

MEDICAL SCIENTISTS AND THE PROCESS BEHIND VACCINES

Researching, designing, building,
and testing a world-changing dose
of medicine within limited time.



Picture From Canva

Word Count:

983 words (Excluding title page and
citations)

LaZer GirlZ 95129A

Audrey L. Kacie C. Audrey W. Elizabeth Y.
Kayla H. Lauren H. Lydia C



Joaquin Miller Middle School
Cupertino, California



Pictures from Canva

INTRODUCTION

MEDICAL SCIENTISTS: EPIDEMIOLOGY AND VIROLOGY AS A CAREER

"Medicine is not only a science: it is also an art. It does not consist of compounding pills and plasters: it deals with the very processes of life, which must be understood before they may be guided."

-Paracelsus

Epidemiologists are important to our society because it affects the health of the people in our community. Their cycle between research and discovery allows them to create vaccines to stop viruses from spreading quickly.

Virologists include workers in hospitals that test samples, recommend treatment, treat patients, and perform clinical research. They provide an overview of the virus which helps epidemiologists create and develop vaccines.

Epidemiologists

eh-puh-dee-mee-aa-luh-jists

PUBLIC HEALTH WORKERS WHO INVESTIGATE PATTERNS AND CAUSES OF DISEASE TO LOOK FOR STRATEGIES FOR CONTAINING OR STOPPING THEM.

Virologists

vahyrol-uh-jist

SCIENTISTS IN HEALTH ORGANIZATIONS THAT SPECIALIZE IN VIRUSES AND THE DEVELOPMENT OF MEDICATIONS.

THE CREATION OF VACCINES

WHY DID WE CHOOSE THIS TOPIC?

Epidemiology and Virology are important careers in our community. Their work inspired us to explore the similarities between their design process and the engineering design process. This includes ways that medical scientists research, build and test vaccines, and the process it takes for engineers to research, build and test robots.



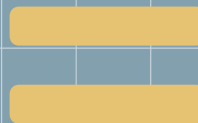
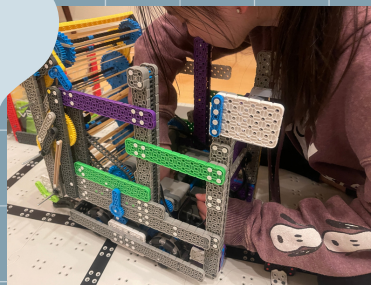
Elizabeth and her brother wait in line to receive a COVID-19 vaccine in San Jose on Nov. 3, 2021.

Picture printed in CAL MATTERS newspaper

RELATION

HOW DOES ENGINEERING AND VACCINES RELATE?

Even though robots and machines seem very different from vaccines and viruses, there are similar challenges in these two fields. Making vaccines takes lots of research, testing solutions, and iterations, similar to the engineering process we took to develop our robot.

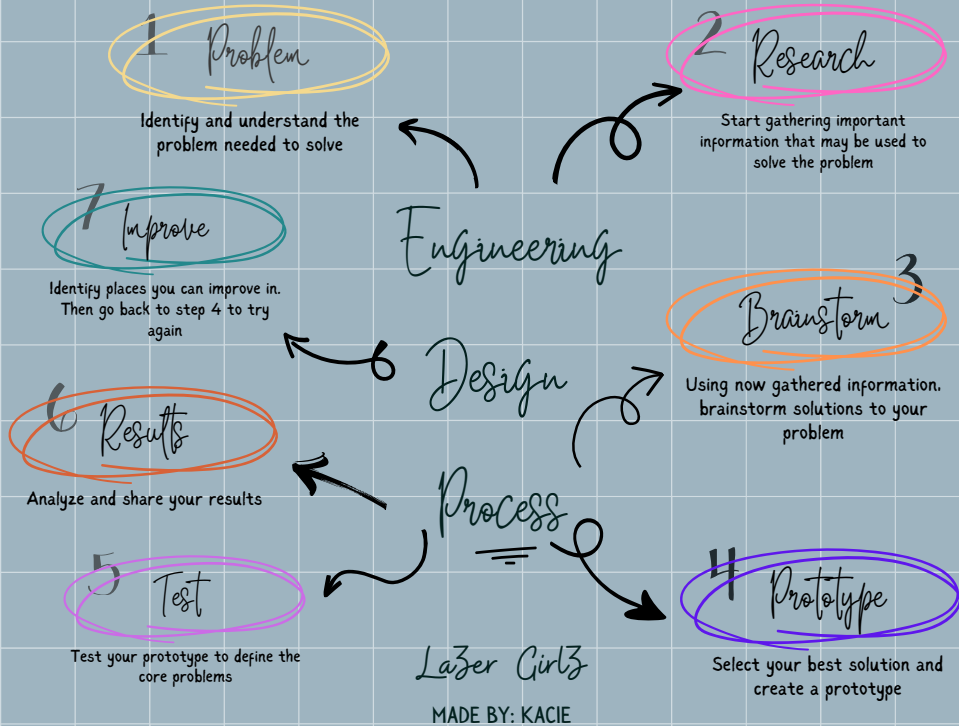


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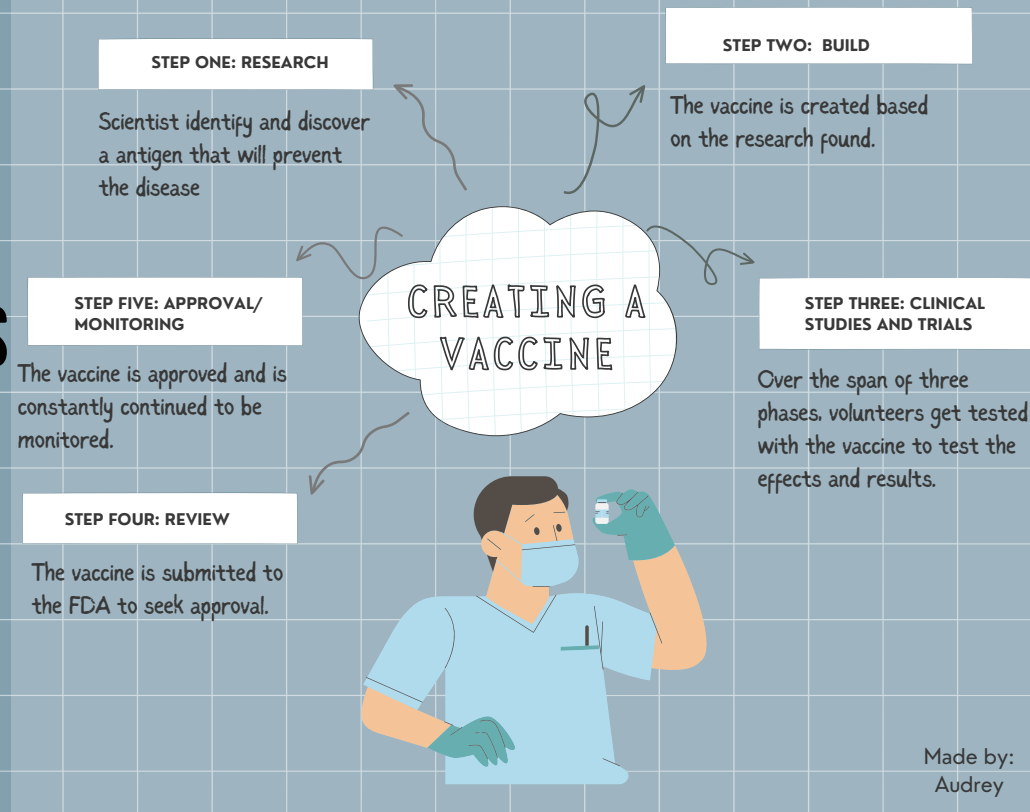


DESIGN PROCESSES

ENGINEERING DESIGN PROCESS COMPARED TO THE CREATION OF VACCINES PROCESS



VS



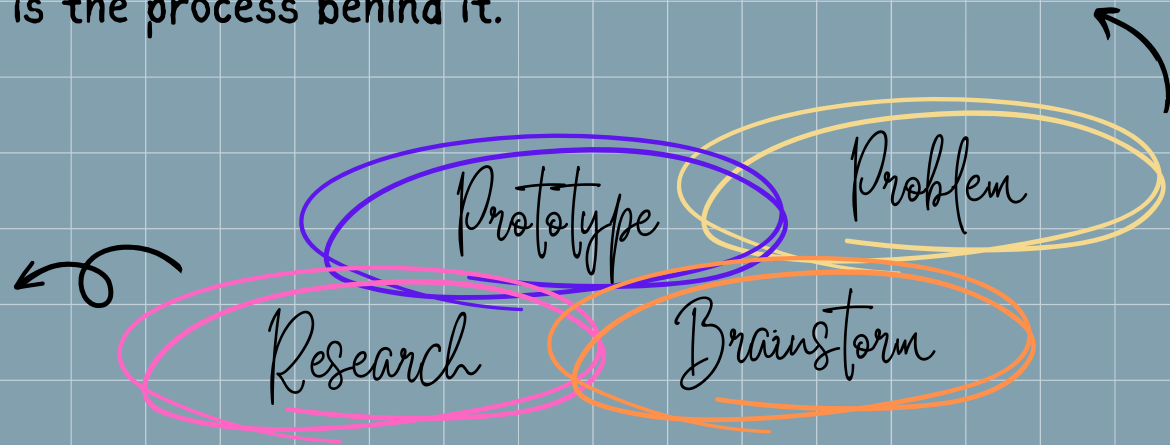
THE COVID VACCINE

EPIDEMIOLOGISTS AT WORK

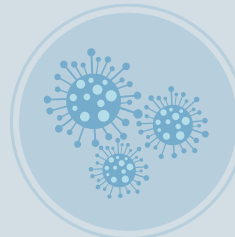
BEHIND THE SCENES
OF VACCINES

Many living through the year 2019 up to now has gotten the COVID-19 vaccine shot. We all know that the shot protects us from getting extremely sick from the virus. What we don't know is the process behind it.

Scientists understood that if a pandemic hit, the vaccine needs to be fast and reliable. Researchers would have to produce many doses of the vaccine in a short amount of time. The vaccine also had to be effective and protect the body from almost all the virus' symptoms.



THE SCIENCE BEHIND VACCINES



The vaccine introduces a new disease to the body.



The body defends itself using its immune system, training it to fight.



The body remembers the disease and will know how to fight it in the future.

MADE BY: AUDREY

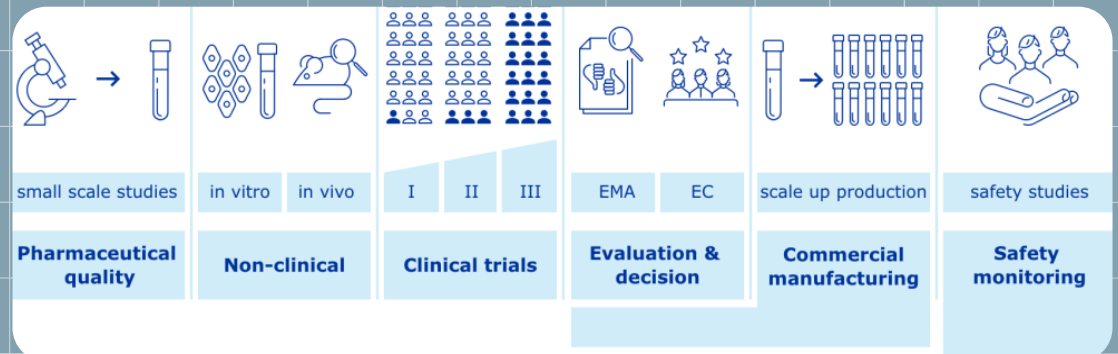
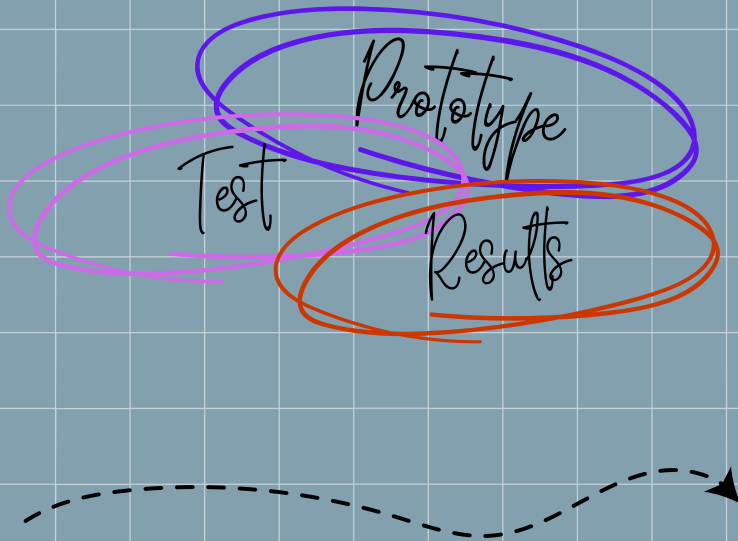
THE COVID VACCINE

EPIDEMIOLOGISTS AT WORK - CONTINUED



First, epidemiologists studied what harms the virus has on the body. Using a prototype injected into the body, the individual's immune system would study the virus and learn to protect itself. However, epidemiologists knew that this process would take too long to make large amounts so, they made a new approach to produce vaccines. This approach is to inject RNA instructions into a person's muscle. The body's immune system then studies the instructions to protect itself from harm.

COVID-19 vaccines were tested in a laboratory to check the effects on animals. Vaccines are then tested on human volunteers during clinical trials. Trials confirm how the vaccines work and evaluates their safety and efficiency.

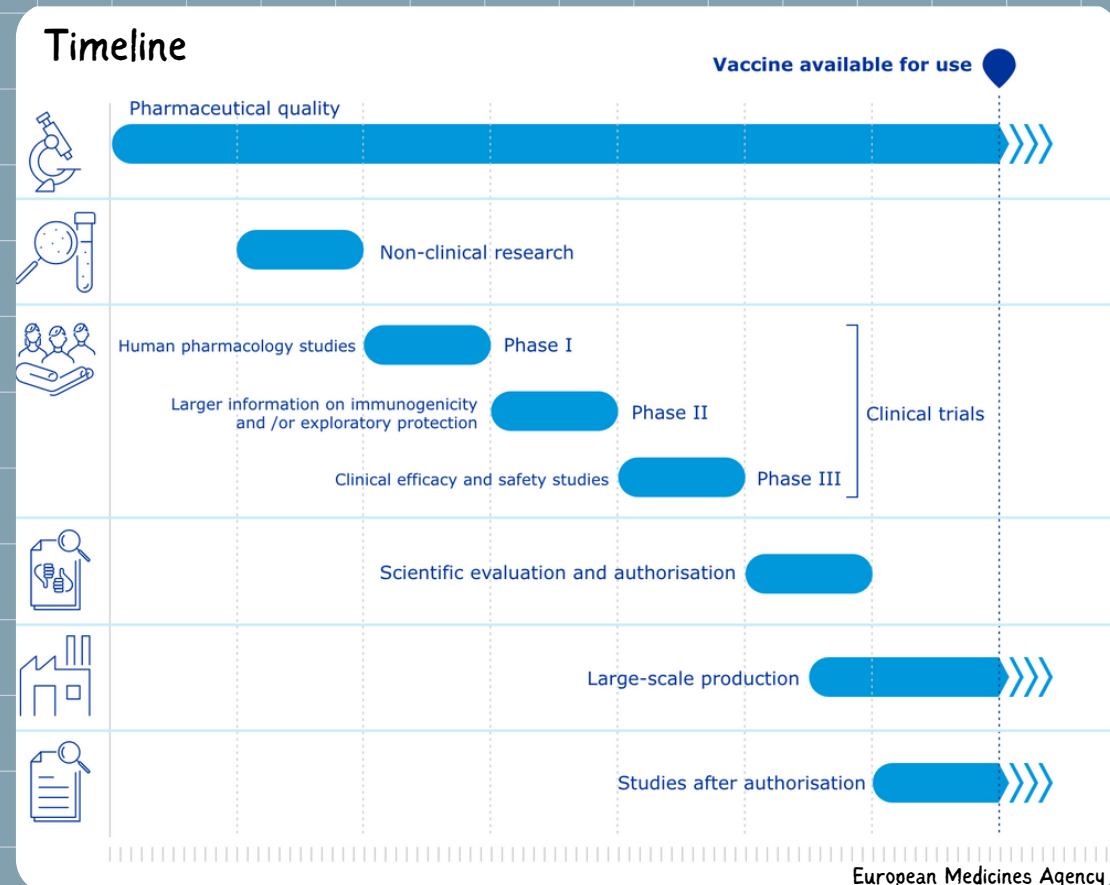
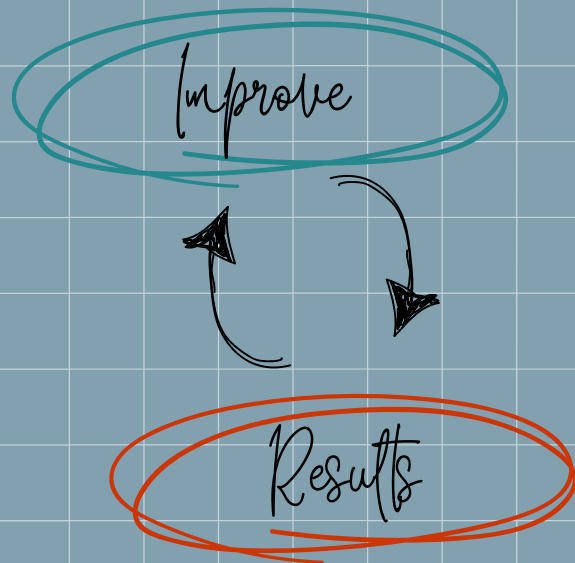


THE COVID VACCINE

EPIDEMIOLOGISTS AT WORK - CONTINUED



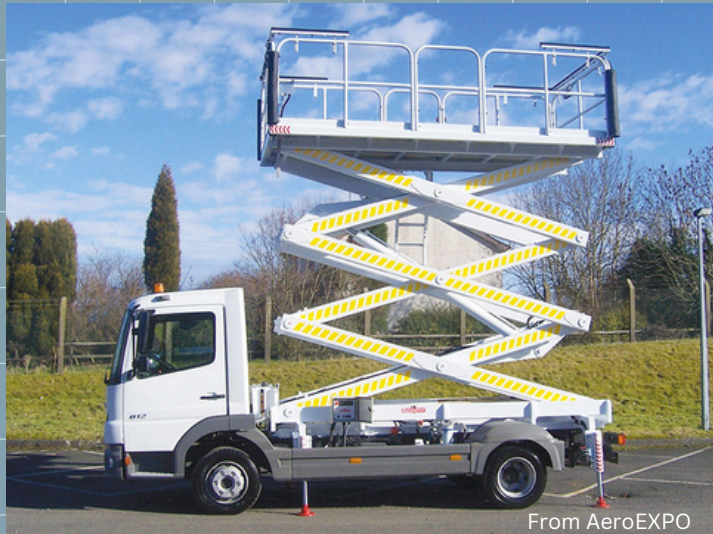
Vaccine companies start by making small batches to optimize the production process. Studies on pharmaceutical quality inspect components of the final vaccine and the manufacturing process in detail. The vaccine developer then studies the vaccine in three phases of clinical trials, with increasing numbers of volunteers in each phase.



OUR ENGINEERING PROCESS

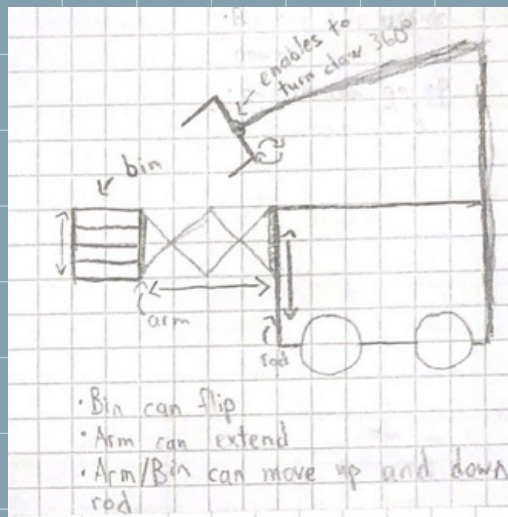
OUR ROBOT AND NOTEBOOK

1) Brainstorming



From AeroEXPO

We brainstormed possible robot designs.



2) Designing

Sweeper:

Pros

- Can collect multiple blocks at once
- Can swiftly collect and release blocks from its bin
- Blocks will not slip or fall out easily

Cons

- Can only collect one type of block
- Will require its own motor
- Rubber bands can get stuck



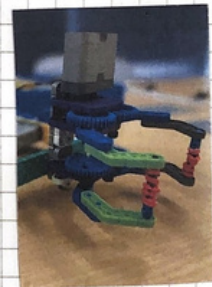
Claw:

Pros

- Can adjust size to grab any size block
- Can easily grab a block from supply zone

Cons

- Can only ~~grab~~ grab one block at a time
- Will require its own motor
- Block may sometimes slip from its grasp

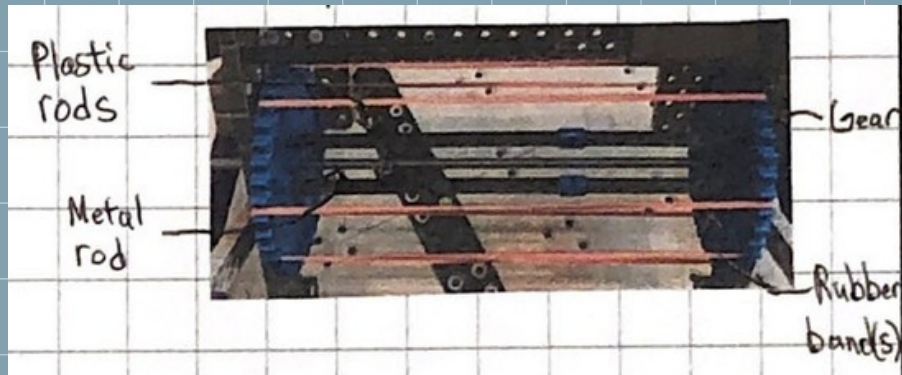


We made a list of pros and cons to see which was better.

OUR ENGINEERING PROCESS - NOTEBOOK

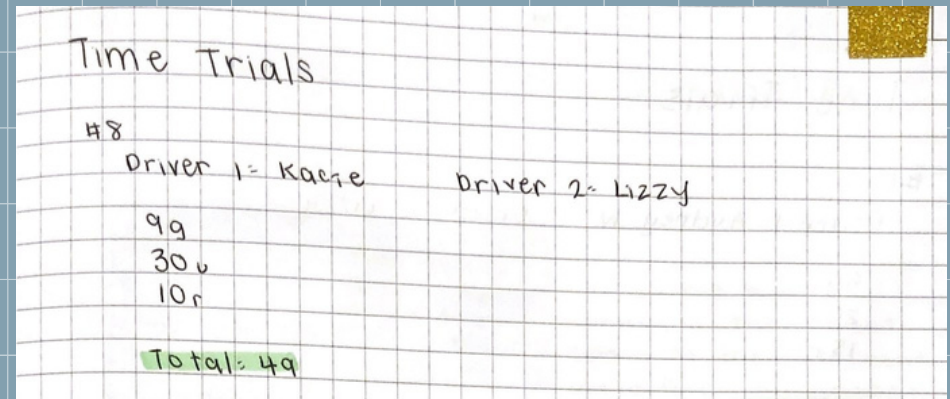
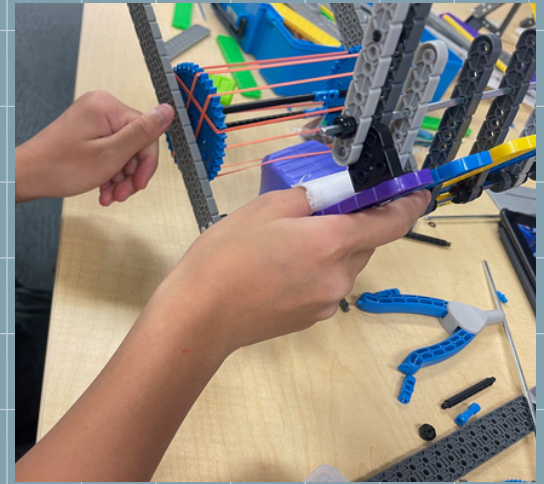
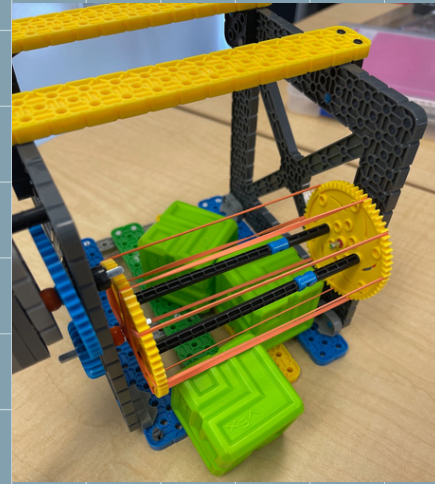
ROBOT AND NOTEBOOK

3) Building



We built iterations based on research and recorded the steps in our notebook.

4) Testing

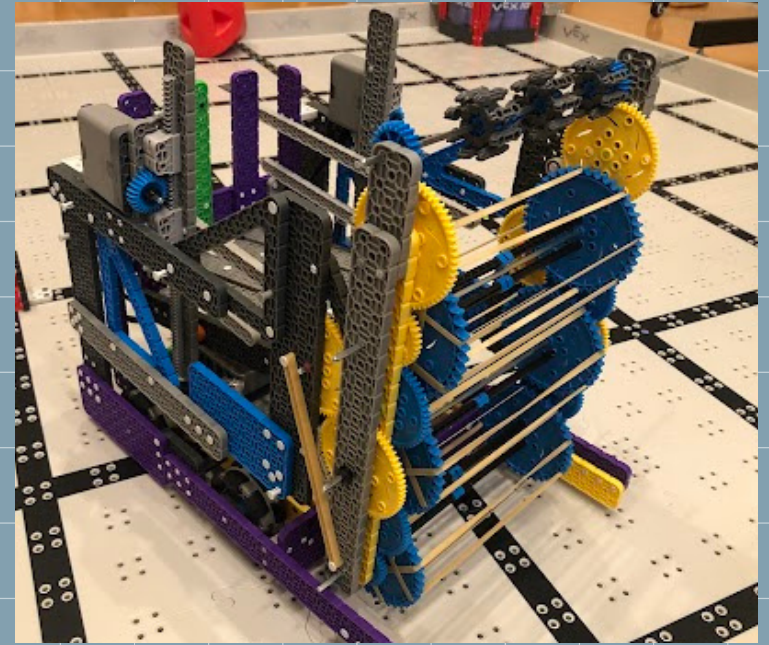
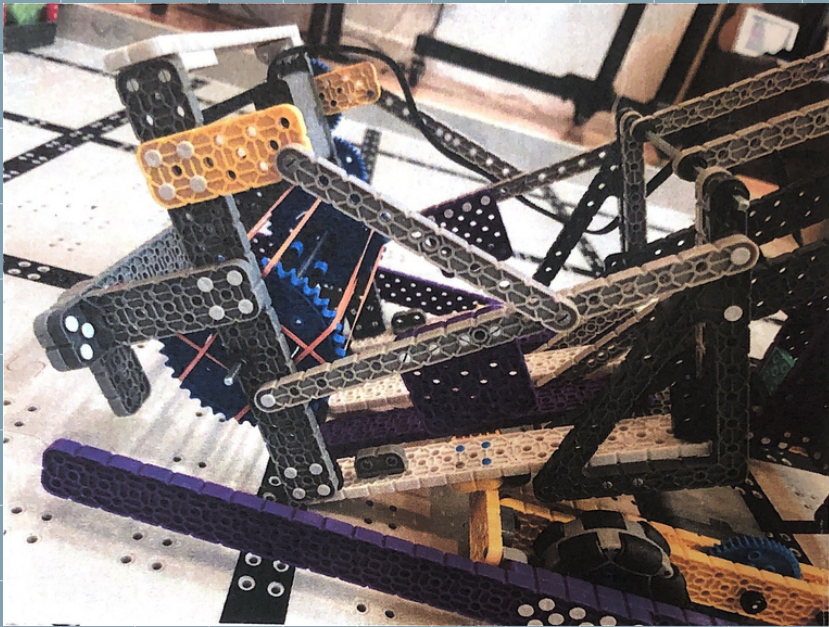


We tested our robot through time trials and inserting blocks through our sweeper.

OUR ENGINEERING PROCESS - NOTEBOOK

ANALYSIS

5) Re-build



We chose to rebuild our robot because we noticed it was limited so that we could only pick up green cubes. We used the engineering design process to re-design our robot.

CAREER READINESS

ROBOTICS IN THE FUTURE



VIQRC presents teams with many challenges that let us apply the engineering process and critical thinking. As an epidemiologist, one must use the engineering process to create a vaccine. As participants of VIQRC, we also follow the engineering process to build and improve our robot. VIQRC prepares us to face just about any challenge throughout life.



CREDITS

THANK YOU FOR READING!

Platform: Canva

Sources:

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[California COVID: A bleak midwinter due to Omicron - CalMatters](#)