Career Readiness Challenge

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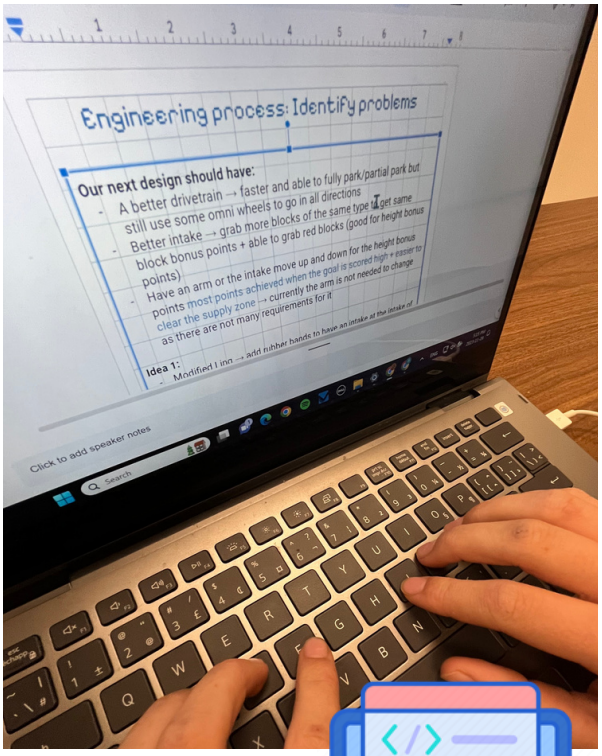
Like professional programmers, VEX IQ Robotics teams use **growth mindsets and find creative solutions to problems.**



We chose a programmer as our STEM career because two of our group members are interested in having a job in that area along with many other eager students in our generation.

We chose one of our companies as Google because Google has very good examples of providing a growth mindset environment for their employees.

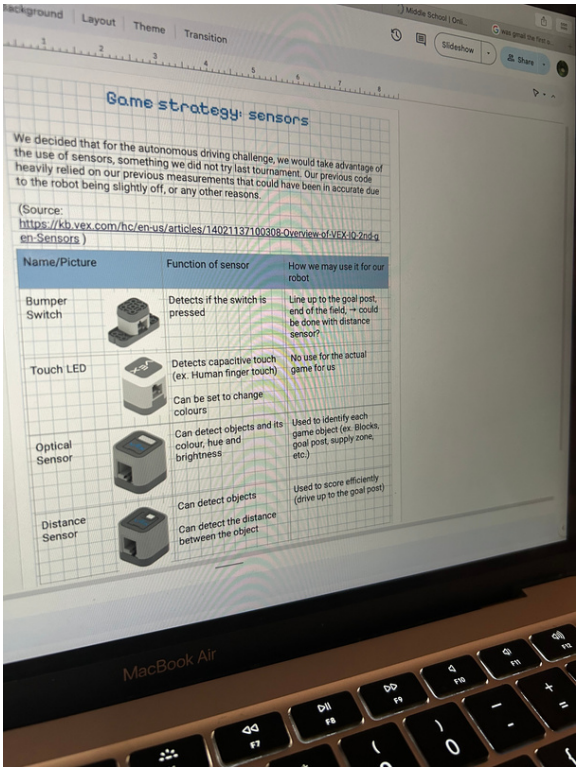
For example, employees are encouraged to devote 20% of their work time to pursue personal interests or passion projects. Some successful things that have come out of this initiative are Gmail, Google News, and AdSense.

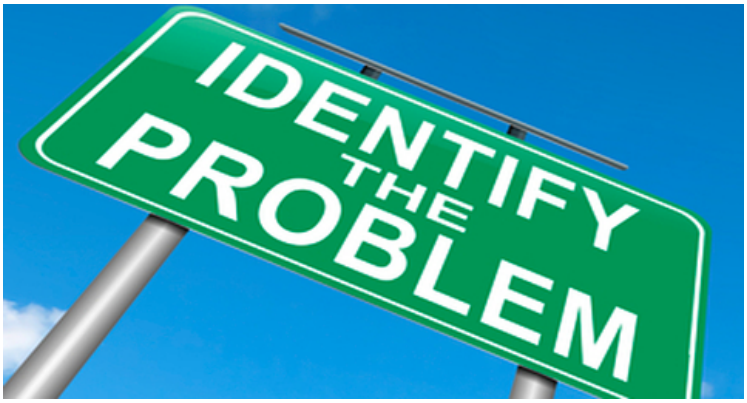
Google is also one of our biggest inspirations because they are constantly finding new solutions to simple problems in our daily lives. For example, gmail allowed workers and students alike to easily use the search function to find certain messages and truly changed the world.

Comparing the design processes of VEX IQ and Programmers...

Engineering Processes

1. Since we are in robotics, we must need a robot and brainstorm a good robot idea to win and achieve success in a tournament.
2. Using various online resources for inspiration, we found likely contenders for a good robot, including intake, drive train, and outtake ideas.
3. After finding different methods for our robot, we made graphs and tables to compare our choices to find the best one





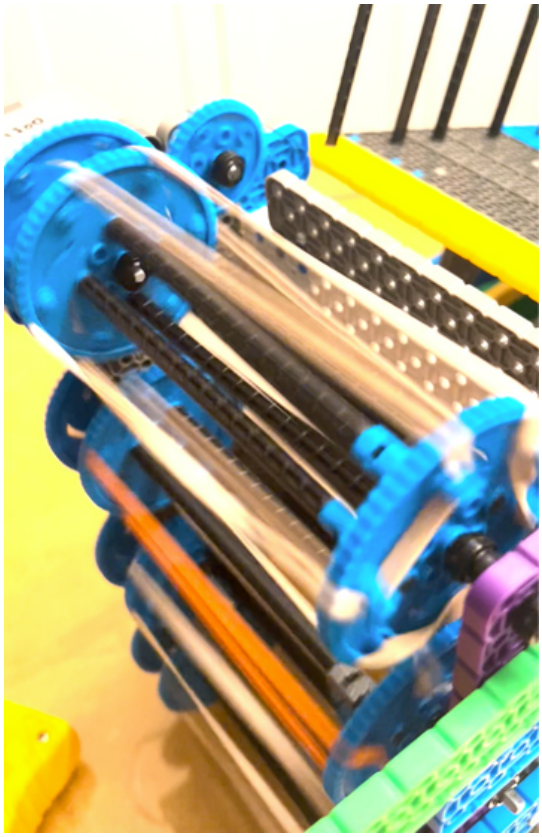
Identifying Problems

As the first step in both of these processes, identifying the problem is the first crucial step in a design process. What is your problem that you are going to solve? You must first identify and define it clearly to properly ensure that you can come up with a good solution to fit within your constraints and goals.

Brainstorm Solutions

Brainstorming is a crucial part of robotics because you need to come up with ideas. There could be a good chance that the first solution you come up with isn't the one that is necessarily going to work. That is why you must brainstorm many different solutions for one problem so you can have a variety of solutions you can choose from.
Compiling solutions together can give you a clearer vision of what could possibly be the best choice.

This is the same for computer science. For instance, if you run into a bug in the code, it may not always be as straightforward to find a solution. Which is why it's always useful to draw a mind map or a flowchart algorithm to get your ideas flowing and down.



For example, we went through multiple different intake designs to create a good solution.

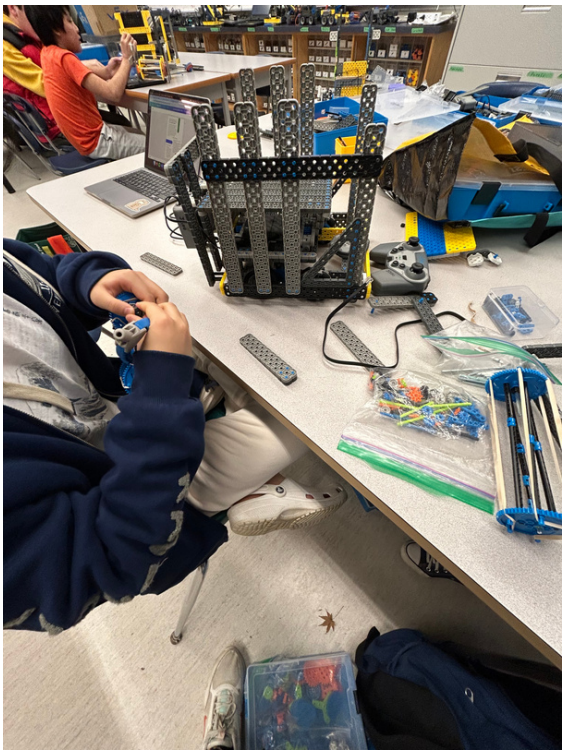
Make predictions/Selecting solutions

As you can see to the right, we used a decision matrix to choose the best solution for our drivetrain. Using a decision matrix allows us to evaluate important features and goals of the drivetrain before selecting the prime option. This is helpful for our team in building our robot as there are multiple parts we need to consider to have a cohesive and sucsessful robot.

Engineering process: Choosing the drivetrain

Rating the drive trains				
Criteria	Scale	Two Omni wheels / two Standard	H Drive	X Drive
Simplicity to build	1-5 (5 is easiest)	5	4.5	3
Ability to turn quickly	1-5	3	2	4
Low motor usage	1-5 (5 is least)	4	4	3
Speed	1-5	3.5	3.5	3
Ability to go over obstacles	1-5	4	4	2.5
Final sum	/25	19.5	18	15.5

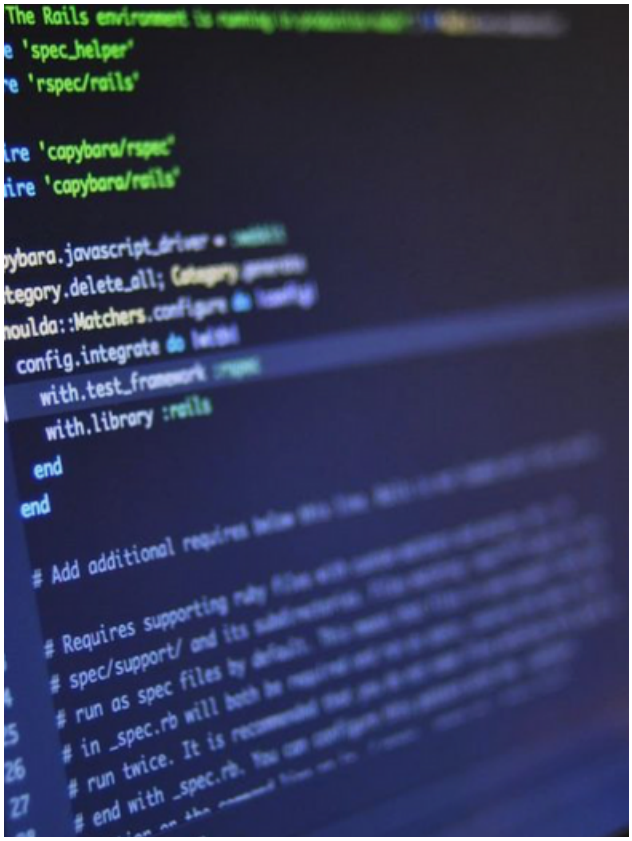
In computer science when writing code, we can predict cases where we may need to consider a different algorithm to accomodate the cases. To do this, it is useful to run the test cases by hand to find any possible steps where the program may have trouble processing.



Programming/Building the solution

Building together cooperatively can be a challenge that teams face throughout several robotics teams. Our teammates communicate clearly to each other through our engineering notebook sharing our thoughts and comments. We manage our time building by having dedicated sessions for certain goals (ex. building, programming, etc.)

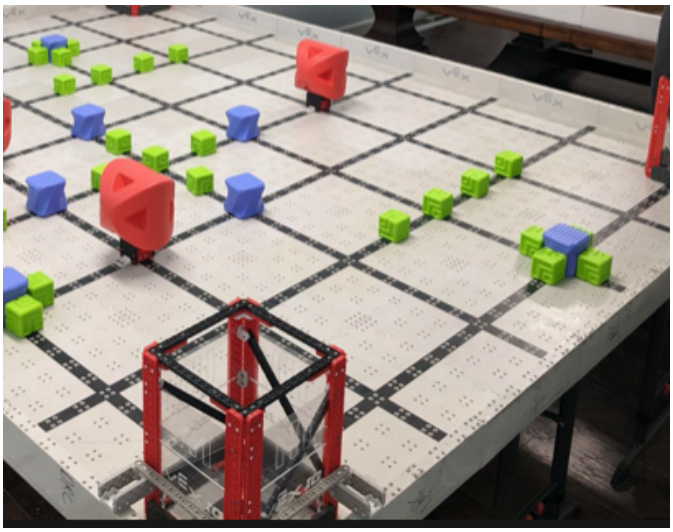
On the other hand, programmers use pair programming to work efficiently with each other. One is the driver, who is writing the code and the other is the navigator, reviewing each line of code as the driver programs. We often use a similar technique in our building sessions by having one teammate building and the other reviewing and commenting on their features.



Testing the solutions

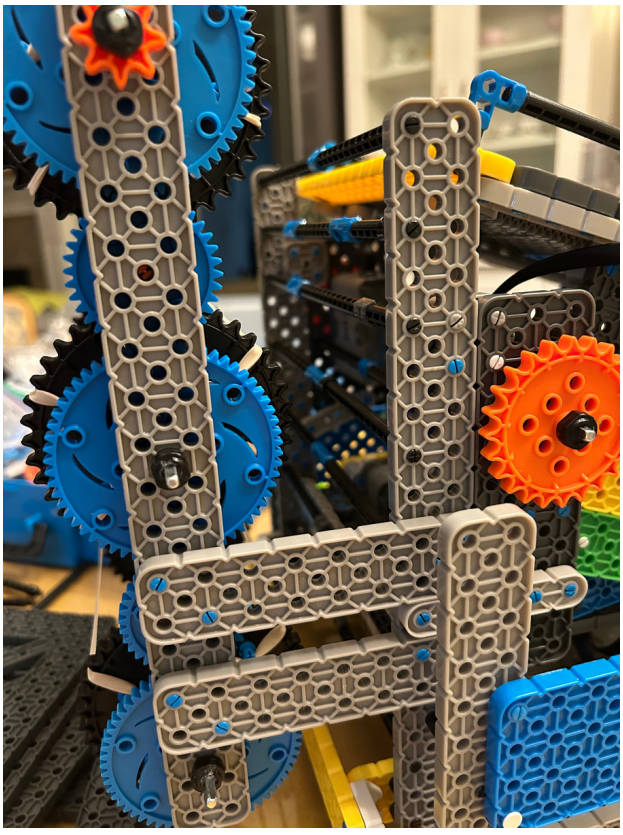
Our robotic team has testing as a stage in perfecting our robot. We test the different features of the robot by putting it through possible conditions in the game.

Similarly, programmers test their program with test cases. They find certain “edge cases,” cases with a different constraint compared to the common cases.



Repeat the Design Process

In our robotic team and in a programming team, we both constantly receive feedback from multiple perspectives, whether that be from each other or our mentor. By reviewing the feedback, we apply the design processes with those goals and constraints in mind to create a better robot and program.



VEX Robotics supports and prepares students for future careers because...

1. Participating in competitions and being judged helps with job interviews and promotes actively trying to thoroughly understand a topic.
2. Teamwork challenges allows us to gain efficient and quick collaboration, teamwork, and leadership skills with other teams to work together and create high scores.
3. Using the engineering notebook allows us to communicate and display our ideas and products easily to teammates and judges.
4. Implementing the engineering process of teachers us you have to try and "debug" issues that arise. This enhances our ability to approach challenges properly and think analytically.

In conclusion...

VIQRC has taught our team many skills that we can apply to our future careers in STEM. These skills include teamwork,and persistence that we continue to grow more in as we go through the robotics season. We thank VIQRC for teaching us these lessons and hope to carry them throughout our career and academic lives.