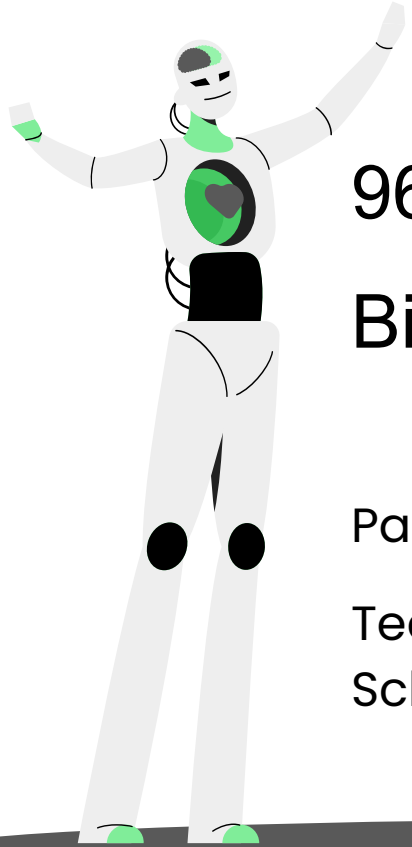
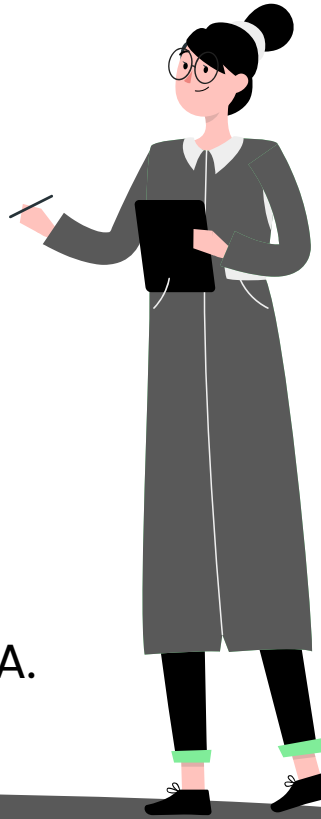


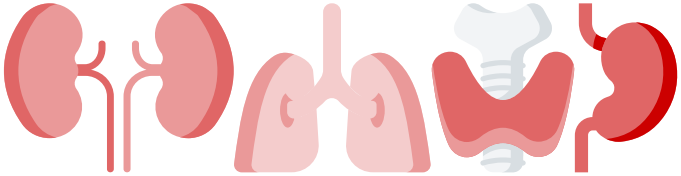
9682C

Biomedical Engineering

Participating Member(s): Emilie

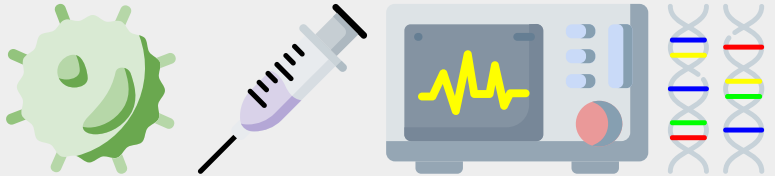
Team Location: Olympian High School, Chula Vista, California, U.S.A.





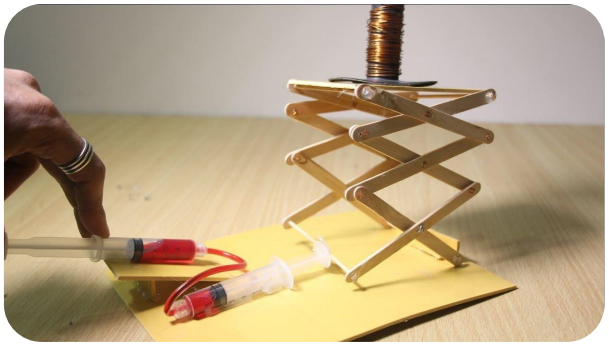
Artificial organs, vaccines, and automated insulin delivery machines would not be possible without the biomedical engineering. This specific field appeals to me very much because of its intention and **use of engineering techniques to solve problems**. Moreover, I am **greatly interested in both biology** and **engineering**; being able to help others in this field is a plus.

"Biomedical engineering focuses on the advances that **improve human health** and health care at all levels."

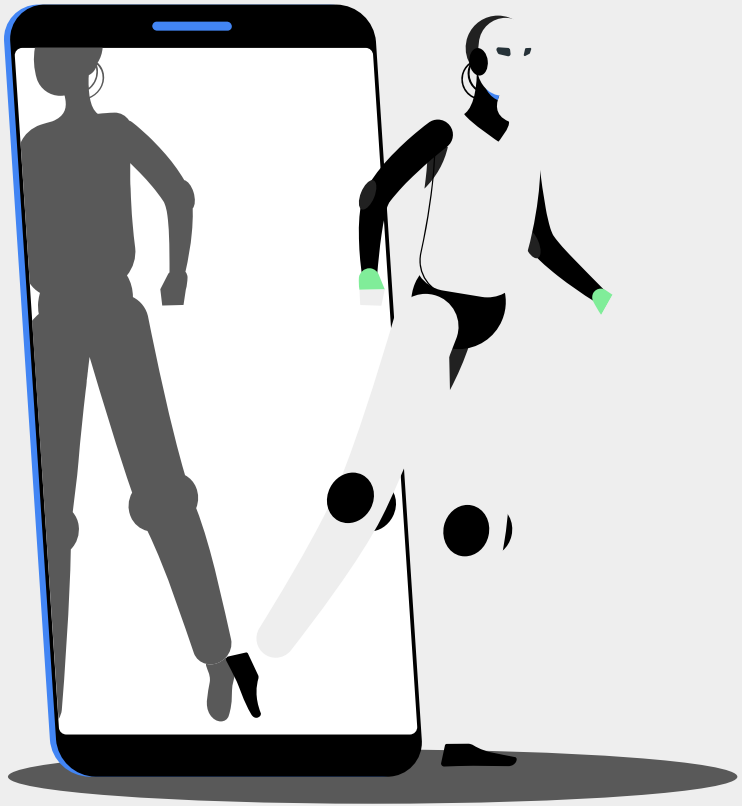


I get the chance to **learn more about this career through classes, independent learning**, and my father.

On the second day of a SWE program from the University of California San Diego, we used a syringe to raise a mechanism with hydraulic power. Through this activity, it reminded me **a problem can be resolved with various solutions**; the design process is not always complete. For instance, there is more than one way to lift objects.

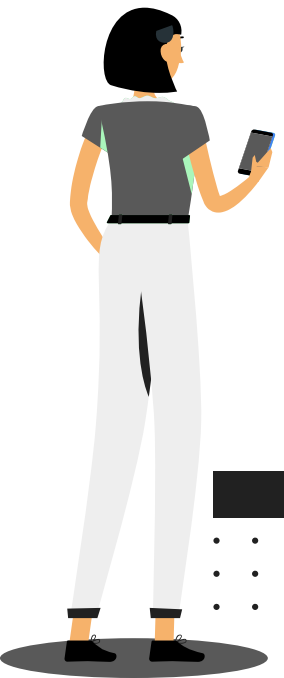


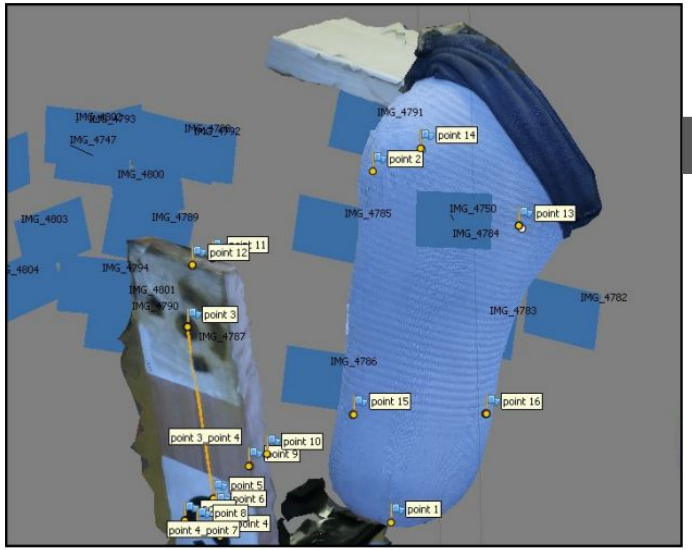
There are next steps after coming up with solutions. There needs to be **a criteria for why alternatives were rejected and why the standing idea is the best**. I learned the steps of the engineering process design mainly from the **scientific method**, but I learned more specified steps through the SWE Program.



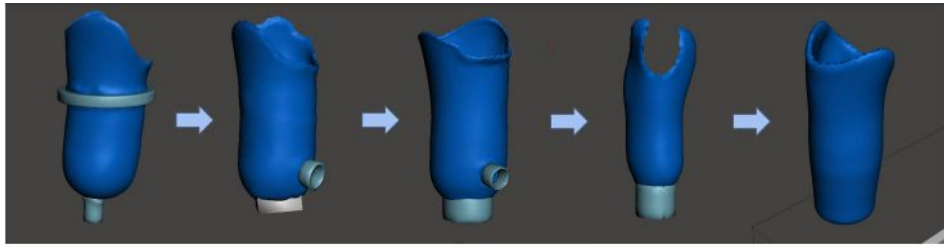
On that same day, February 13, 2021, the focus was bioengineering. One of the volunteers of the program, Samantha ong, mentioned the university's **Center for Human Frontiers** during the Zoom Meeting. I researched it and learned they have a project called **PROJECT LIM[B]ITLESS**. It aims to "explore and experiment at the frontiers of human experience to harness technology to augment human potential." This project interests me because it is something **similar to what comes to my mind** when I think of biomedical engineering.

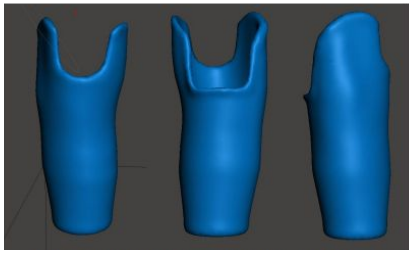
For this project, they first identified their problem: amputees everywhere, especially in developing countries, have a **difficult time obtaining prosthetics** because of their **high prices** and the **complexity of having a prosthetic fit perfectly** to a person's limb. With robotics, they wish to **use 3D printing as a solution** to increase the global number of amputees who have a prosthetic.

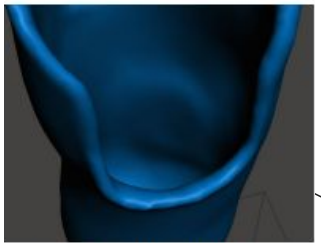




First, participating engineers plan to develop an app in which **amputees can scan their residual limb using photogrammetry**. The biggest problem they are currently facing is **determining the optimal number of photos** to have an accurate, digital, 3D model of the limb. Moreover, there is the question of whether when **processing the photos**, should it be on the **mobile device** or uploaded to the **cloud** for processing.



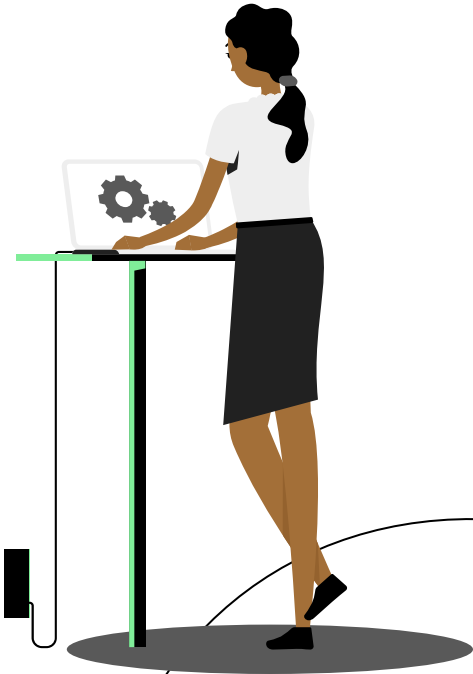




Nonetheless, they know that once they have a 3d model of an amputee's limb, there will be **software that uses Artificial Intelligence to apply compression zones** to each model "where weight loading can be distributed on the residual limb (based on a database of compression zones based on the needs of earlier amputees, with **the accuracy increasing as more data** on compression zones is added to the database)."

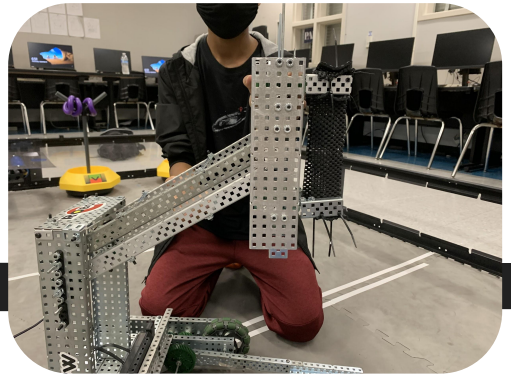
Once the model is completed, it will be sent to a **3D printer to create a physical socket**. “By focusing on 3D printing instead of the current labor-intensive hand-manufacturing process, the **cost of building a prosthetic socket decreases**. Presently, the engineers are also **testing out different materials** for the prosthetics to optimize usability versus cost.

Currently, the project is not at the stage in which they have communicated the results of their solution because they are **still running tests** on aspects of each step of the plan. So in that aspect, I would say **the project is similar to our robot**. Our team is **continuously testing to see if our solutions for the game work**, and the work on our robot is still incomplete.

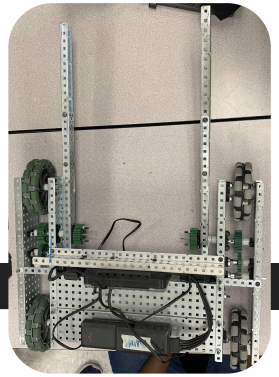


The project engineers' approach to engineering design is similar to ours because they **researched and assessed the problem they're confronting like we are**. As they continue to get the logistics, we analyze the game setup and see which type of subsystems are best for our robot.

Moreover, like they are testing out **different materials** for the prosthetics to see which is best, we are creating **different subsystems** for our robots and testing their effectiveness regarding the competition game.

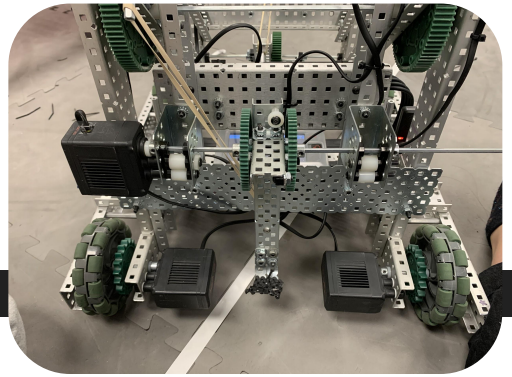


Tall Claw Subsystem

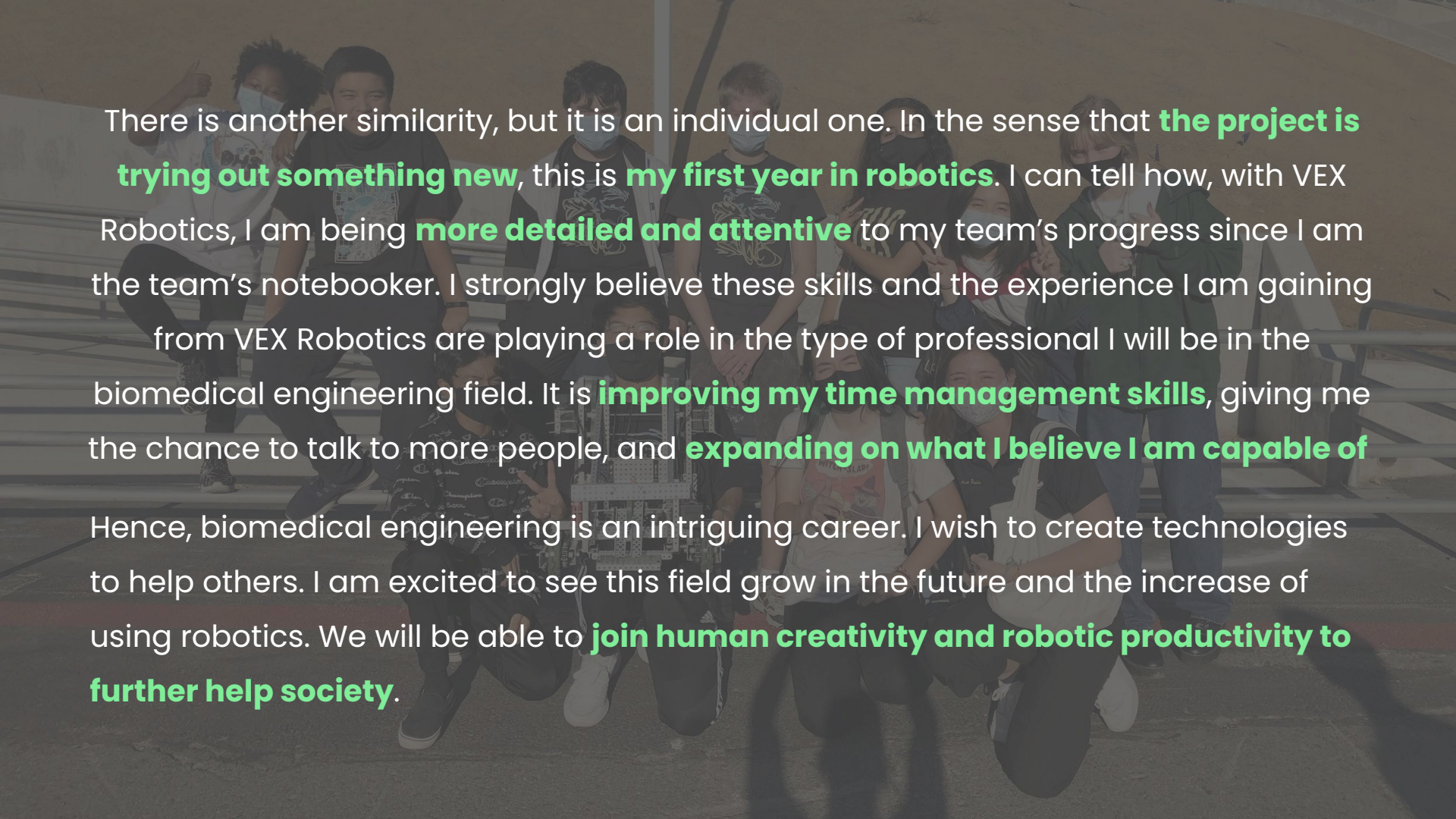


Forklift Subsystem

Front Clamp Subsystem



Back Hook Subsystem



There is another similarity, but it is an individual one. In the sense that **the project is trying out something new**, this is **my first year in robotics**. I can tell how, with VEX Robotics, I am being **more detailed and attentive** to my team's progress since I am the team's notebooker. I strongly believe these skills and the experience I am gaining from VEX Robotics are playing a role in the type of professional I will be in the biomedical engineering field. It is **improving my time management skills**, giving me the chance to talk to more people, and **expanding on what I believe I am capable of**

Hence, biomedical engineering is an intriguing career. I wish to create technologies to help others. I am excited to see this field grow in the future and the increase of using robotics. We will be able to **join human creativity and robotic productivity to further help society**.

Citations

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- Images were from:
  https://i.ytimg.com/vi/TQRM-7kSNmI/maxresdefault.jpg (hydraulic power mechanism)
  http://chf.ucsd.edu/wp-content/uploads/2019/05/photogrammetry.pdf (3D digital limb model)
  http://chf.ucsd.edu/wp-content/uploads/2019/05/socketdesign.pdf (modeled socket designs and prototype)