Footwear Designer Using Engineering Design Process

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Introduction -

My entire life I've lived in Philadelphia and that has come with a lot of ups and downs. However there is one thing that always sticks out to me when I am walking down the streets or waiting for the train, which is how much homelessness we have in this city. There are so many people in our city struggling to gain basic necessities that everyone else has. According to "Project Home[1]" an organization in Philly trying to help homelessness in the city, Philadelphia has a 25% poverty rate and about 14% of that number is living in deep poverty. Along with that there are currently about 5,700 people homeless in Philly, according to The City of Philadelphia[2]. With all of this information and my first hand experience of seeing the homeless, I wanted to try and do something to give back to the community.

So for my capstone project my original plan was to create shoes for the homeless. I noticed that especially in the colder months it is hard for people without resources to gain proper footwear/attire for the changing climate. Throughout this document you will see my progress with this idea, as well as a breakdown of the engineering design process and how it shaped my overall project.

Starting with an overview of the engineering design process, this is a strategy people use to come up and perfect their ideas and designs. There are 8 steps in this process:

- Identify the Problem
  (Figure out what issue you are trying to solve or purpose of your project.)
- Identify Criteria and Constraints
  (What requirements are necessary to completing the project.)
- Brainstorm Possible Solutions
  (Start thinking about ideas and ways to go about solving your problem.)
- Flesh Out Ideas
  (Branch out ideas by making a list or idea web of anything that comes to mind)
- Analyze Pros and Cons
  (Decide what is positive and negative about each idea.)
- Select an Approach
  (Choose one idea and plan out the steps necessary.)
- Design and build a prototype
  (Start designing how you see fit.)
- Refine and Design
  (Work on any changes or edits needed to complete the project.)

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[1] "Homelessness in Philadelphia." *Project HOME*, 8 Oct. 2020, projecthome.org/homelessness-in-philadelphia.

[2]http://philadelphiaofficeofhomelessservices.org/know-homelessness/#:~:text=How%20many%20people%20are%20homeless,largest%20cities%20in%20the%20US.

On this next page I will be explaining how I used each step in this process to work on my capstone project, as well as showcase ups and downs that may occur when creating something new.

Engineering Design Process -

Identify the Problem: The problem or issue I wanted to help solve was how can I give back to the homeless community, in what ways can I help? Originally the question I wanted to ask was how can I design a shoe to fit anyone's foot? However throughout the process I changed my question to how can I help make a change by showcasing aspects of footwear designing?

Identify criteria and constraints: The idea for this originally came from wanting to make shoes for the homeless, however when thinking about this a little further I came across some questions that needed to be answered. For example the most pressing question was how would I know what shoe size they were? Not knowing what shoe size they were made this idea that much harder. So if I can accurately design a shoe somehow that can fit anyone's foot, I can be able to easily give them out to people in need. Some other constraints I need to consider are how am I going to build this? How do I make sure the shoe is durable to withstand the different weather changes in the winter? How many can I make?

Brainstorm Possible Solutions: Design a shoe using CAD (Fusion 360)

Flesh out Ideas:

- Some sort of turning mechanism on the back of the shoe, this will move the sole in and out
- A super stretchy sock like shoe
- A sole that can expand and contract to the desire need using some sort of sliding mechanism
- A waterproof fabric that is durable but can connect to the sole somehow

Analyze Pros and Cons: Designing a shoe on CAD

Pros	Cons
On the computer so any modifications to it can be added or taken away	Hard to use/learn
Really understand/build small details in the shoe	Very time consuming
You can save all work	Difficult to show certain features
Work on different components all at once	Can not animate it

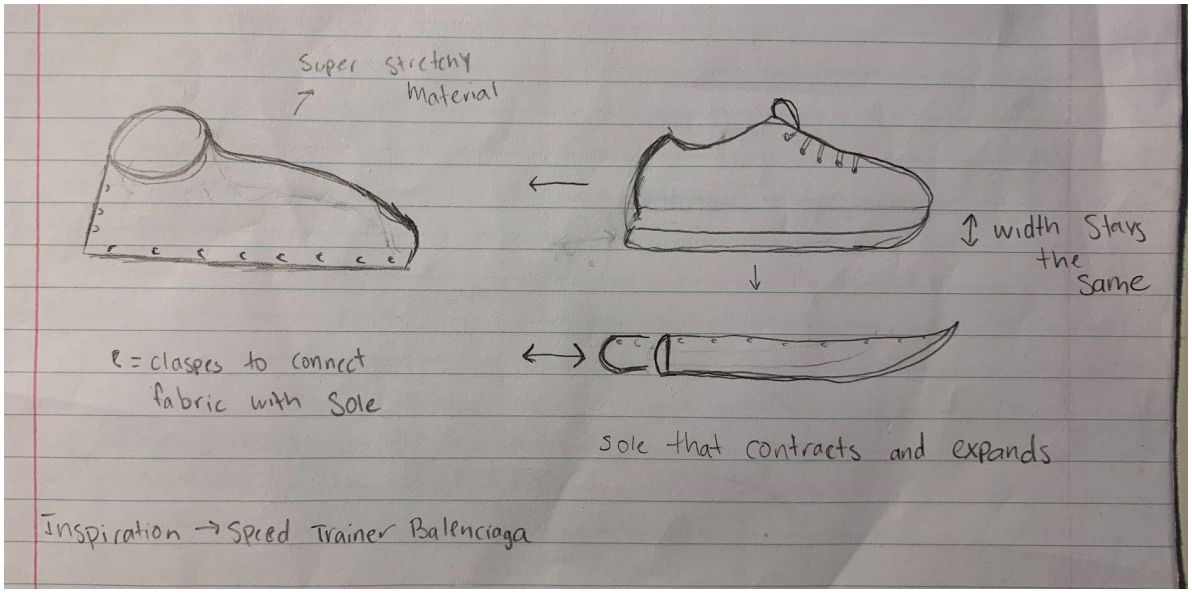
	Can not animate means I am unable to show the function of the shoe

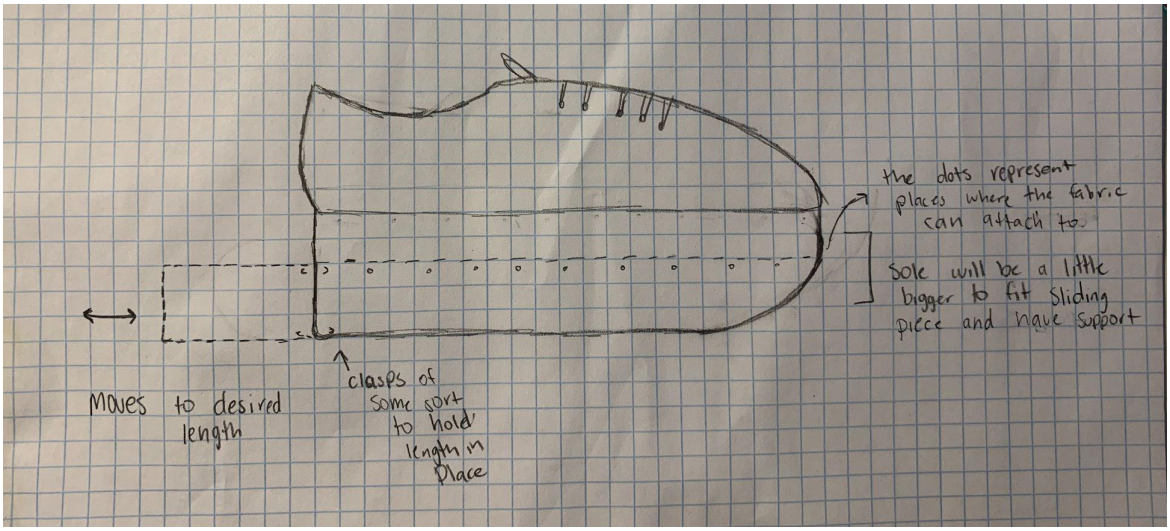
Select an Approach: When selecting an approach this timeline helped me to plan everything out ahead of time and was there to hold me accountable to completing my tasks.

Week	Detailed Description of Work Planned	Time allotted / Date(s)
1/22-1/30	*Updated Proposal, Timeline, Annotated Bibliography*	*90 minutes x 2 per class = 180 minutes x 3 classes = 540 minutes (note, this does not count as overtime!)*
1/31 - 2/6	● Brainstorming ideas for the actual design (follow the engineering design process)	2 hours
2/7 - 2/13	● Figure out what software to use and how much it is going to cost	2 hours
2/14 - 2/20	● Start designing the shoe on the software	2 hours (split over 2 days)
2/21 - 2/27	● Continue designing until it's done	2 hours
2/28 - 3/6	● Continue designing until it's done	2 hours (split over 2 days)
3/7 - 3/13	● Continue designing until it's done	2 hours
3/14 - 3/20	*End of Q3*	
3/21 - 3/27	● Once it's done designing some sort of logo for the shoe	2 hours

However I have learned that sometimes even with a solid plan things can fall through, it's hard for everything to always go according to plan when designing something new. For example during my project I came across lots of technology issues, time management, as well as brainstorming possible solutions.

Design and build a prototype: Before jumping right into my CAD I created some designs on paper to get my ideas flowing about how to approach it on CAD.





Refine the design: The process of creating something totally new can be very difficult and for me it certainly was. My time management was not on my side, so the CAD didn't turn out as well as I had hoped. However even when one thing doesn't go the right way you shouldn't give up. So the next question I asked myself was how can I still keep the same shoe idea theme but make it so it can still benefit the community. I then went through the same process above but for my new idea.

New Idea -

Identify the Problem: Even though the plan to design a shoe didn't go as planned, I started thinking about what else I could do to reach out to the community. How else can I spread the opportunity to make change?

Identify Criteria and Constraints: For this there aren't too many constraints, however I really want to make something that can help future generations be some sort of change makers. One contributing factor would be how can I keep this new idea related to shoe designing or something similar.

Brainstorm Possible Solutions: Some possible solutions could be something related to how shoes are made or the process behind people who create shoes.

Flesh Out Ideas:

- Booklet on being a footwear designer
- Video on how name brand companies and how they design shoes
- Interview with a footwear designer

Analyze Pros and Cons: Booklet on being a footwear designer

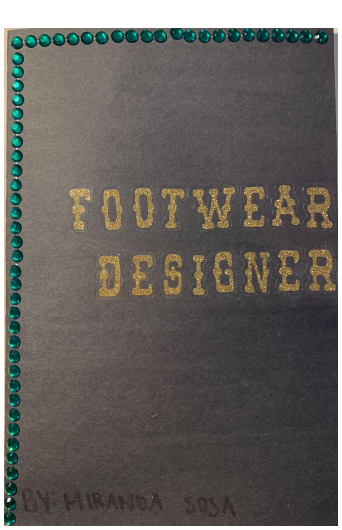
Pros	Cons
Shows the career side behind my first idea	Doesn't directly impact the homeless
Lots of opportunity to be creative	Lots of research (could be time consuming)
Can help provide information to people considering going into that field	Doesn't provide much insight on the process behind designing a shoe

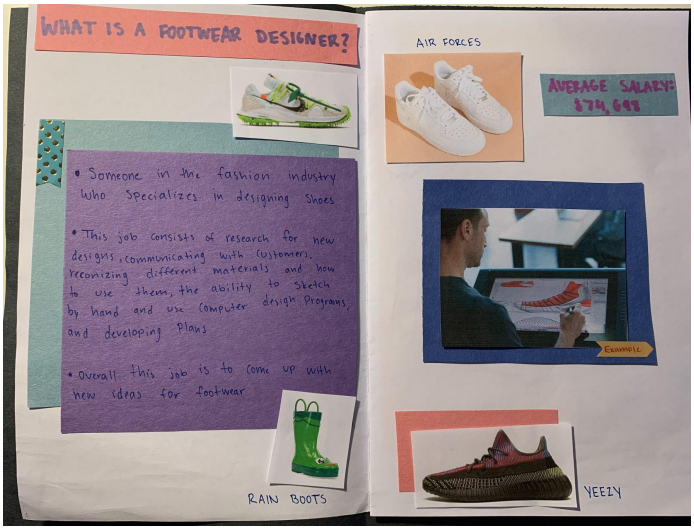
Select an Approach: For my approach I really wanted to be cautious of my time management especially when it came to researching. I created a timeline, a smaller version than the first one.

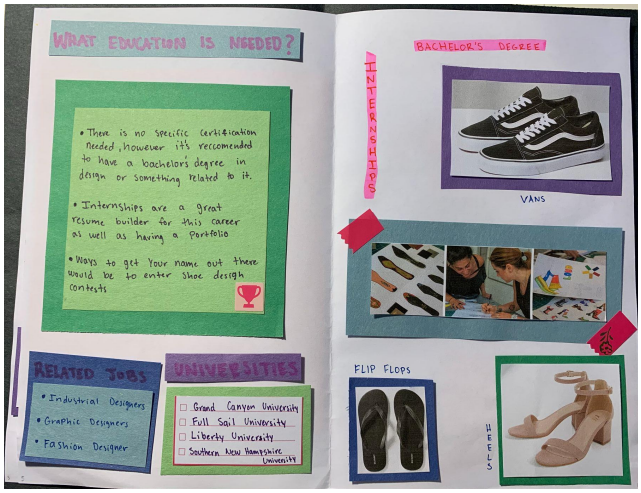
Detailed Description of Work Planned	Time allotted / Date(s)
• Start researching about being a footwear designer	3 hours
• Figure out what are the most important points to add in the booklet	30 minutes
• Start designing how the booklet is going to look	30 minutes
• Start crafting the booklet together	4 hours
• Make a cover and put all the components together	2 hours

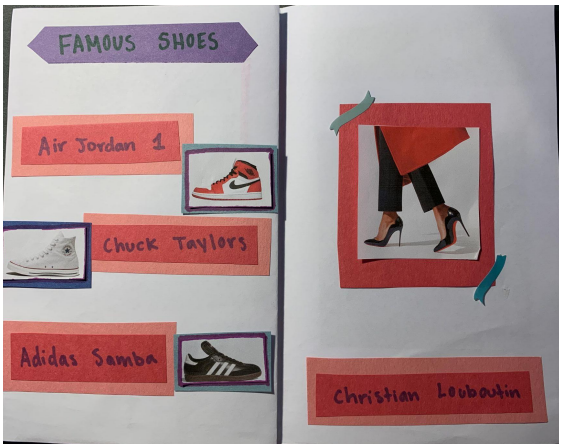
Design and build a prototype: For my design I started with all my research and then planned out where I wanted everything to go in the booklet.

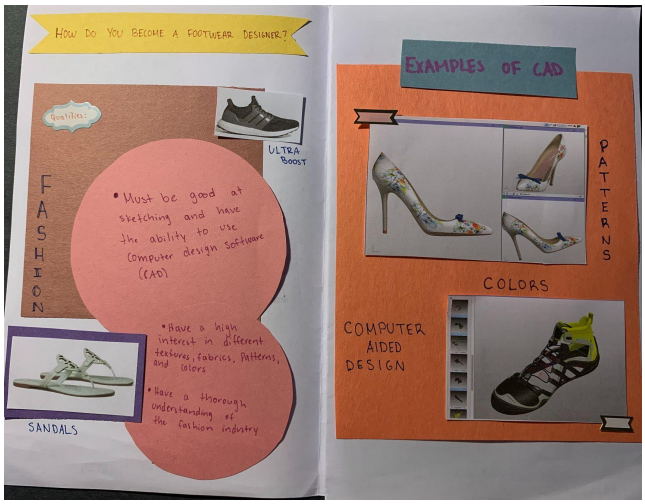
Refine and Design: For the final product I came up with a 10 page booklet all about what a footwear designer is and some background information having to do with that career.

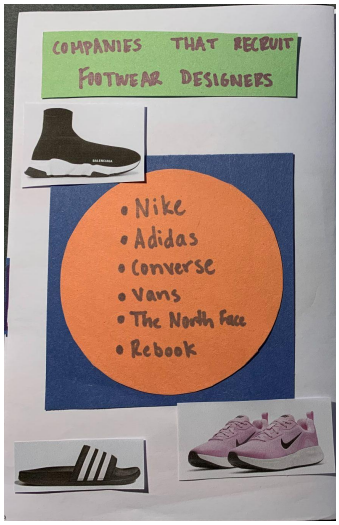

FOOTWEAR
DESIGNER
BY: MIRANDA SOSA


WHAT IS A FOOTWEAR DESIGNER?
• Someone in the fashion industry who specializes in designing shoes
• This job consists of research for new designs, communicating with customers, recognizing different materials and how to use them, the ability to sketch by hand and use computer design programs and developing plans
• Overall this job is to come up with new ideas for footwear
RAIN BOOTS
AIR FORCES
AVERAGE SALARY: $74,693
YEEZY


WHAT EDUCATION IS NEEDED?
• There is no specific certification needed, however it's reccomended to have a bachelors degree in design or something related to it.
• Internships are a great resume builder for this career as well as having a portfolio
• Ways to get your name out there would be to enter shoe design contests
BACHELOR'S DEGREE
HIGH SCHOOL
VANS
RELATED JOBS
• Industrial Designers
• Graphic Designers
• Fashion Designer
UNIVERSITIES
Grand Canyon University
Full Sail University
Liberty University
Southern New Hampshire University
FLIP FLOPS
HEELS


FAMOUS SHOES
Air Jordan 1
Chuck Taylors
Adidas Samba
Christian Louboutin


HOW DO YOU BECOME A FOOTWEAR DESIGNER?
Qualities:
ULTRA BOOST
FASHION
• Must be good at sketching and have the ability to use computer design software (CAD)
• Have a high interest in different textures, fabrics, patterns, and colors
• Have a thorough understanding of the fashion industry
SANDALS
EXAMPLES OF CAD
PATTERNS
COLORS
COMPUTER AIDED DESIGN


COMPANIES THAT RECRUIT FOOTWEAR DESIGNERS
• Nike
• Adidas
• Converse
• Vans
• The North Face
• Rebook

Conclusion -

Overall this capstone project was a bumpy road for me, however I learned a lot more about being a footwear designer and who I am as a person when it comes to challenges. This definitely wasn't the easiest thing for me to complete and it came with a lot of long hours. In general I think the capstone is a prime example of how things don't always go how you expect, and you just have to keep pushing through no matter how hard. I believe I could've done more to benefit the community, however I think the whole process of this project can help students in the future to understand the engineering design process and all the steps needed to create a new idea. In the future I would like to revisit this project and really follow through with some of the ideas that I had because I think it can really help the Philadelphia community.