SUSTAINABLE ARCHITECTURE

BUILDING TOMORROW'S WORLD TODAY

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21549C

INTRODUCTION

Architecture is all around us, but rarely do we stop to consider the planning, thought and innovation that goes into creating some of mankind's greatest achievements. Nowadays, it is of paramount importance to live sustainably. This issue explores the profession of green architecture, comparing our design philosophy with the one used by professionals at DSA. This helps us realise the lessons learnt from participating in VEX Robotics.

Point Richmond Waterfront, DSA

WHY DSA?

DSA Architects, based in California, designs a variety of infrastructure from houses to schools to offices with a philosophy of elegant design that reduces environmental impact, exemplified in their Straw Bale Project using organic cellulose materials for sustainability. They have a strong client relationship, use a schematic design process and have completed 400+ projects, earning many awards.

Workshop, DSA

"while building projects tend to be lengthy and complex endeavors, they can also be a source of inspiration and fun"

DESIGN PROCESS

DSA and ourselves utilise an iterative design process that focuses on creating the most effective design possible. We do this by continuously addressing flaws and iteratively improving, rather than making major last-minute changes.

STRATEGISE

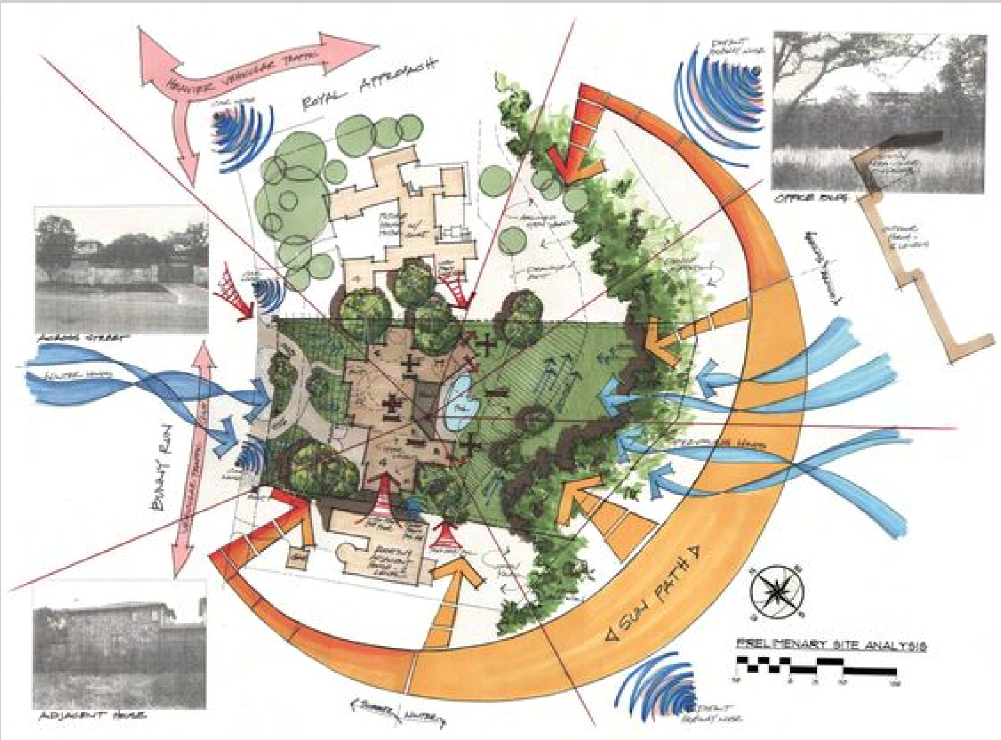
In the pre-design stages of a project, DSA Architects clarify the wants and needs of the client, and also establishes specifications, influencing brainstormed ideas.

Design Brief

A design brief is created to best summarise the task at hand. Whatever the project may be, a brief is vital to understanding the client's requirements.

Design Considerations

Factors considered by the firm are the duration of the project, an estimated budget and physical features of the site like solar access and the topography.

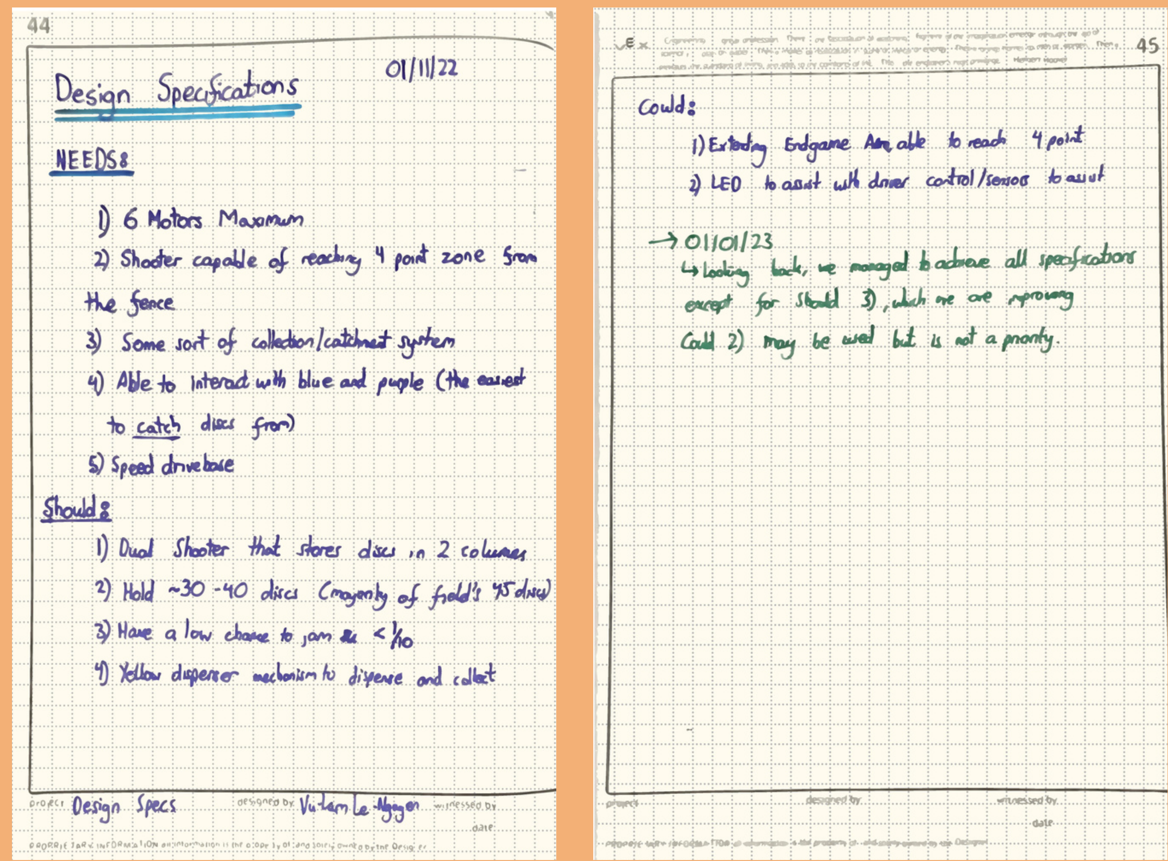


Sketch of the building site's geography

When Slapshot was announced, we planned meetings to discuss the brief and specifications.

Design Specifications

Specifications involve aims that we need, should and could meet. Like DSA Architects, this allows us to meet the design brief with maximum efficiency and effectiveness. Specifications help us prioritise what's important.



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Design Specifications 01/11/22

NEEDS:

1) 6 Motors Maximum
2) Shooter capable of reaching 4 point zone from the fence
3) Some sort of collection/catchment system
4) Able to interact with blue and purple (the easiest to catch discs from)
5) Speed drivebase

Should:

1) Dual Shooter that stores discs in 2 columns
2) Hold ~30-40 discs (majority of field's 45 discs)
3) Have a low chance to jam ie < 1/10
4) Yellow dispenser mechanism to dispense and collect

project Design Specs designed by Vu-Lam Le-Nguyen witnessed by

date

45

Could:

1) Extending Endgame Arm able to reach 4 point
2) LED to assist with driver control/sensors to assist

→ 01/01/23
↳ Looking back, we managed to achieve all specifications except for Should 3), which we are improving
Could 2) may be used but is not a priority.

project designed by witnessed by

date

Our Design Specifications: 5 Needs, 3 Shoulds and 2 Coulds dsa architects

DESIGN

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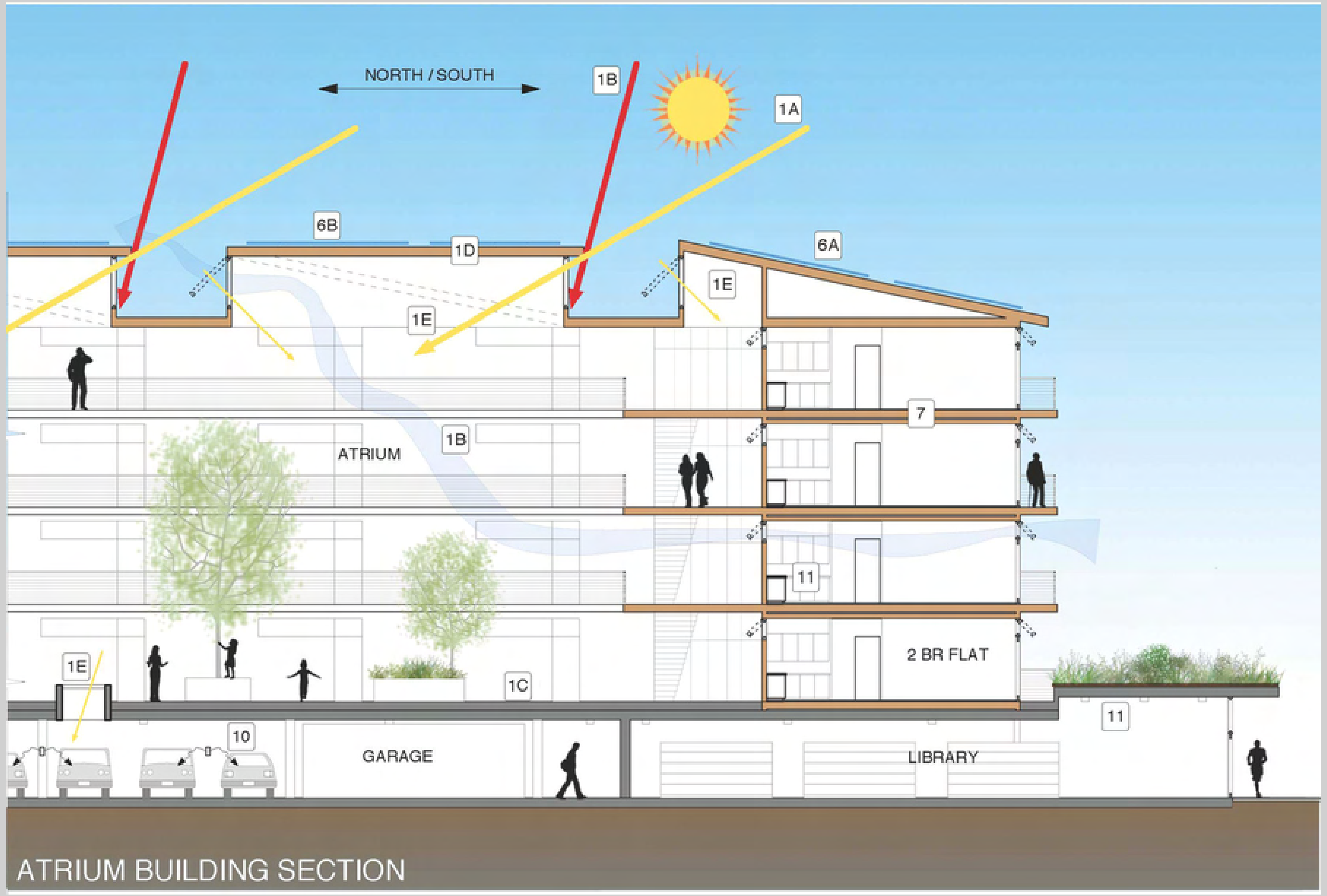
Schematic Phase

In this phase, concept designs are created. Research is also conducted - for example, when designing new buildings in an area, looking at the materials that vernacular buildings use can help one understand the climate.

Development of Designs

The selected design is expanded on - This is done by drawing more views (including a 3D render of the project), and deciding on a material for the product, as well as calculating the total cost.

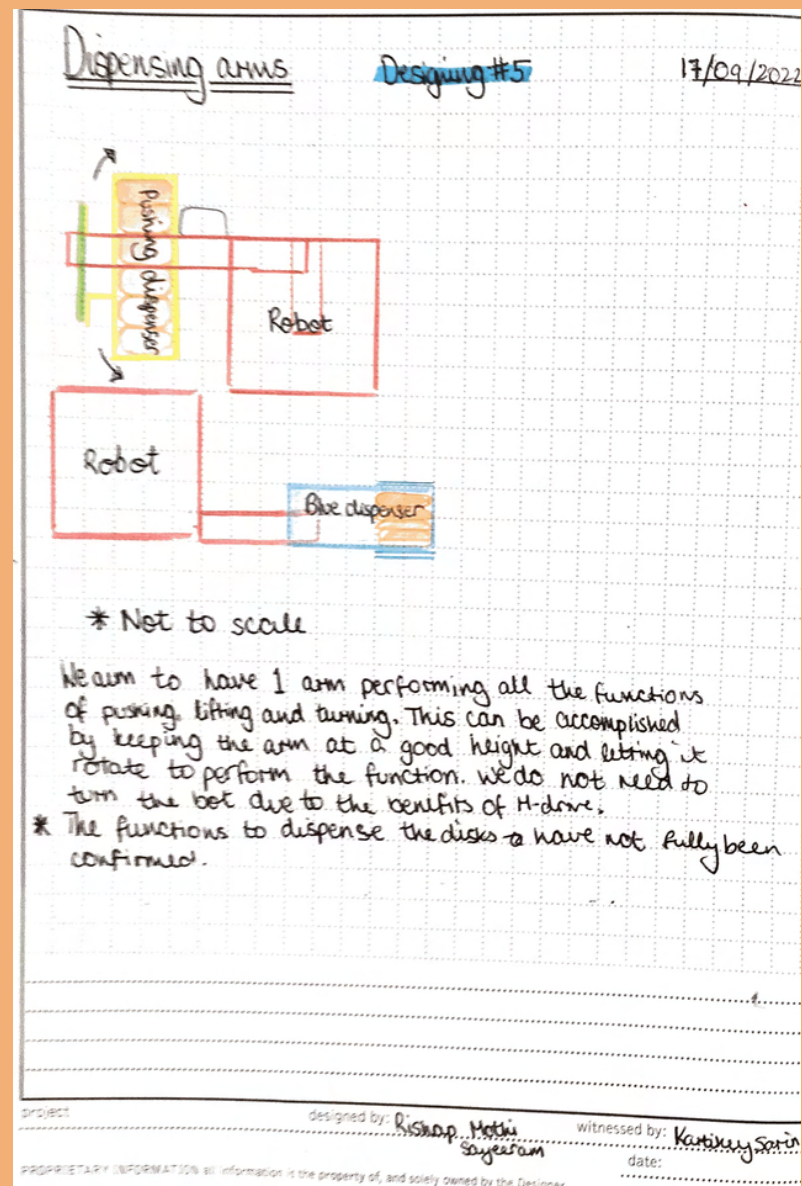


A technical drawing of a house block, DSA

Brainstorming Concepts

After establishing the specifications and brief, we move onto create a mind map of our different ideas for each specification. Often these ideas are accompanied by a short description of the key parts required and a sketch in order to effectively communicate the idea visually.

Having brainstormed the ideas, we select the best idea and develop it into a final design before building it. This involves additional sketches as well as some reasoning behind design choices.



Initial Concept Idea of using an arm to interact with both blue and yellow dispensers.

PROTOTYPES

dsa architects

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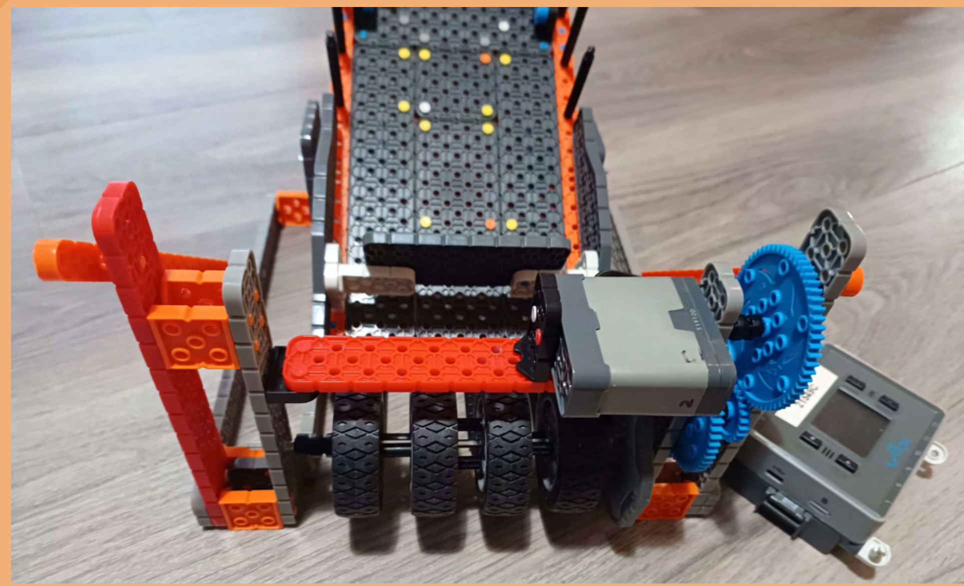
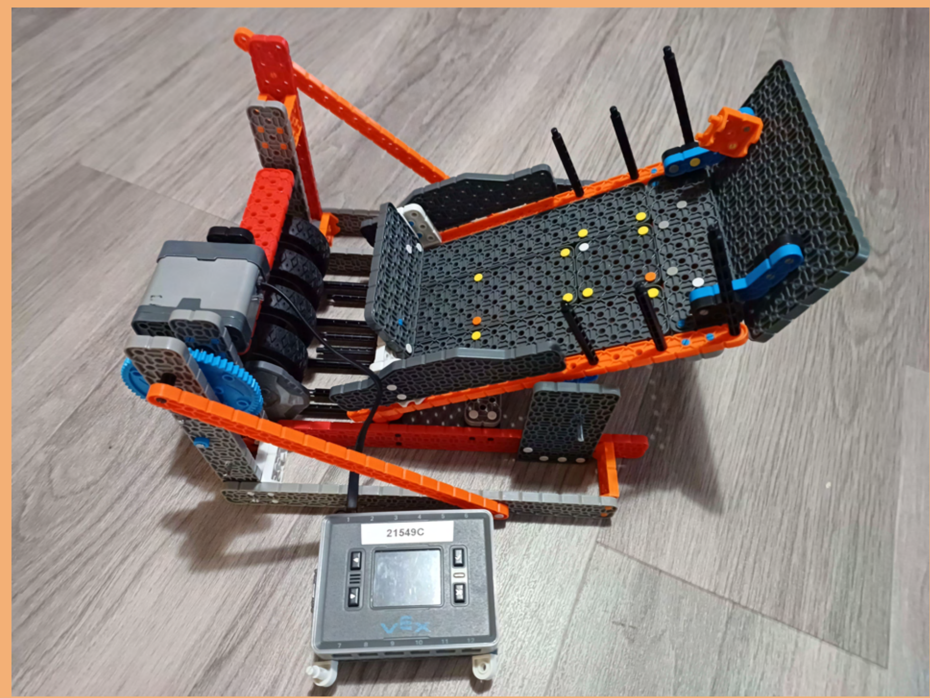
When design ideas are narrowed down, DSA architects create CAD and real life, downscaled models to help visualise designs.

Cad of the Net Zero Urban Renewal Community Area, DSA

When changing robot parts that affect gameplay, we must fully test features before integration.

When brainstorming concept ideas, we simultaneously built prototype shooters in order to bring our ideas to life, and identify strengths and weakness. For example, our flywheel (below) was effective at not jamming but couldn't deal with large amounts of discs at once. This gives us an idea of how useful a flywheel is at solving our current issues.





Flywheel prototype built to test its shooting capabilities

dsa
architects

CONSTRUCTION

constellation

It is still important for designers to be involved beyond designing stages.

Administration

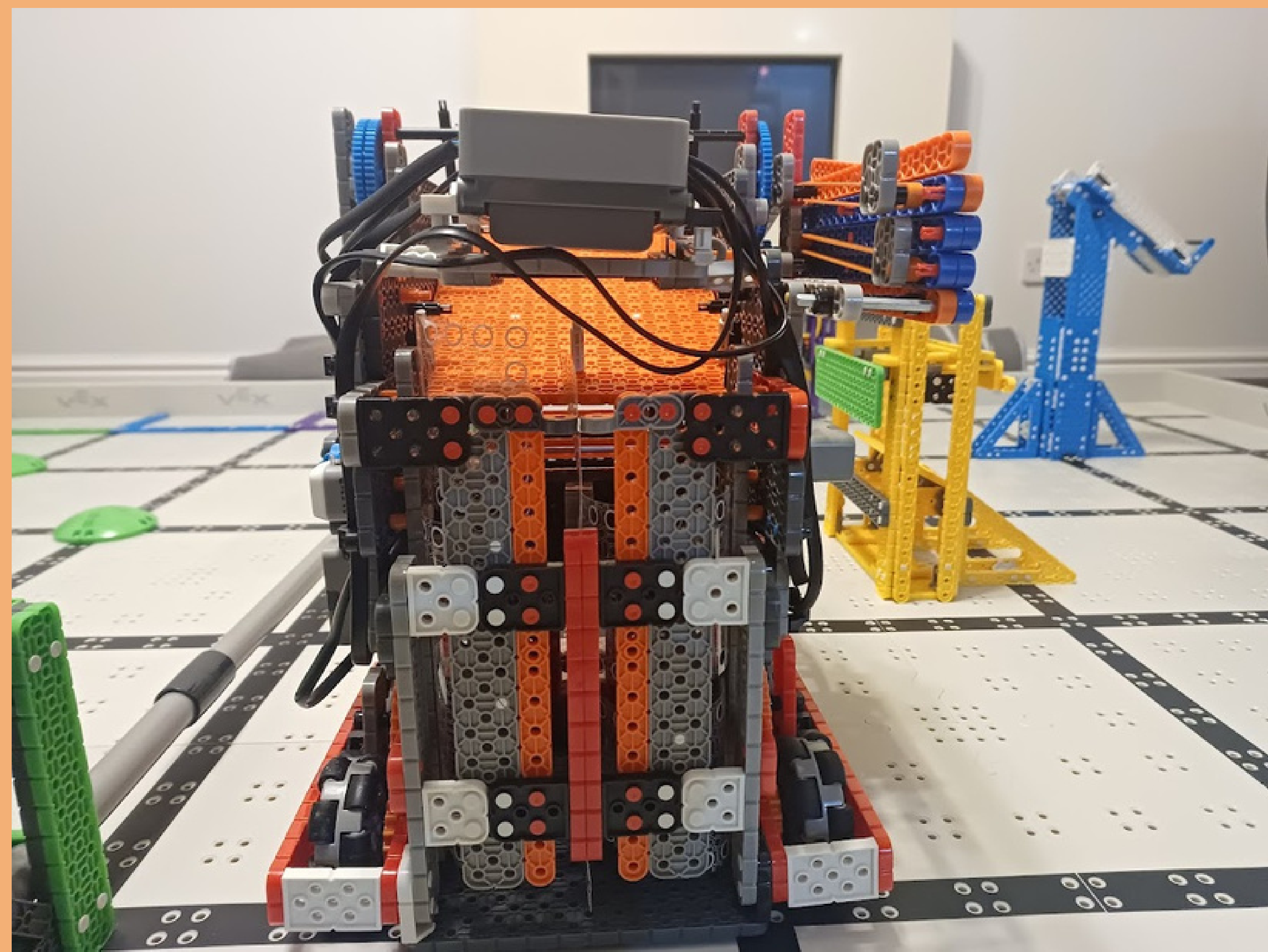
Throughout construction, DSA Architects record the intricate details of the building, such as the electricity systems and client-choice materials. This helps with later improvements, striving for energy independence and sustainability.

Clarifications may be needed and frequent reviews by the designer can help a project reach its potential. This is reflected in our design process too, where the builders often reference our notebook and design materials.

Building

Most of our time is for robot construction, an enjoyable aspect of VEX. Two people work on the robot at once, maximising team input whilst giving them breathing room. When building, it is vital to consider the design process, so that we can address problems quickly, before they aggravate.

A wide range of parts allow us to test out different methods to deal with issues. For example, we didn't realise the solution to our storage was with PET plastic sheets until we actually laid out all our parts and scrutinised each of them.



EVALUATE

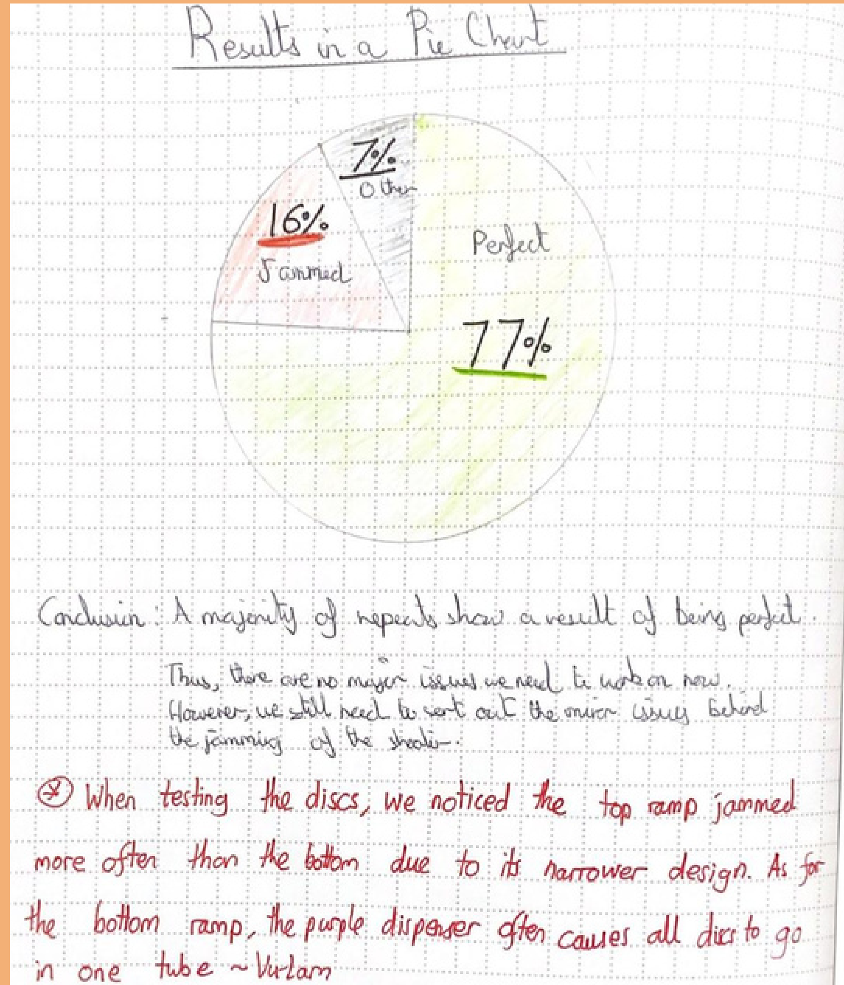
Evaluation: a crucial skill when designing something new.

It can help with understanding the advantages and disadvantages of a project, highlighting areas of improvement for future projects. For example, DSA may reconsider their use of materials and how future builds could benefit from a palette of construction resources, reflecting on previous mistakes to improve for upcoming projects.

Test and Evaluate

Upon the robot's completion, we test it thoroughly to ensure its consistency. Practice is vital so if a problem turns up mid-match, we record and attempt to replicate it to find a solution. This integration of different parts requires critical thinking, asking questions such as:

- Is it necessary to rebuild or do we just need small improvements?
- If we were to explore other ideas, would other issues arise?



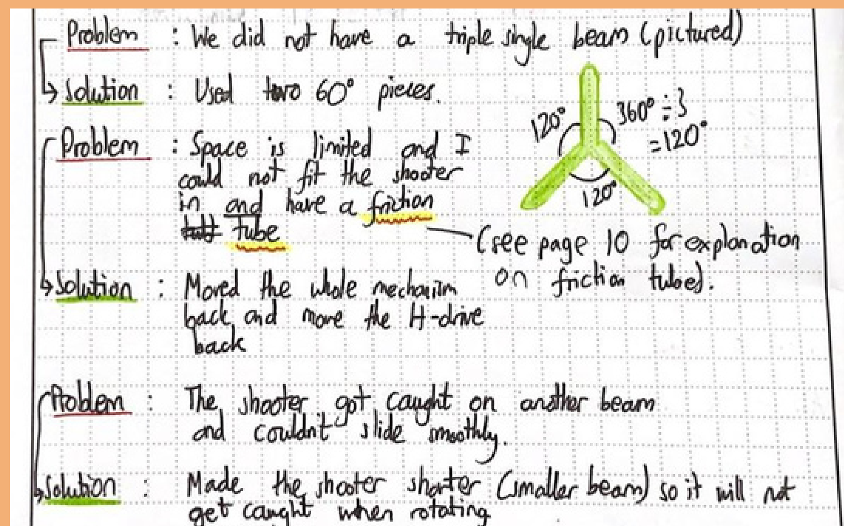
Results in a Pie Chart

7% Other
16% Jammed
Perfect 77%

Conclusion: A majority of repeats show a result of being perfect.

Thus, there are no major issues we need to work on now. However, we still need to sort out the minor issues behind the jamming of the shooter.

When testing the discs, we noticed the top ramp jammed more often than the bottom due to its narrower design. As for the bottom ramp, the purple dispenser often causes all discs to go in one tube ~Vu-Lam



Problem: We did not have a triple single beam (pictured)
Solution: Used two 60° pieces.

120° 360° ÷ 3 = 120° 120°

Problem: Space is limited and I could not fit the shooter in and have a friction ~~tutt~~ tube (see page 10 for explanation on friction tubes).
Solution: Moved the whole mechanism back and move the H-drive back

Problem: The shooter got caught on another beam and couldn't slide smoothly.
Solution: Made the shooter shorter (smaller beam) so it will not get caught when rotating

THE ROLE OF VEX IN OUR FUTURES

VEX has given us experience with future careers in many ways.

Teamwork

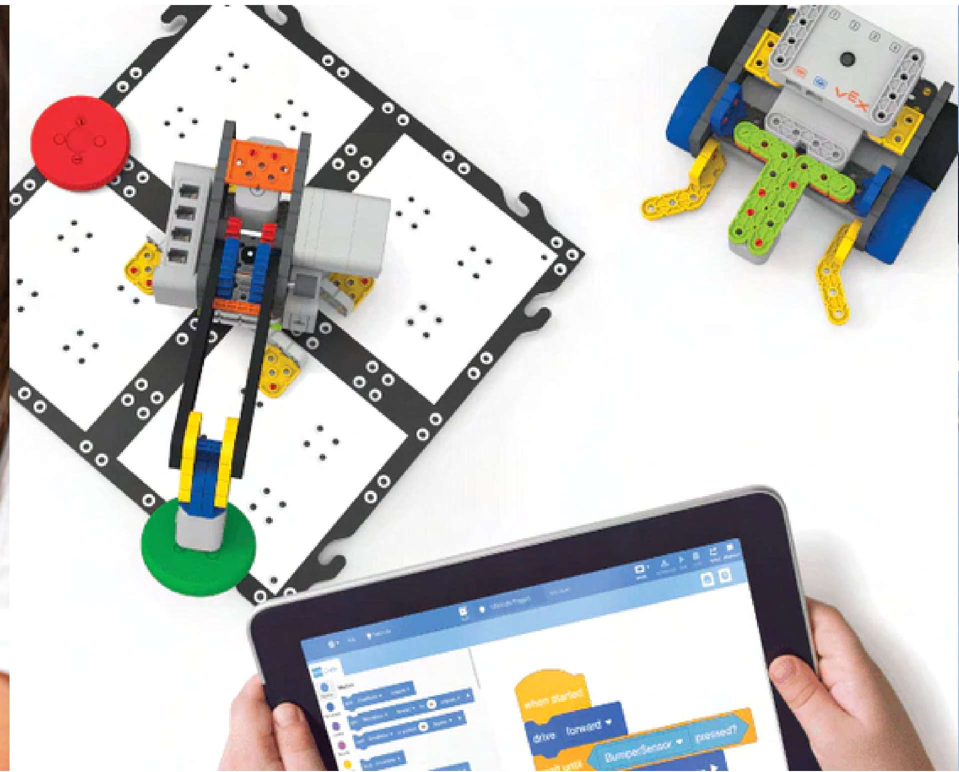
Teamwork; an essential part of VEX, defining how efficient progress is. When working together, productivity is increased and we enjoy VEX more. In the same way, in future STEM careers, teamwork is necessary to get projects done quickly with high quality.

Developing Skillset

In VEX, communication is essential - this can be done through drawings and CAD, which are all useful skills to learn in future STEM careers, especially design. Another valued skill is critical thinking, helping with self-evaluation and improvement of design.

Working under pressure

At the competition, sometimes things may not go according to plan, and we need to make adjustments to our robot at the last minute. This quick thinking to search for solutions is useful throughout life, especially in competitive STEM careers.



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