Career Readiness Challenge: Civil Engineering

By: 3314A - Pace Invaders (Riley and Julia)

Location: 12 Bond Crescent, Richmond Hill, Ontario, Canada

About the Team

- Team: 3314A Pace Invaders Alpha-Pi

Team Members :

Julia

Designer, Engineering Notebook, Driver, and Coder.

Riley

Designer, Builder, Driver, and Coder.

What is Civil Engineering?

Civil engineering involves planning and developing projects. Those projects include designs for buildings, roads, airports and much more! With the increase in demand for new and improved infrastructure, Civil Engineering ensures we have stable homes to live in, and smooth transportation systems to ride on. They also revitalize parts of abandoned land. Civil Engineers are very important in our lives, because we are surrounded with these structures. These professionals work collaboratively, perform testing, problem-solve, and communicate to get the job done.
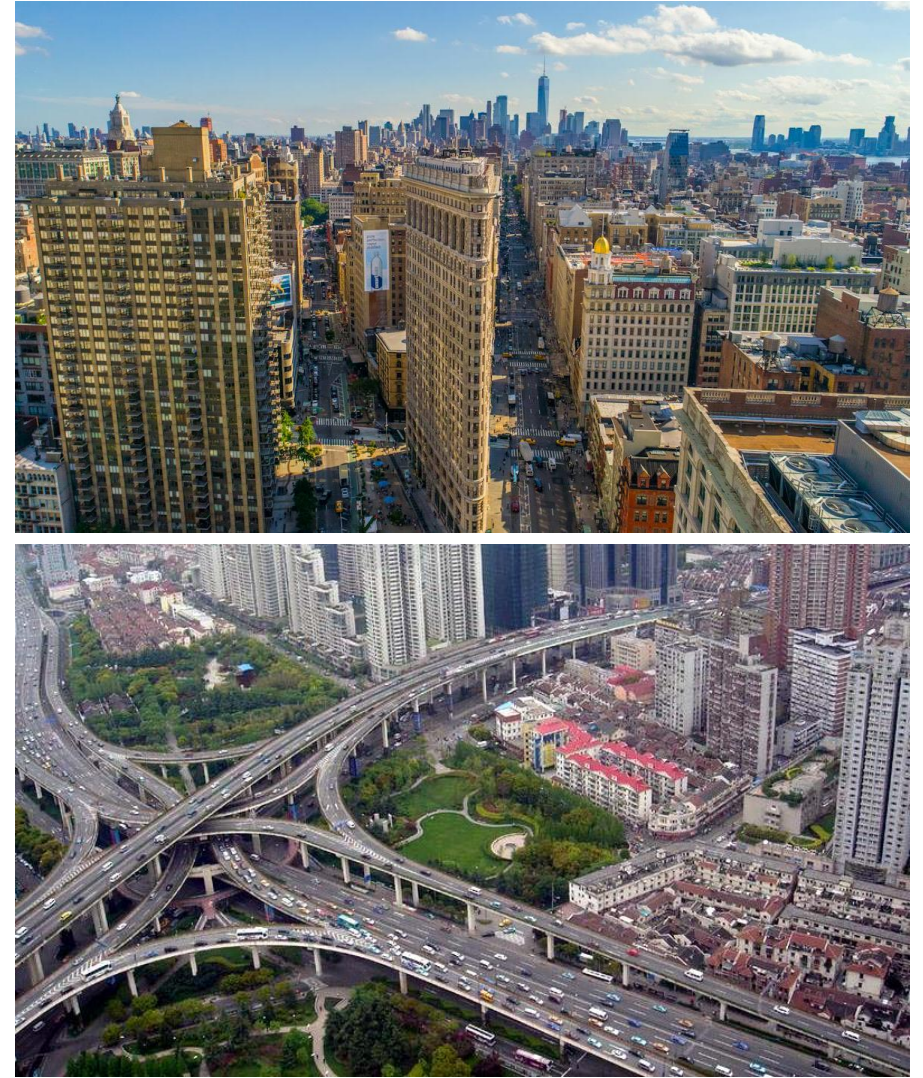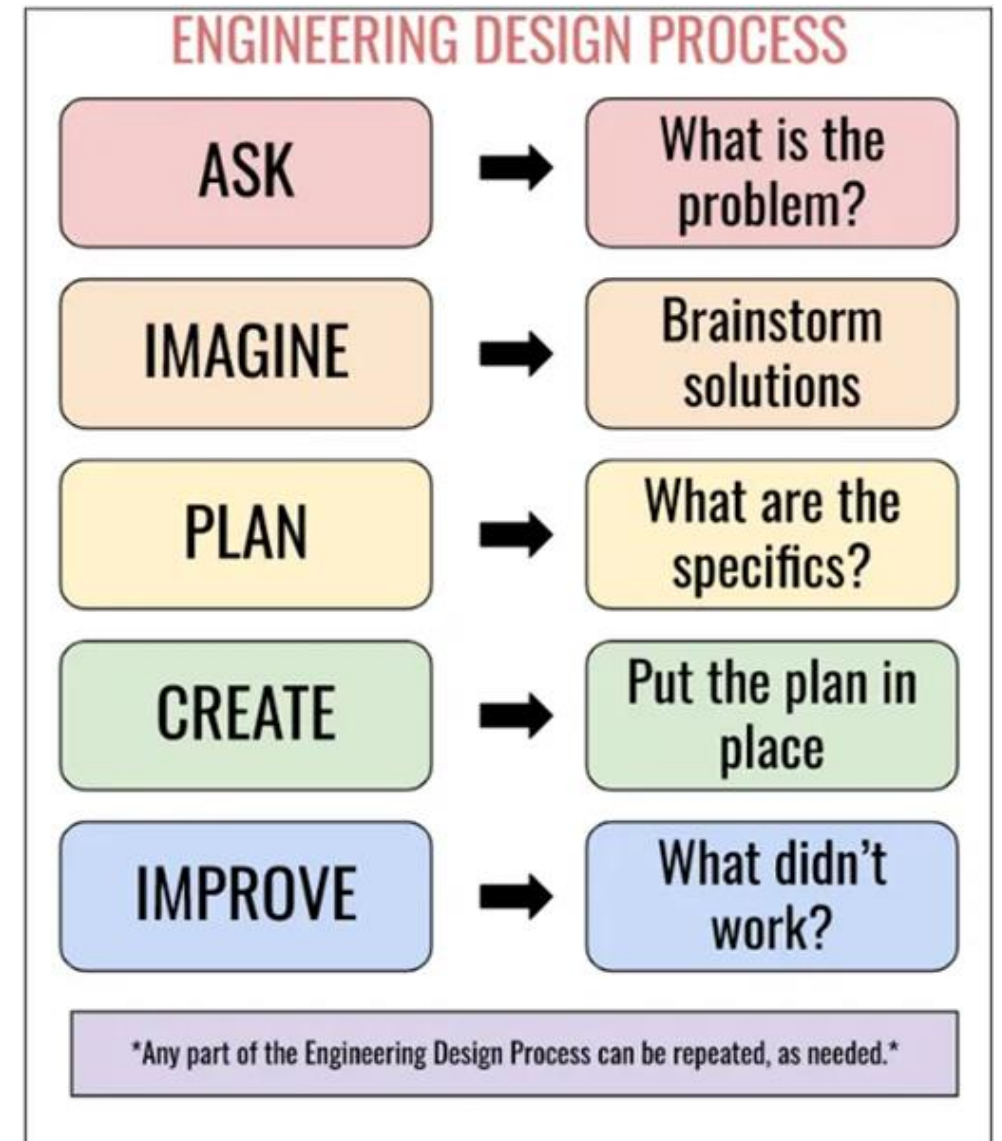
Why Did We Choose Civil Engineering?

Our team chose to research about Civil Engineering because they build our everyday structures. It is very interesting how they can build these big structures in such little time. They use the engineering design process to make our structures more stable and durable. They have such a big impact in the world, but we don't really seem to notice. Without them, we wouldn't have homes and transportation to get around. They also work as a team to get things done, just like us.

Comparing the Engineering Design Process

When we compare our team to the Civil Engineers design process, the structure they use is nearly identical. The steps in the design process is to identify the problem, brainstorm, build, and then make improvements. Civil Engineers use this process to organize their work, so they don't have many problems in the future. It also gives them a good idea on when they are going to complete it, and that everyone is on the same page.

ENGINEERING DESIGN PROCESS

ASK	➡	What is the problem?
IMAGINE	➡	Brainstorm solutions
PLAN	➡	What are the specifics?
CREATE	➡	Put the plan in place
IMPROVE	➡	What didn't work?

Any part of the Engineering Design Process can be repeated, as needed.

Planning and Identifying the Problem:

Civil Engineer's:

Civil Engineer's are either given a project/problem or they identify it themselves. Civil Engineers evaluate the situation and see if there are more obstacles in the way. They must overlook the plot of land before they build. They work as a team to outline constraints and due dates. Civil Engineers also ensure that the project is within the budget and brainstorm multiple solutions for the problem. After, they have a variety of designs to choose from.

3314A:

Like Civil Engineers, we identify the problems or possibilities in this year's game. VEX IQ gives us a challenge, and our team will work together to find a solution. We research any requirements that involves scoring, strategy, and any robot limitations. For example, in VEX we have motor constraints and a size limit. We then identify how we can score in the game, and what is the most strategic route. After the research, we design prototypes based on the game and research. We set deadlines, so we don't fall behind.

Design

Civil Engineer's:

When designing a structure, Civil Engineers eliminate some prototypes that won't work. They instead use modeling clay or a miniature model to simulate how they are going to build it. The model and research assists them in completing the design process.

3314A:

We eliminated some prototypes that wouldn't work well with the scoring and speed of the game. We then improved the stability and efficiency of the prototypes. Our team updates all our findings in our online Engineering Notebook.

The Building Process

Civil Engineering:

After choosing their best prototype, they start the building process. While building, Civil Engineer's think of the most efficient ways to structure it, so it is done on time. They must ensure that there are no errors in the building process, so they don't run into any future problems.

3314A:

We started to build our chosen prototype. We had already planned our goals and drawn out the prototypes, so we have a good idea. To increase efficiency, each member of the team built a part of the robot and coded at the same time. During that process we documented information in the Engineering Notebook.

Testing

Civil Engineering:

After they build the prototypes, they go through various testing. Civil Engineer's test the structure based on its efficiency and durability in harsh conditions. They record data and observe any problems. Having a lot of information and data can help them improve.

3314A:

We test each mechanism to observe if it is efficient and effective. We collect the data and see how we can further improve our current design.
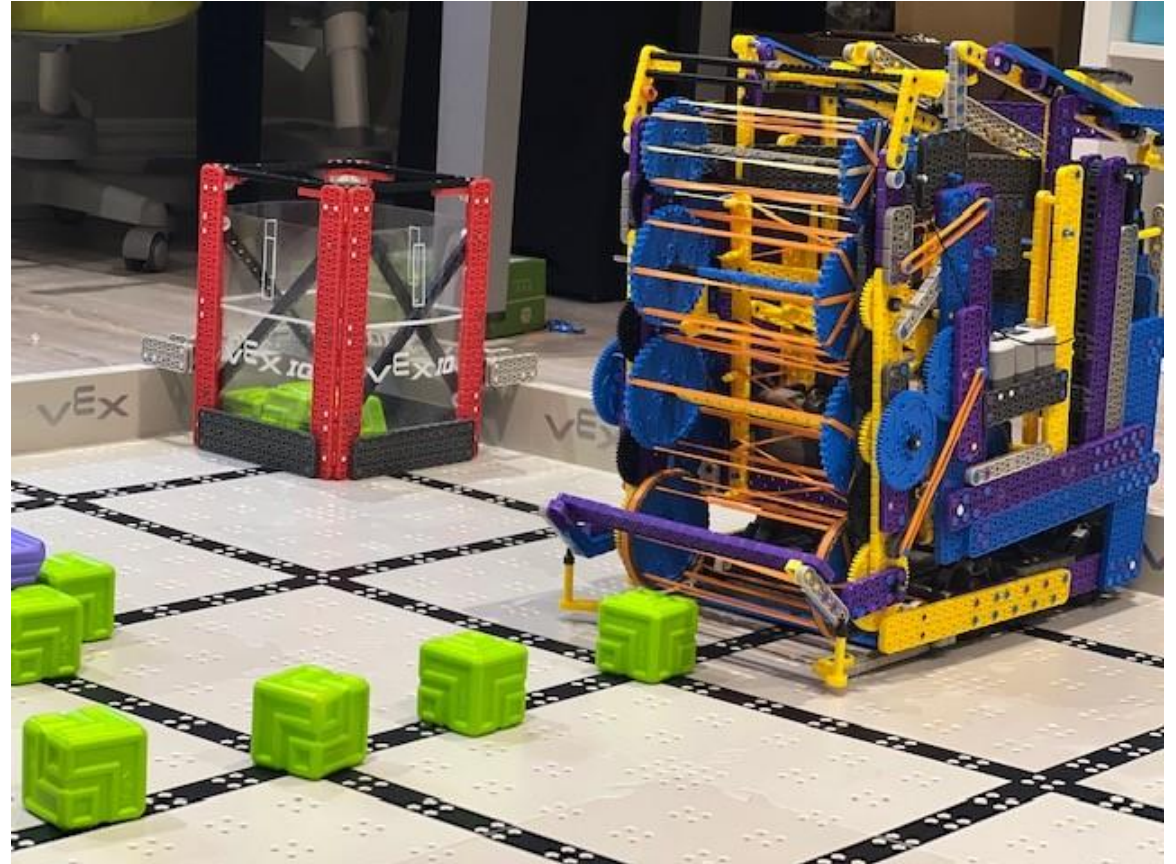
Documentation and Improvement

Civil Engineering:

Based on the result and data, Civil Engineer's document information and get a better understanding of the improvements needed. They make design changes and then they evaluate the new result. They can share each other's findings with other team members to further improve the current project.
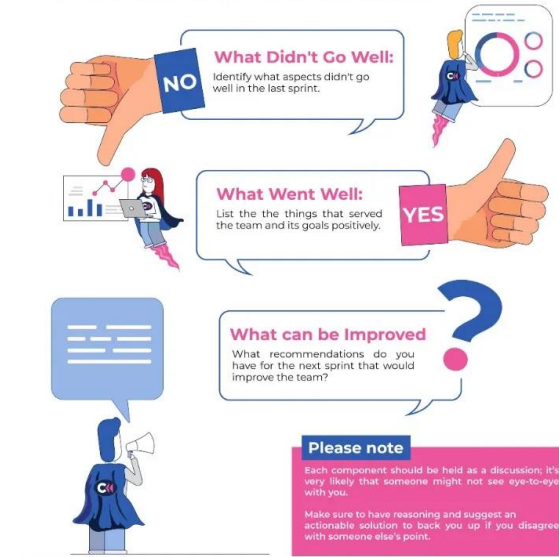
3314A:

We continuously record our intake progress from our robot and autonomous code. We document what went well, and what didn't. This can further help us to improve our robot to perform its best.

What Went Well Retrospective

Have you ever been in a situation where you feel like your project isn't going anywhere?

One method you can use is the What Went Well Retrospective. WWW is the easiest and most efficient way to complete a sprint retrospective.

How to use the What Went Well retrospective:

What Didn't Go Well: Identify what aspects didn't go well in the last sprint.

What Went Well: List the the things that served the team and its goals positively.

What can be Improved What recommendations do you have for the next sprint that would improve the team?

Please note
Each component should be held as a discussion; it's very likely that someone might not see eye-to-eye with you.

Make sure to have reasoning and suggest an actionable solution to back you up if you disagree with someone else's point.

Go Retro

Repeat

Civil Engineering:

Civil Engineer's strive for improvement. After building, they may identify some errors that occurred in the design process. Steps may be repeated to improve the current structure and old prototypes may be reconsidered.

3314A:

After every competition, we troubleshoot and identify more problems. Sometimes, we encounter minor problems at the competition. We take our failure as an opportunity to learn, as we can make improvements to our robot.

How Does VEX Help You Prepare For Your Future Career?

Strategy

VEX robotics teaches you how to think strategically. Strategies used for basic coding, routes, and time management, all done while having fun!

Teaches Life Skills

VEX robotics teaches you collaboration, organization, and problem-solving skills. Along with basic building and coding skills. Being able to work as a team and collaboratively problem-solve is a needed life skill.

Introduction to Different Careers

VEX introduces different career paths such as Software, Computer, Aerospace, and Mechanical Engineering.

Social Atmosphere

VEX encourages students to have fun while collaborating and make new friends at tournaments.

References:

https://www.istockphoto.com/photos/civil-engineering-construction

https://ellipsiseducation.com/blog/the-engineering-design-process

https://www.goretro.ai/post/what-went-well-retrospective

https://www.jobbank.gc.ca/marketreport/occupation/22376/ca