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Maker Showcase

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Payton's Philosophy on Making

I have concluded that anyone can be a maker, and that being a maker is not defined by what resources and skills are accessible to an individual. Rather, making is a mindset. ”

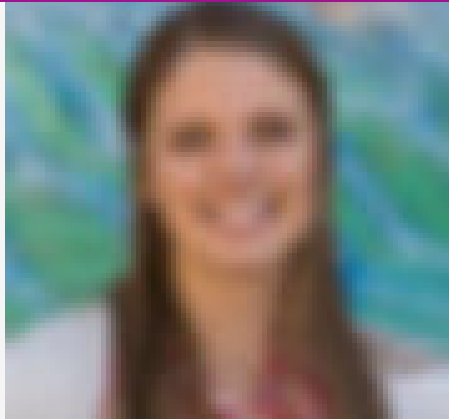
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About Me

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at Austin. I will be graduating in May 2018 with a Bachelors of Science in Mathematics, along with a UTeach certificate. After graduation, I plan to work for an organization on the UT campus for a year or two, and then go on to teach internationally.

Most of my maker style is influenced by my upbringing. I am the oldest of six children, so the making I observed from my mother and participated in myself was flavored with resourcefulness. I remember multiple occasions when I creatively used the resources I had in order to complete my tasks, and I still do the same today.

Payton's Teaching Site



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Payton's Philosophy on Making

Making happens daily in peoples' lives, yet the label of 'maker' has seemed exclusive and elitist to me in the past. I grew up sewing, tinkering, crocheting, knitting, cooking, engineering, and crafting, but when I became a UTeach Maker I felt like all of my past projects were minimized in comparison to the projects I would create under this new label. While making recently, I have realized that what and how I make now is not much different to what it was prior to joining UTeach Maker, that what has changed are only the resources and skills I have gained through being a part of this community.

In coming to this realization, I have concluded that anyone can be a maker, and that being a maker is not defined by what resources and skills are accessible to an individual. Rather, making is a mindset. Making is the physical development of an idea in a way that is personally meaningful. Making can be expressive and without obvious applications, or it can be in response to many problems humans face in life. While making can be done by anyone, it is the *work* of makers that varies due to the variation in resources, skill levels, and creative expression.

Equity, Access, and Diversity

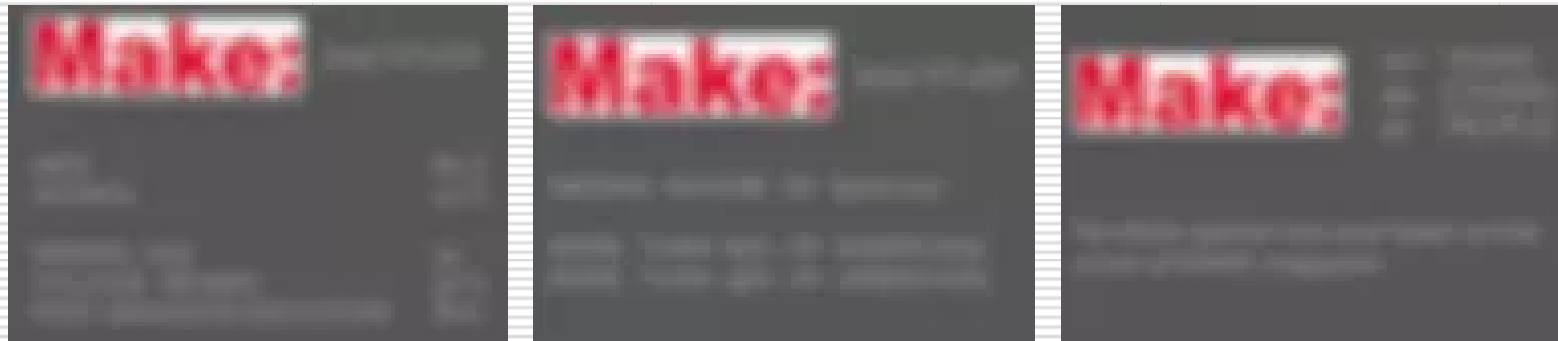
The making process can empower everyone by the exposure to new tools, techniques, and materials, and can promote student collaboration and advancement through the sharing of diverse ideas. It is the access to these resources that leads to the empowerment and development of makers, however not every maker has equal access to

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magazine. She found that, in reality, the maker movement has primarily been inclusive of and represented by educated white males.

Although making is broad enough that students do not need expensive equipment to be included in this movement, many ideas are being lost as the movement does not actively facilitate diversity in maker backgrounds and demographics. This may be corrected, in part, by progressing toward equal access to resources for underrepresented groups and increasing the representation of diverse ideas. In working to achieve this goal, we must remember that we as humans are limited in our advancement as long as the maker movement is dominated by one demographic.



"2015 Closing Plenary by Leah Buechley." Vimeo, 2 Apr. 2018, vimeo.com/136961776

To others who
might initially
experience

Although it seems like certain criteria must be met in order to be a maker, that is simply not the case. Generally speaking, those who have more resources and/or leisure time are those who represent making to the public, but that should not prevent future makers from joining in as well. The idea of making is not restricted to any people group, since every person has the capacity to bring ideas to life regardless of the resources available to that individual.

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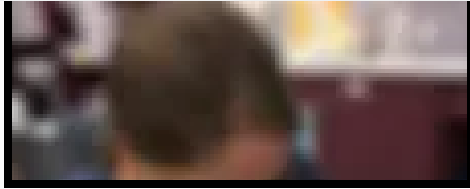
making as
“elitist” as well:

characteristics are a growth mindset, personally meaningful creation, iterative fabrication, collaboration with others and public sharing of work, and use of engineering practices. Though these aspects may be more developed in some, this does not mean that making is elitist in any way.

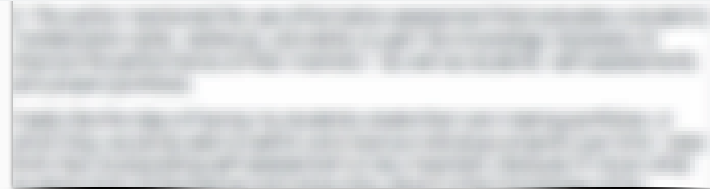
Reflecting on Maker Education

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This was my first time to ever use a soldering iron, and I loved it!



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Pythagorean Proof Quilt

This project displays four proofs of the Pythagorean Theorem in the form of a quilt. My heart for this project was two-fold in that diversity would be celebrated through the inclusion of mathematicians from varied backgrounds, and that all of my future students would realize that they too could create a new, unique proof of this famous theorem.

Initiation

This was my first quilting experience, so when I

<https://paytoncrawley.wixsite.com/uteachmaker/maker-project>

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to get it right the first time. I was nervous about jumping in prematurely and risking failure, but now I know that there is much to be gained from getting started and making adjustments along the way.

Coming Together

The creation of each square was a unique experience. I ripped out so many stitches and needed to re-cut several sections, which were frustrating experiences at first since I was still focused more on the finished product than on the process. Some sections were pieced together through a mostly trial-and-error approach (Bhaskara's first and second proofs), while others mostly required just the use of a protractor and a compass (Garfield's proof).

At a couple points over the course of this project, I had questions about basic quilting

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friends is a textiles and apparel major who also has some experience in quilting, so I was able to reach out to her and receive the assistance I needed. In addition to basic measurement and arithmetic and geometry concepts, I found that

I needed to rely on concepts from algebra and trigonometry to figure out how to cut and orient the fabric pieces. This was an unexpected, but exciting realization!

Completion

This quilt is not yet finished, but it is very close to completion! Next week, I plan to sew all of the proofs together to finish the front, sew together the backing, batting, and front, then bind it all together.



Connection to UTeach Experience and Maker Philosophy

In creating my Maker Project, I did not anticipate how challenging it would be to calculate the dimensions of the fabric shapes and the seams that would correctly display the mathematical content, which may have been partly due to the fact that I had never sewn a quilt before. At first, I tried to plan out these factors on paper, but I soon realized that an element of trial and error was necessary to piece it all together. I had to rip out stitches and re-cut pieces several times, but I learned something every time. I see my quilt's imperfections in craftsmanship, but I learned so much throughout this making process and I know what I would do differently in the future, and all of that is worth celebrating.

My UTeach experience has been filled with lessons that I created and modified, and I have made modifications and critiques to numerous aspects of these lessons. I have received feedback on almost every lesson I have taught, and this has been very helpful in leading me to make appropriate adjustments.

I have learned so much about what making is, and how it manifests itself in my life. I now see beauty in the entire process- in the failures, the revisions, and the finished product- whereas previously I was

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before forming a polished plan because I do not always feel the pressure to have a final product after my first attempt.

MathHappens Projects

The images below highlight projects I have worked on with MathHappens. Click the images to read about them!

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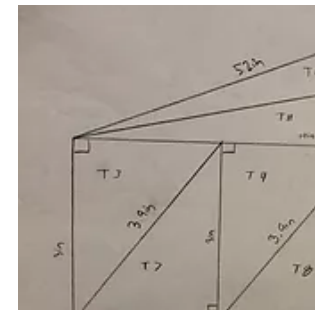
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Maker Education

So far in my teaching experience, I have taught two classes that were centered around making. The first class was project-based at Manor New Tech High School, where students needed to design and build a light fixture that relied on triangle congruence theorems. The second class was in Apprentice-Teaching at Lamar Middle School and Fine Arts Academy for 7th-grade Advanced Mathematics. This project incorporated much more student choice, which resulted in a wide range of finished products.

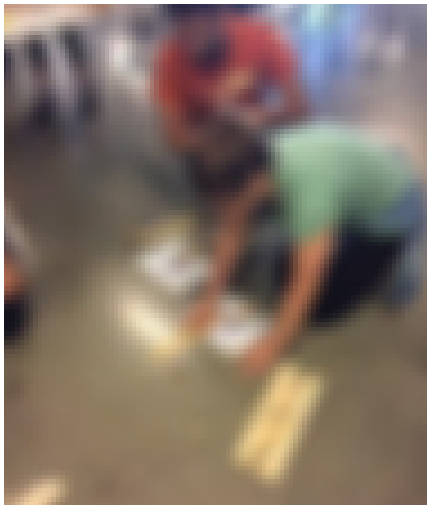
Other Experiences in Maker Education:



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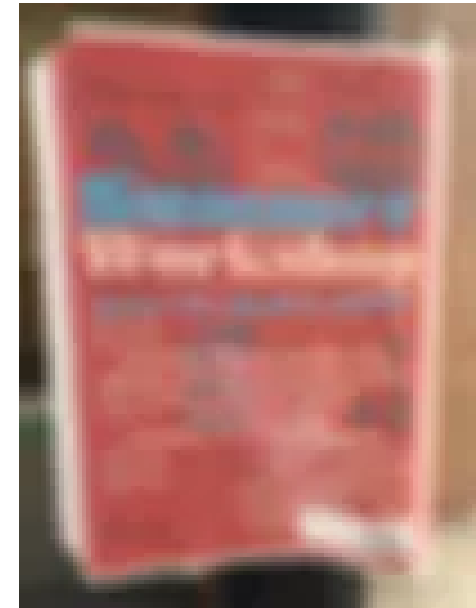
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was able to participate in different Maker Ed. opportunities. On one occasion, I helped present navigational tools at the Bob Bullock Texas State History Museum in Austin, Texas. I was able to present a game that simulated the journey that the La Belle ship took in the 17-th century. This activity reinforced navigational knowledge and skills and helped students visualize the proportional distances that the famous ship traveled.



A blueprint design from a Manor New Tech student (PBI)

On another occasion, I had the opportunity to present alongside a faculty member in the math department at UT. This presentation was for a math teacher circle, and we presented on the Golden Ratio using materials that I had helped create with MathHappens.



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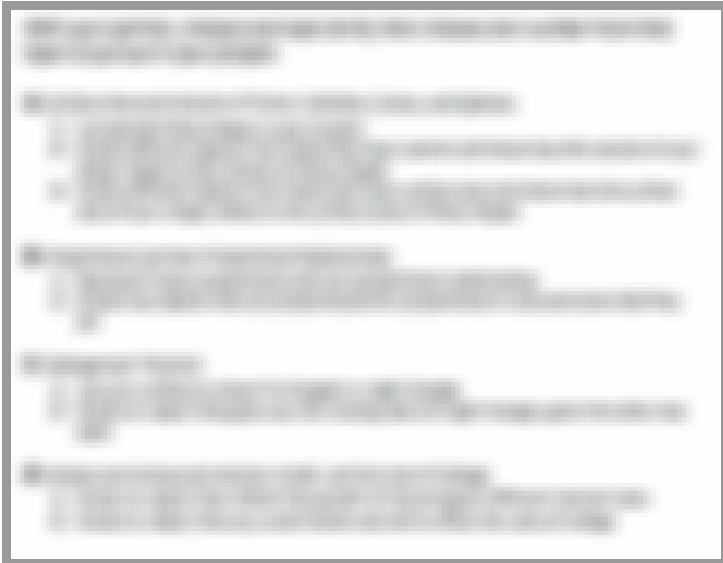
Payton's Maker Lesson

Warm Up: Yourself on Paper

Students completed warm ups that helped them to see their creative expressions and the things that are meaningful to them. Then I showcased many projects I have made.

The Goal:

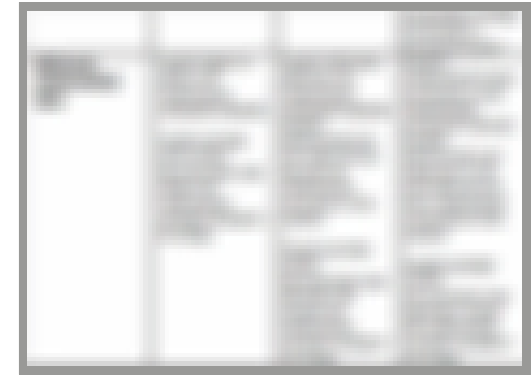
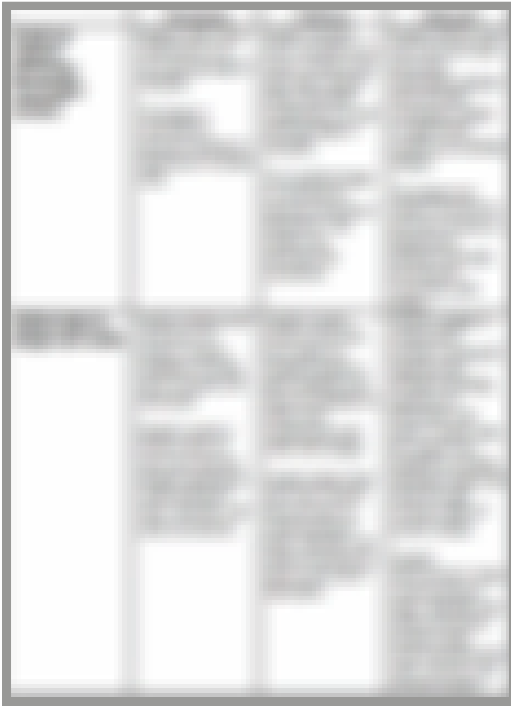
Students chose their groups of 2 (one group of 3) and chose which criterion they wanted their project to have. Each lettered topic is one that the class had covered that semester.



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Students were given rubrics along with their list of criteria to choose from.



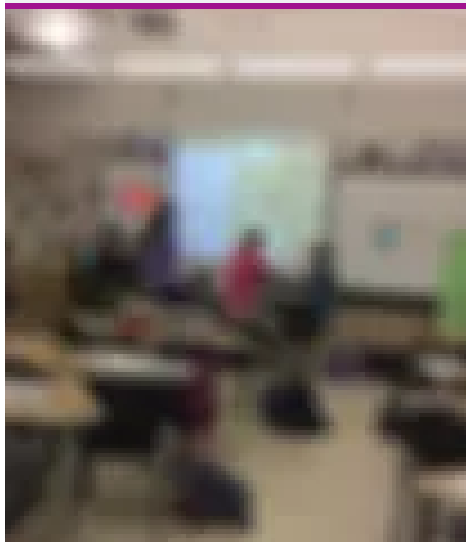
The Making:

Students were given hand tools (screwdrivers, hammers, hot glue guns), power drills, nails, screws, wood blocks, recycled materials, fabric, sewing materials, box cutters, batteries, MakeyMakeys, copper tape, leds, various kinds of tape, paint, Chromebooks, and various craft supplies to use in making their projects. Students were encouraged to bring materials from home if they wanted to add something else to their projects.

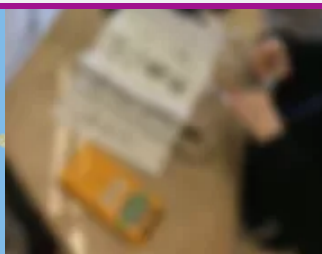
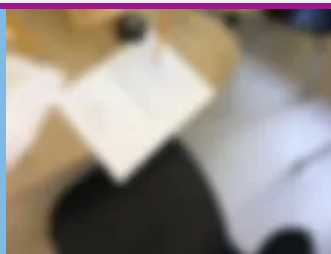


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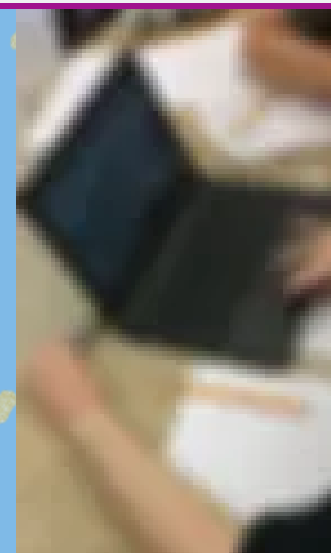
Students used to work on their projects during lunch



Students using various tools and equipment



Students collaborating on their projects



Students researched more information for their projects

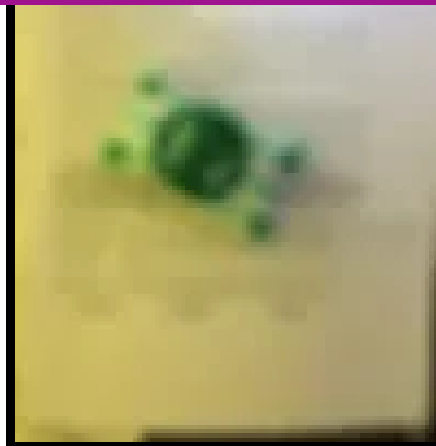
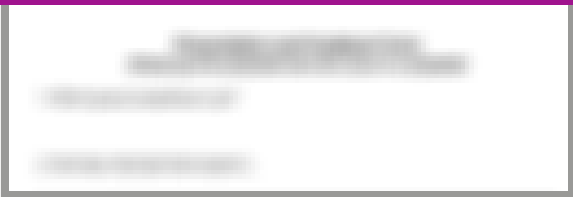
Presentations and Modifications:

Students presented their projects at the end of the week. In this activity, each group member took a turn to present their group's project, with time to propose modifications in between each turn. While group members were not presenting, they were visiting other groups and filling out feedback forms.

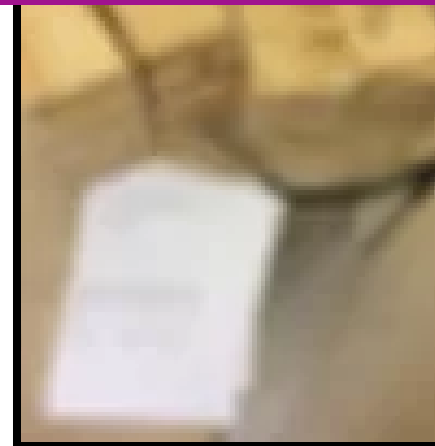


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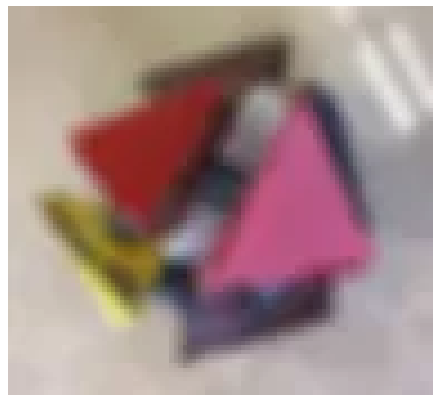
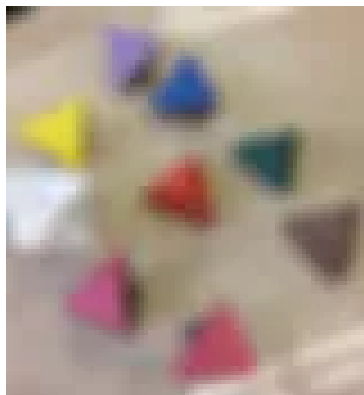
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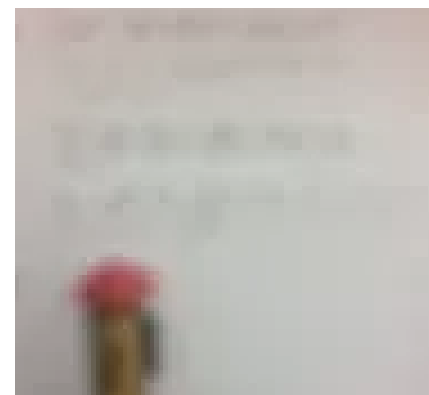
Project with feedback



Prototype (left), final product (right) with feedback



Project disassembled (left) and assembled (right)

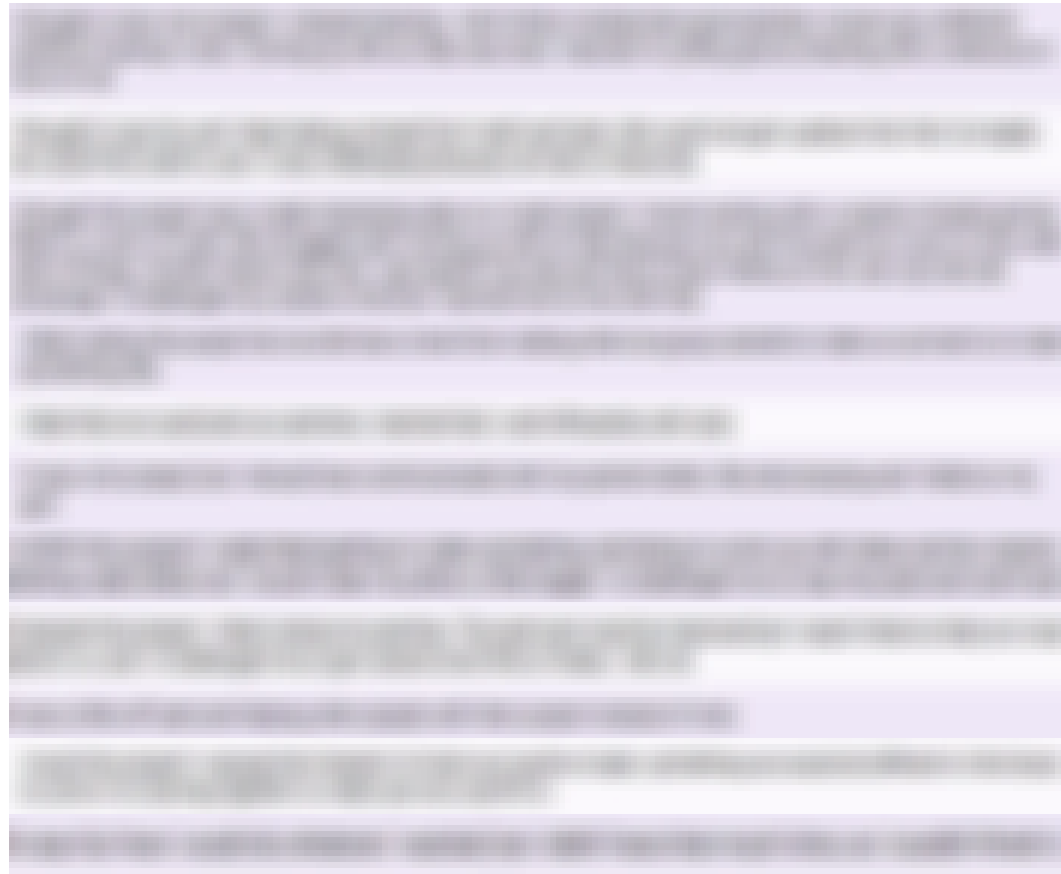
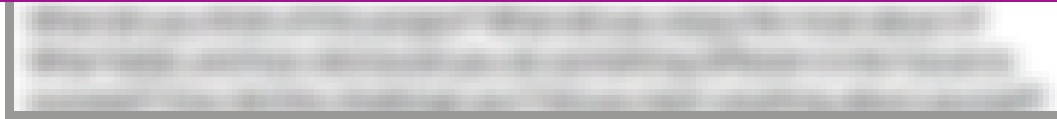


Student Reflections:

Students submitted a Google Form with their final reflections and evaluations of their contributions and their partner's. Below is one of the questions and some student responses.

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My Reflection:

I really enjoyed implementing this lesson! Although I would make revisions in the future, I am happy with the process and the results. I loved seeing students try out new tools and learn new skills. I loved that I was able to help students learn how to use newer tools and build circuits. I

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think that many students felt very empowered by this process, and I think that they learned things about themselves as makers and as students.

If I was to implement this lesson in the future, I would first set up the room differently in a way that would be more conducive to the making process by having materials organized and separated. I would also give more attention to placing student work stations so that there is plenty of room for students to make. I would include more opportunities for students to reflect throughout the process and evaluate the work of themselves and their partner. Additionally, I would institute a check-in system for each group to meet with me and display the criterion they chose and their plans to achieve that in their project.

Maker Resources:

- [Renovated Learning](#): A good starting place to begin establishing a makerspace
- [MakerEd](#): So many resources that are engaging for students!
- [Circuit Playground](#) offers many tutorials to get started and create new projects
- [Makey Makey](#), similar resources as Circuit Playground

Equity, Access,
and Diversity

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emphasized in the math classrooms. I know that there are some exceptionally creative students at this school, and I wanted to give all students the opportunity to express themselves as they "make" math. I also wanted to provide several different types of tools, materials, and project options to appeal to the diverse skills and interests represented in my classroom.

Every student has the ability to make things, and by providing all students with the tools they need to achieve their goals in a personally meaningful way, all students will meet success.

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Making in Community



Outside of a classroom context, there are still opportunities for collaboration among makers. There are multiple forums and organizations that bring makers together, and I

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spaces, I have shared my ideas and failures, received feedback, and felt empowered from the exposure to new tools and techniques. Being a part of the maker community has challenged me to grow as a maker and has allowed me to better know how to help other makers grow as well.

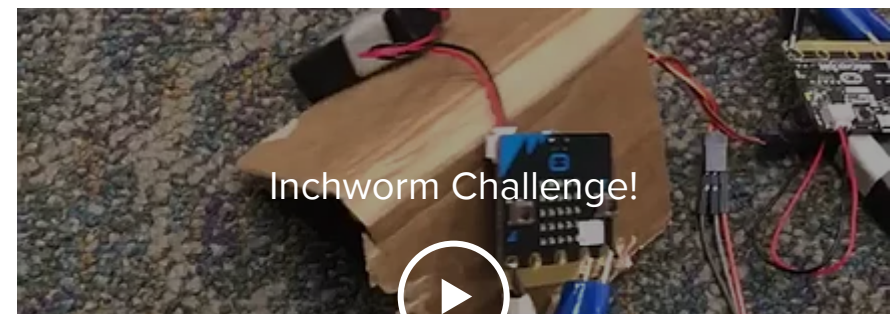
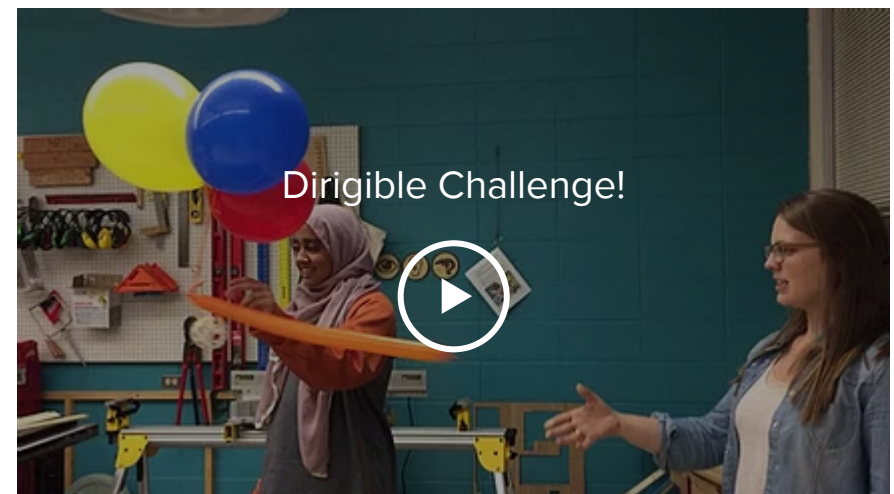
UTeach Maker Meetings

On the first Tuesday of each month, UTeach Makers meet to discuss their progress on their showcases, learn and develop new skills, and play with all kinds of materials. We often participate in maker challenges within our mentor groups, as seen in the videos to the right. In one of these meetings (top video), we were challenged to make a dirigible-type ship that would maintain altitude as it traveled to the other side of the room. Ours did not measure up to the standard, but seeing the work of other groups allowed us all to better discuss our successes, failures, and proposed modifications.

In another meeting (bottom video), our mentor groups were tasked with making an "inchworm" using circuit playground, servo motors, and various craft supplies. Like in the challenge described above, we tested our products and reflected on successes and failures.

Challenges like these reveal the diversity and creativity of the makers in the room and provide opportunities to encourage

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Maker Faire

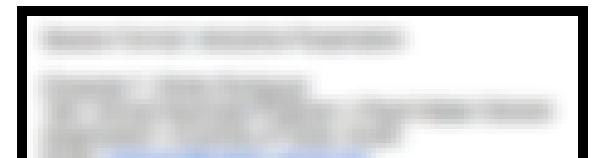
Maker Faire was one of my first experiences in the maker community! During the faire, I was able to represent UTeach Maker by facilitating participants' construction of circuits. At the booth there were challenge cards for visitors to try out, materials needed to complete a circuit, and various additional components (buzzer, servo motor, etc.) that could be used. It was exciting to interact with the general public in this way, and I enjoyed the discussions that arose on topics concerning circuits, making, and UTeach.



2018 UTeach Institute Conference

This conference will be held May 22 - 24, and I have been given the opportunity to present with my UTeach Maker

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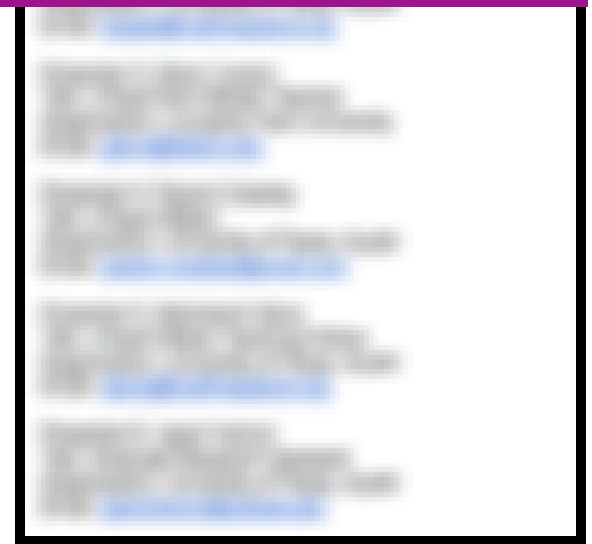
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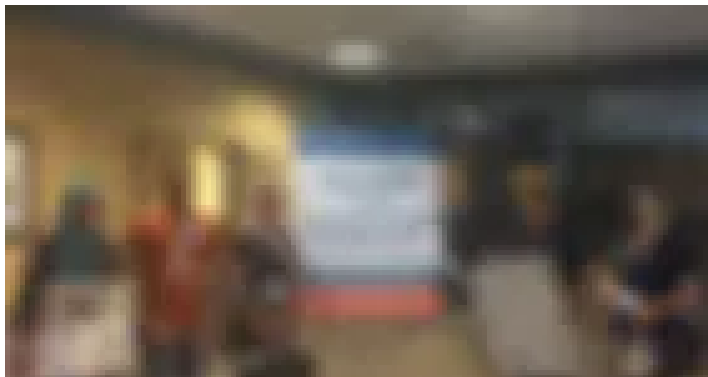
tools (the unit circle manipulative set I made with MathHappens) are featured on the "Projects" page in this website. I am looking forward to presenting the work that I

did and I am excited to learn about how they are being used in the lessons developed by UTeachTech!

At this conference, I hope to meet other educators who are involved in making so that we can share ideas and experiences. This conference will be a great opportunity to continue to establish myself in the maker community, and I am grateful for such a privilege.



2017 UTeach STEM Conference with MathHappens

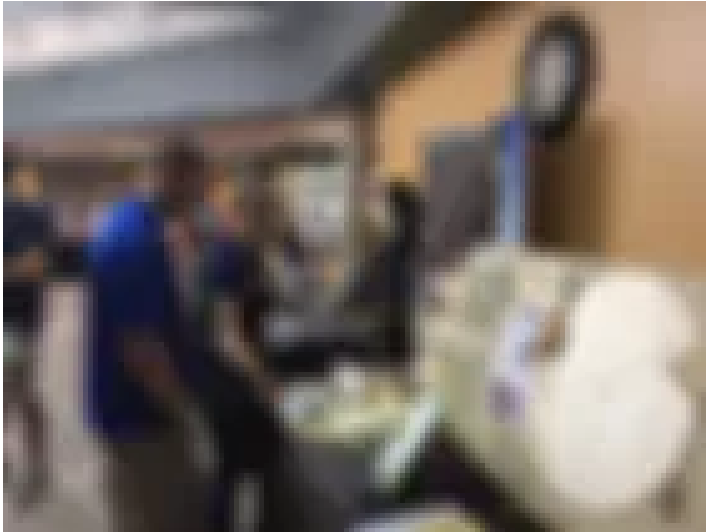


<https://paytoncrawley.wixsite.com/uteachmaker/community>

Last summer I was an intern for MathHappens, and among several other opportunities, I was able to present our work at the annual UTeach STEM conference. This was one of my first opportunities to publicly present my work to a broader community, and I loved it! I gained experience in building connections with current makers and educators, and my presentation skills were further developed. Through conversations at the MathHappens booth, I learned about education initiatives taking place in other communities, and I discussed opportunities to include more making into other

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The range of materials we showcased appealed to all educators. We included Golden Ratio calipers and other proportional calipers, astronomical and navigational tools, and several tools used for measurement and conversion.

Many people were excited about handling the tools and wanted to learn how they worked, which were welcome conversations for my colleagues and I!

Equity, Access, and Diversity in the Maker Program

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- Equity

- Every UTeach student is eligible to apply for UTeach internships and UTeach Maker, and the monthly meetings allow all makers to participate and develop their skills
- During my time with MathHappens, I saw that all interns were given the opportunity to work on various projects. This allowed for all interns to create materials that they could present at various conferences and public displays

- Access

- Many students are able to take part in the UTeach Maker program, but they all have to apply to get accepted. This is an insignificant portion as compared to all of the students who attend UT, a group that is already out of reach for many aspiring students.
- Many maker faires and conferences like those mentioned above cost anywhere from \$50 - \$450, and if it were not for UTeach waiving these fees, I would not have been able to participate in all of these opportunities. Being involved in the maker community is important for the growth of makers, but by setting costs this high, many makers are being barred from participating and sharing their ideas.

- Diversity

- Through all of these programs, I have been given the opportunity to work and collaborate with fellow makers having backgrounds different from my own. Where I grew up there was not as much diversity, so I have loved being exposed to different mindsets on making.
- Although I have seen more diversity in making than I did prior to being a UTeach Maker, there is still room for more diversity. Many people groups are underrepresented, if represented at all, and we will not be reaching our potential in the maker community until all groups are represented.
- Throughout my experience in the UTeach program, I have co-taught and participated in class discussions with people of various backgrounds, and these experiences have resulted in improvements of my work and more developed understandings of the content. This has further grown my understanding that all makers need to be

projects.

Who and What is Missing?

From my perspective, I see that many people and ideas are overlooked or missing completely from the Maker community. By largely highlighting the ideas of educated, upper-middle class white men (*see Philosophy page, section 2*), entire people groups and ideas are being excluded from our community, thus hindering the innovation and advancement of our societies. The type of diversity we see in our world is not reflected in the Maker community, but that can be improved by making advances to further include the following people groups and components:

- Who
 - People of color
 - People of varied ethnicity
 - Females
 - People of varied economic status
 - People of varied educational background
 - People of varied age
- What
 - Perspectives of makers from diverse backgrounds
 - Techniques and resources of makers from diverse backgrounds

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