Comparisons Between VEX IQ and Mechanical Engineering

1715M - Hopkinton, MA

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Introduction

"The engineer has been, and is, a maker of history." - James Kip Finch

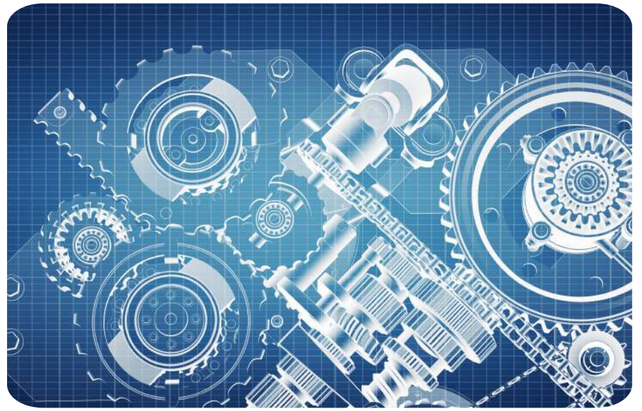
We decided on Mechanical Engineering as our topic and will explain its relation to the Engineering Design Process, along with our usage of the process. Everywhere in the world, mechanical engineering is evolving just as civilization does. The purpose of mechanical engineering is to make a positive difference in society. Human beings shape mechanical engineering in the present, but in the future, our way of living will be shaped by it.

Why We Chose This

We've all had our share of experiences with mechanical engineering. Upon realizing mechanical engineers created the complex phones, TVs, and computers we use every day, we became invested in learning about the process of mechanical engineering. The technologies developed shape the modern world itself, and the engineers behind the solutions get to affect billions of lives around the world.

Why is Mechanical Engineering Important?

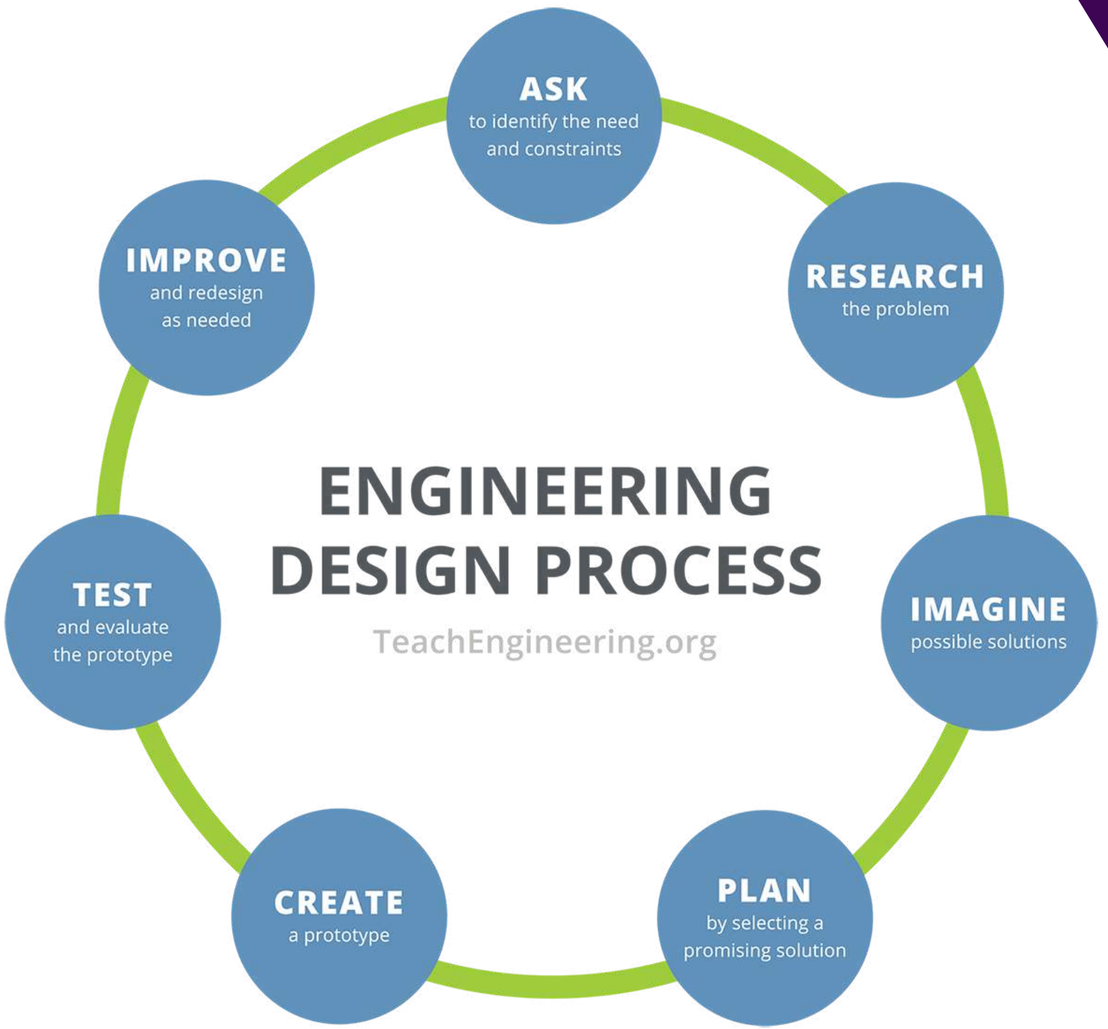
Mechanical engineering is the application of problem-solving techniques like implementing the engineering design process to create a device to help solve everyday issues successfully.



Although the average person might not notice them, mechanical engineers are crucial to the progress of technology. Despite having their importance overlooked, mechanical engineers work to create designs to solve the multiple problems arising worldwide.

The Engineering Design Process

The Engineering Design Process refers to a repetitive series of steps used to find a solution to a problem. We chose this iteration of the design process because it was easy to understand and shows that the process is continuous and improving.



ASK

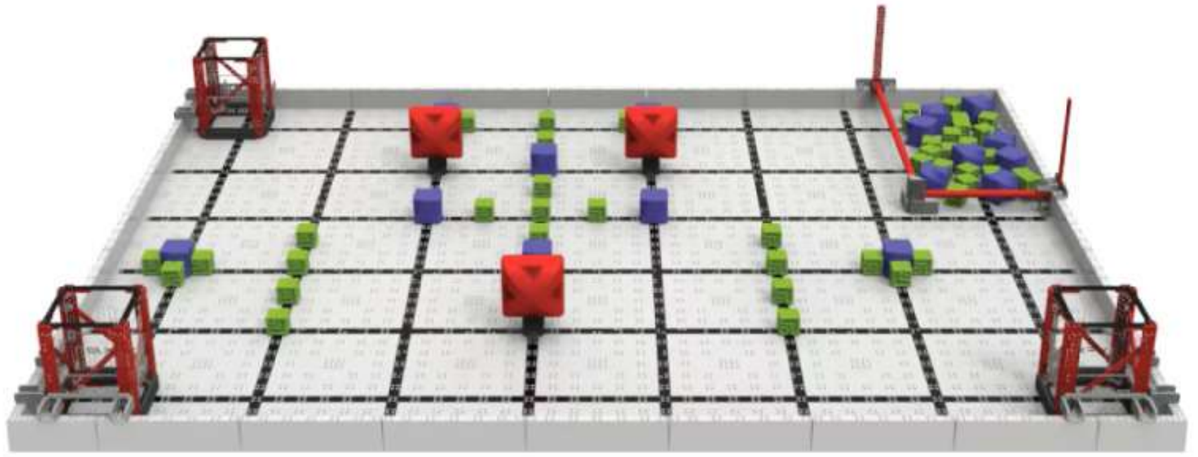
Mechanical engineering is vast and versatile, in fields such as manufacturing, biomedical, and chemical engineering. To successfully construct a design, engineers must identify the restrictions and goals of the design.

Areas Mechanical Engineering Affects:

- Health Care
- Non-Renewable Energy
- Transportation
- Poverty
- Space Exploration
- Climate Change
- World Hunger

Ask VEX IQ

The goals of every season are presented to us in a short video. Our task is to decide how to acquire the most points in the time constraint of one minute. Instead of concentrating on the multiple constraints mechanical engineers face, VEX IQ allows us to be able to focus on one goal.



RESEARCH

Engineers must figure out what the possible solutions for the problem is. Engineers confront books, articles, professionals, and past precedents to gather information. Using their research, mechanical engineers can figure out what methods will be successful and what won't.

Research VEX IQ

Research was an essential part of our design process. We needed to learn more about the challenge we were facing, and how to best utilize our resources. The VEX IQ Game Manual, Rubric, and designs created by other people were helpful.

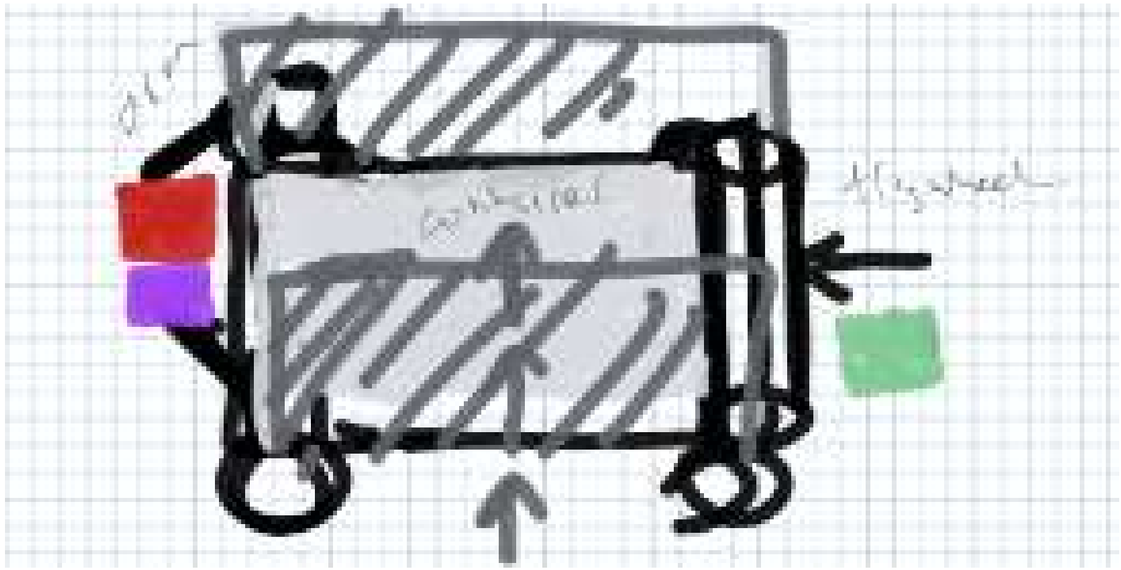
VEX ROBOTICS | Official Forum

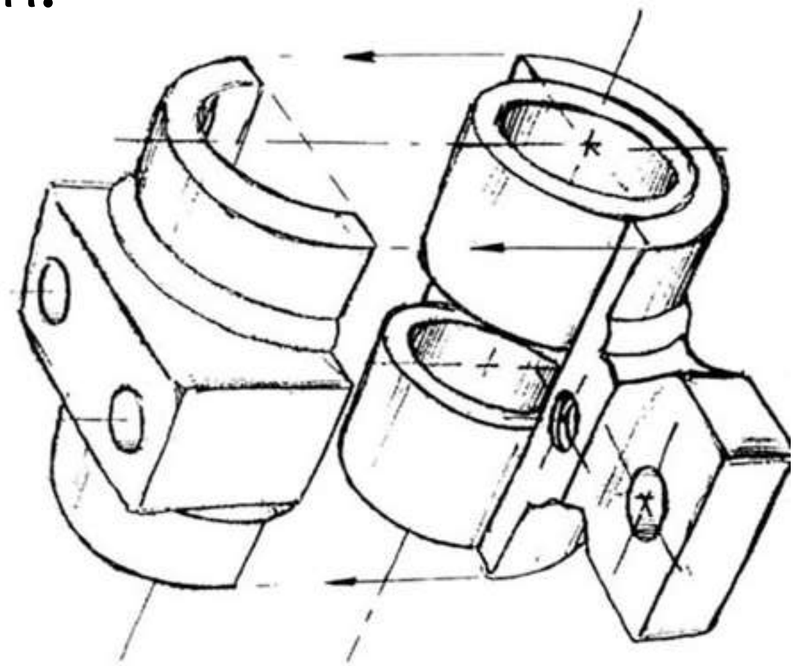
IMAGINE

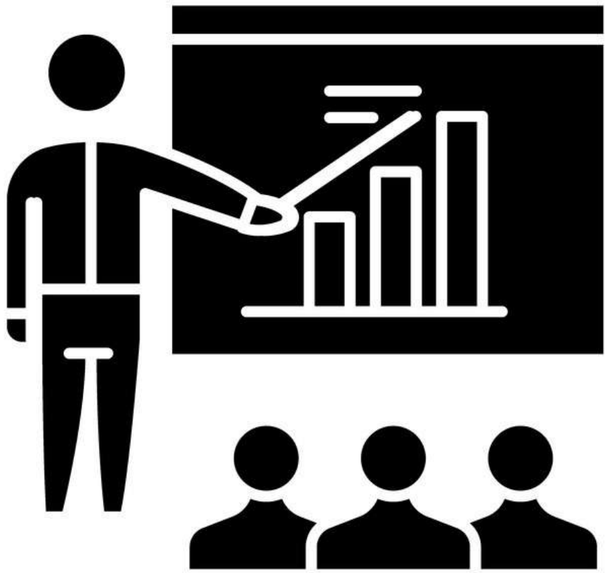
Mechanical engineers imagine the solution to their problem based on the data obtained from research. It's best to incorporate ideas from people of diverse experiences.

Imagine VEX IQ

After research, we created a basic sketch of what we wanted the robot to look like which is shown below. We also organized our ideas in the engineering notebook. Our notebook helped us keep track of our ideas and the pros and cons of each.





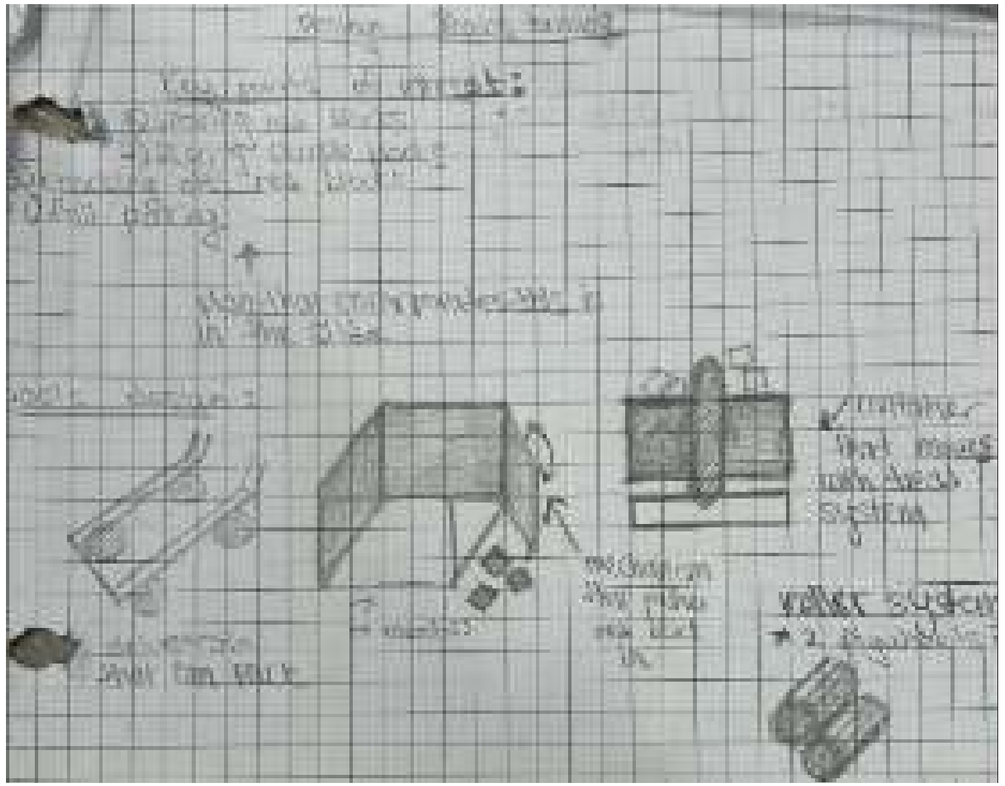


PLAN

After devising several ideas, mechanical engineers choose the solutions that work the best. Deciding factors are how the design will be used, where it may fail, and the efficiency of the design. Engineers must discover problems during the planning stage rather than after the prototype has been built.

Plan VEX IQ

When we first learned about the challenge for VEX IQ, we needed to have a solution to be successful in the competition. We discussed what solutions would be the most successful. Once we chose a solution that would work, we sketched it and discussed what materials we would use.

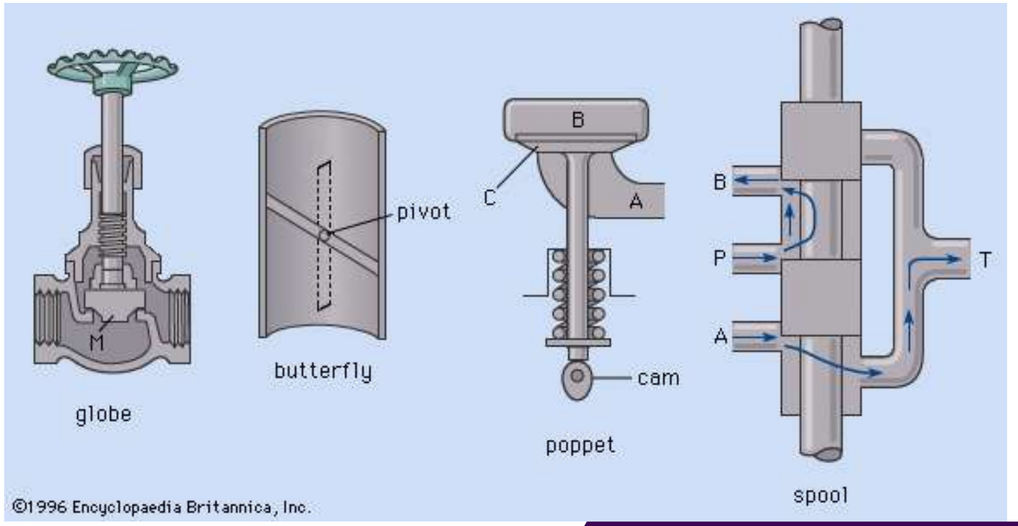


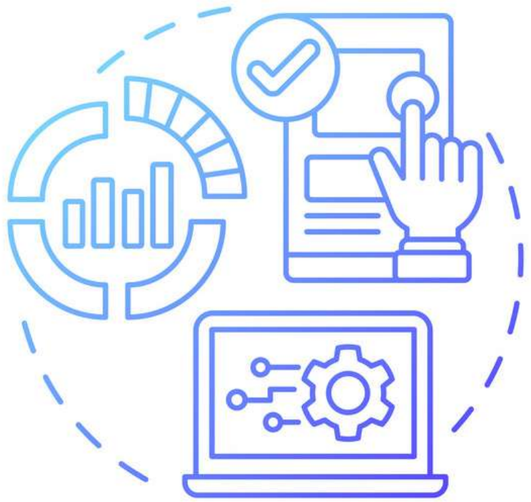
CREATE

Prototypes are versions of the final product that are built quickly and made up of different materials. Prototypes include the details and functions the final product will have. During this step, engineers create a working design and fix any issues that come up.

Create VEX IQ

Instead of creating a prototype, our team planned out the layout of the bot beforehand. We started with the drivetrain and built the exoskeleton while keeping the space in the middle empty for future mechanisms. The mechanisms were attached later to ensure the robot would meet the size requirements.





TEST

Mechanical Engineers use prototypes to test their solutions for flaws before creating it. Testing the prototype gives the creation a better chance of succeeding because it uncovers issues. Testing allows mechanical engineers to find solutions that work well and ones that need improvement.

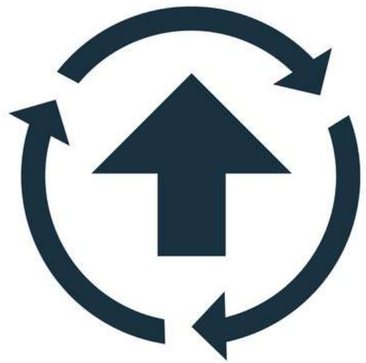
Testing VEX IQ

During testing, certain outcomes vary depending on specific circumstances, like the angle or position of the robot. Although the first try never seems to work out how we want it to, we fix what went wrong and try again.

Number of Tests	What happened	What went wrong	What we changed
1	It worked and we started figuring out what we need to do next.	It wouldn't turn the correct way.	We changed the heading to make it turn the right way.
2	The first part worked.	The second part, the robot doesn't turn the right way.	We are continuing to change the headings and measurements until it works.
3	The first part did not work.	One of the cubes did not go completely in which caused the entire program to shut down.	We re tested to make sure that there isn't any problems in the program.
4	It turned the opposite way then we wanted it to.	It kept spinning too much.	We changed the degrees from 90 to -90
5	The robot kept turning too far and would not get the two more blocks	It got one of the blocks and skipped the first block	We changed the angle and made the bot go forward before turning
6	The robot got the two blocks and turned backwards towards the container	The angle of the turn backwards was too much.	We changed and tried multiple different angles

IMPROVE

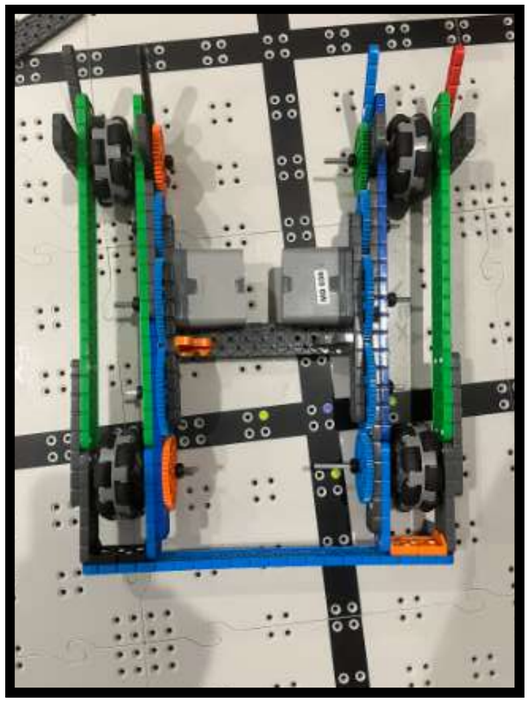
To improve, engineers reflect on past failures and successes. They use this step to identify issues in the prototype and go back to the Ask stage. Mechanical engineers take feedback from colleagues and look back at the best practices for more ideas.

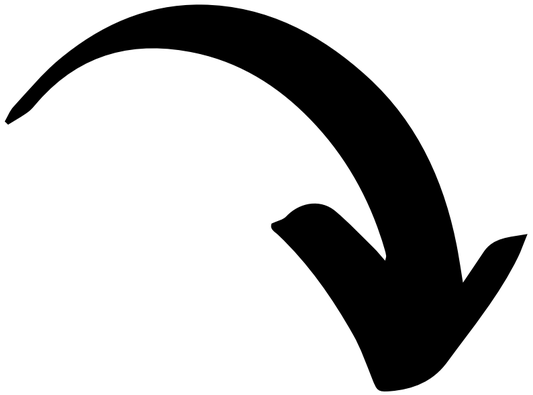


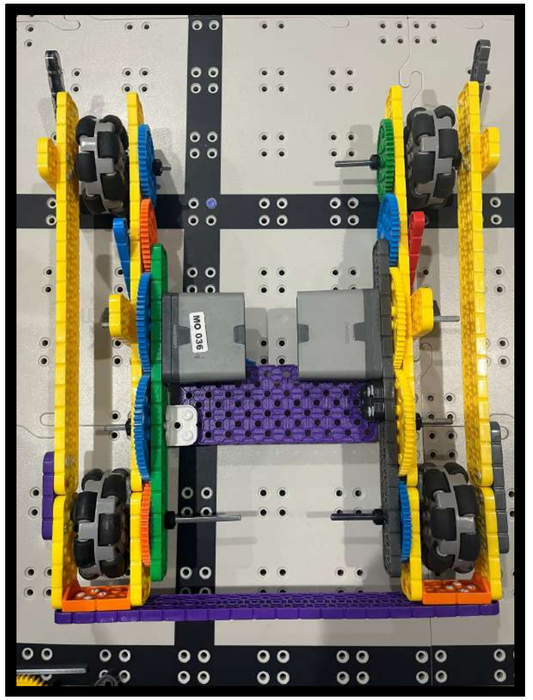
IMPROVEMENT

Improve VEX IQ

So far, both iterations of our robots had improvements. After each competition, we discuss how we can improve our robot further and reflect on what went wrong with the robot. Then, we went through the engineering design multiple times until we felt satisfied.







Preparing for the future

As many of us approach our final year of middle school, we start to consider the options for our future and the paths we might take to get there. Robotics has helped us learn about teamwork and problem-solving. We also learned about building, programming, documenting progress, and how to work efficiently under pressure and time constraints. There have been times when we had struggled, but others when we persisted and succeeded. Instead of giving up when disappointed, we overcame the challenges and grew as engineers and people.

Citations

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How to Improve Your Mechanical Engineering Designs

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