everything in superglue has helped me affirm that this is Making.

I will be teaching engineering classes at Reagan ECHS and hope to keep allowing students to take ownership of their work so that they will be confident in their engineering abilities in the future.

Describe your Maker project. What were the challenges and successes?
My Maker project was created for my Physics by Inquiry final. It is an embroidery project integrating wearable tech. I used a TinyLily board which has a pre-programmed ATtiny microcontroller and several pink LEDs to create a twinkling blossoms scene.

These components were connected using conductive thread. Though it seems obvious that conductive thread conducts electricity along its entire length (since it is not insulated), I did not take that into consideration when sewing my components together. I shorted my circuit on several occasions and had to test components separately on a different project before figuring out my issue.

Eventually I figured out how to insulate my wires, and though the back is not beautiful, the font is stunning. I love how it came out and next time I will think about how I can integrate the LEDs without the backing showing. Taking this project further, I have designed a shirt that includes sever of the same components. The collar would have the embroidered blossoms and twinkling lights to draw attention to the embroidery work. The challenge here is time.

What benefits did you get from being in UTeach Maker and creating this Showcase?
UTeach Maker has expanded my view of Making to include digital arts and technology integrated arts. I have had more exposure to circuits and programming than I would have had otherwise and can integrate a lot of what I've learned into my classroom. This will be coming in hand as I'll be teaching students about circuits and electronics next school year! Becoming comfortable with trying and failing

ok back at my usage of Making in my personal life and how Making has shaped my teaching style. Though I want to deliver

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What suggestions do you have for the next group?
Start as early as possible. Create your Maker project and continue iterating on it. If you teaching partners let you, create as many Maker lesson plans that you can because maybe you'll end up loving one more than the other. Talk to your CT about integrating Making into the classroom within the first week of AT. Make friends and be active in this community.

Most importantly, be passionate. Be passionate and let your students see how passionate you are about Making. They'll feel your energy and be just as excited as you are.

What are some resources you recommend?
As an engineering teacher, I love exploring different websites that help give me inspiration for maker lessons. This is a list of some of the best ones I have found:

- 3D Printing
  - Tinkercad: https://www.tinkercad.com/
  - Thingiverse: https://www.thingiverse.com/
- CAD
  - GrabCAD: https://grabcad.com/
  - AutoCAD: https://www.autodesk.com/ (specifically their knowledge and learning resrouces)
- Coding:
  - Scratch: https://scratch.mit.edu/
  - Code.org: https://studio.code.org/courses