

10173X: Pharmaceutical Scientists

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On 08/01/2024, my team and I attended a career fair at our school, to host as a introduction to potential careers we would like to investigate. At the career fair, we all visited **Fatima Al-Hashimi**, a successful pharmacist, who fuelled our interest specifically in the **pharmaceutical industry**. She gave us a wonderful presentation on the benefits of pursuing a diversified career, especially as the world witnesses the **rapid development of medicines and medical technology**.

As a girl-powered team, we know how **28% of women are represented in the STEM industry**, and we relate to this through our own experiences in the VEX robotics community. This sparked our interest in the STEM workforce, especially in medicine. Ms. Al-Hashimi's wonderful presentation piqued my interest in the **careers of pharmaceutical scientists** and how it relates to the process of 10173X. **Engineering can look different in relation to all careers**, even in the pharmaceutical industry .

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CAREER FAIR

Don't miss the chance to attend the career fair, where you can meet with recruiters face-to-face and learn about job openings in your field.

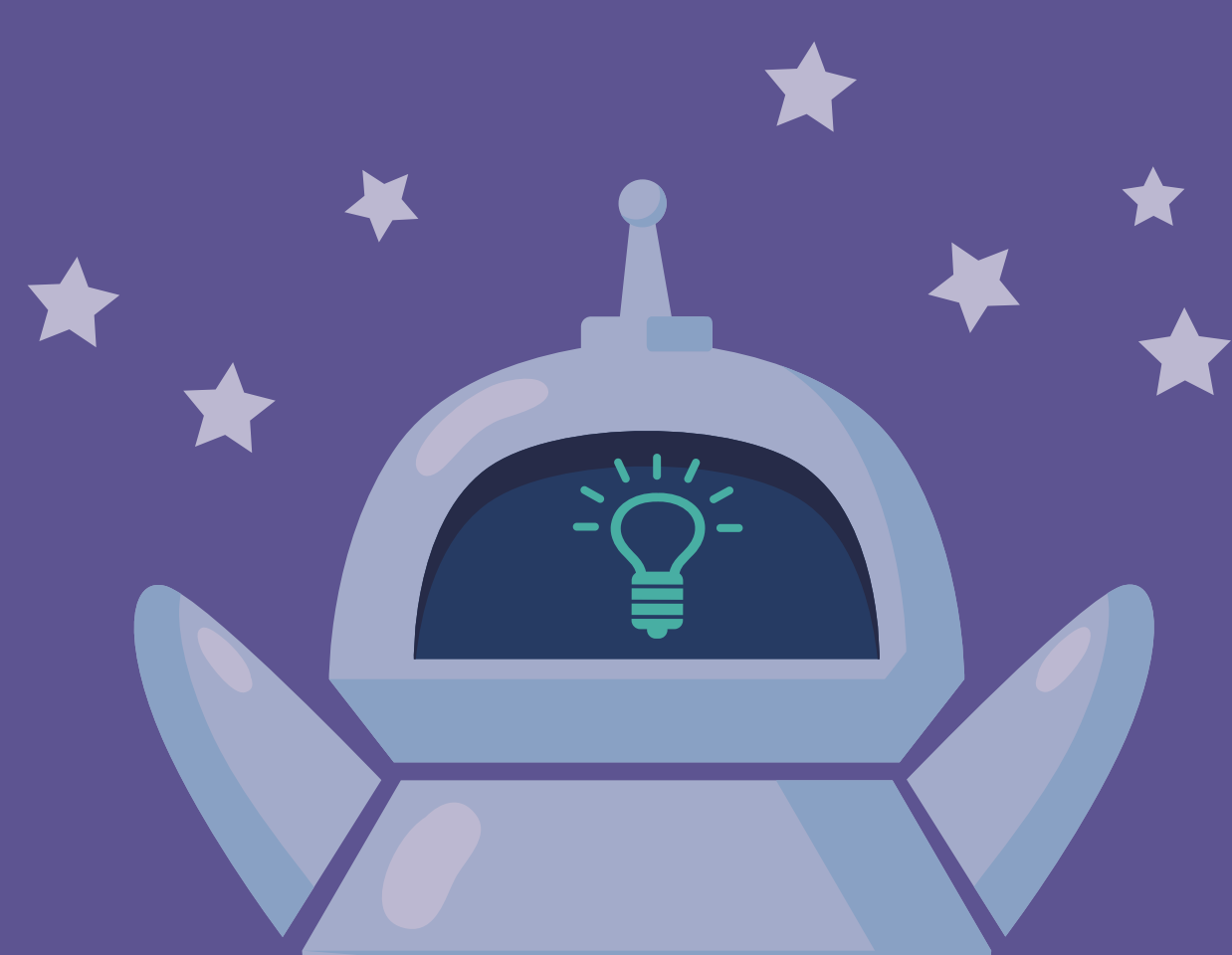
Come visit on Monday 8th January !!

For more info, please visit Ms Regan, Ms Rodwell or any of the career prefects

Y10 - 13:15-14:00
YR11 - 14:00 - 15:15
YR12 -YR13 - 16:00 - 17:30

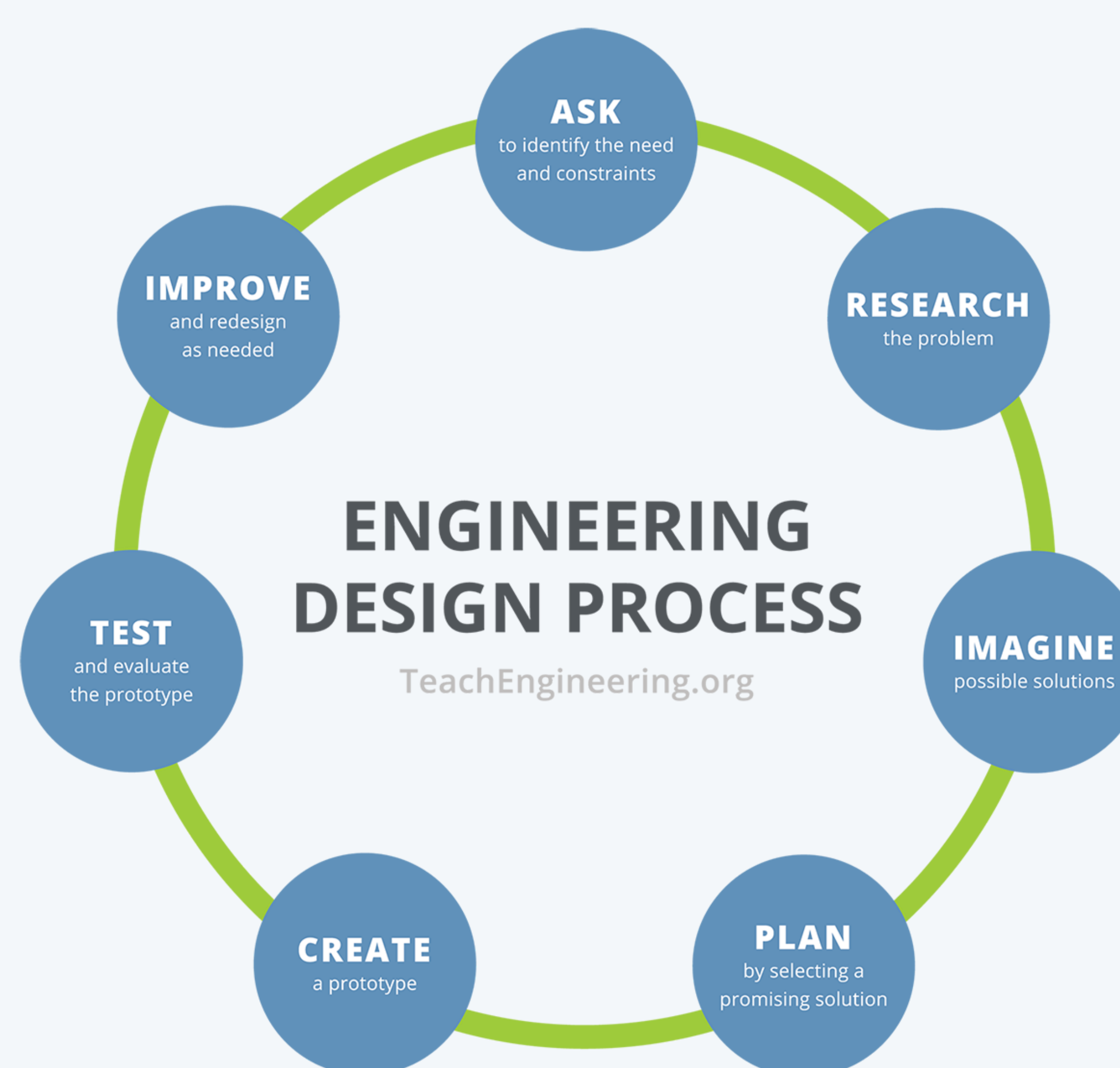
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How does the Engineering Design Process differ and relate to our team's process?

Creating novel, innovative drugs requires a lot of time. The typical time from discovery to market is **12 years**; but, in more recent medical fields, such as gene therapy, this time can reach **30 years**. The 12-year mark would seem optimistic to many in the drug development industry, especially in light of the startling statistic that only **about 1 in 5000 novel compounds** receive approval as pharmaceutical drugs from regulatory agencies such as the European Medicines Agency (EMA) in the EU or the Food and Drug Administration (FDA) in the US.



These are our two processes in **simplified diagram form**, and we can see certain stages **overlapping** but there are several differences as well. Our robot is always **tested thoroughly**, like the several stages of clinical trials, and we always record our findings in our notebook, like the many research papers published on all drug development work for future references. However, there is a **difference in how drugs and robots are built**: drugs are built through several chemical processes in a laboratory whereas we use very different tools e.g. screwdrivers to build robots made out of metal. Furthermore, the competing element and rankings compared to other robots is not prevalent in the careers of Pharmaceutical Scientists as all **researchers try to develop from each others' findings**.

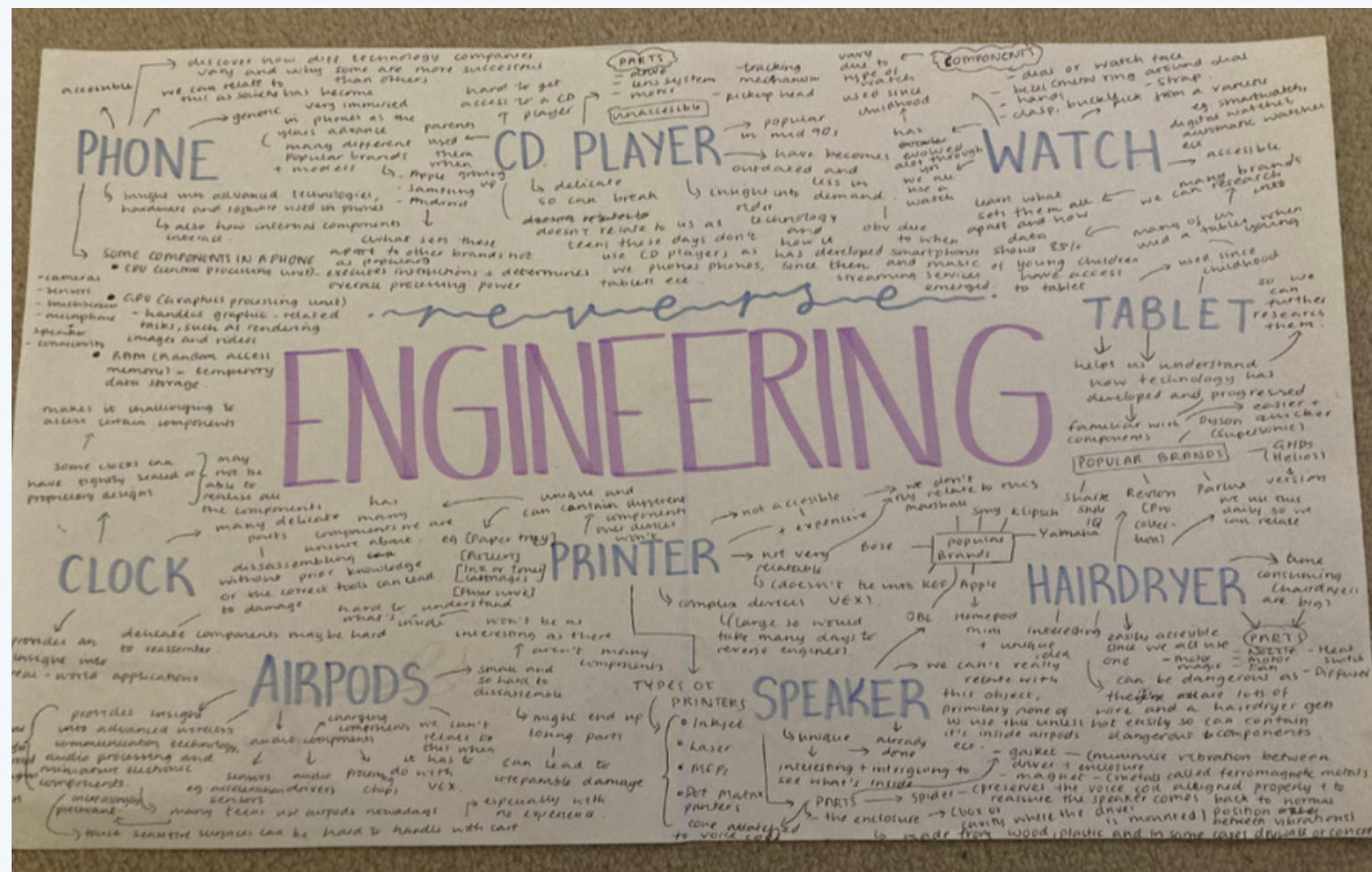
PROBLEM DEFINITION:

- **Robotics:** Identifying a problem in the design brief for the season. Any problems that occur in the future are addressed and we brainstorm on how to solve or adapt to eliminate such problem.
- **Drug Discovery:** Recognizing a medical need or identifying a target for a new therapeutic intervention.



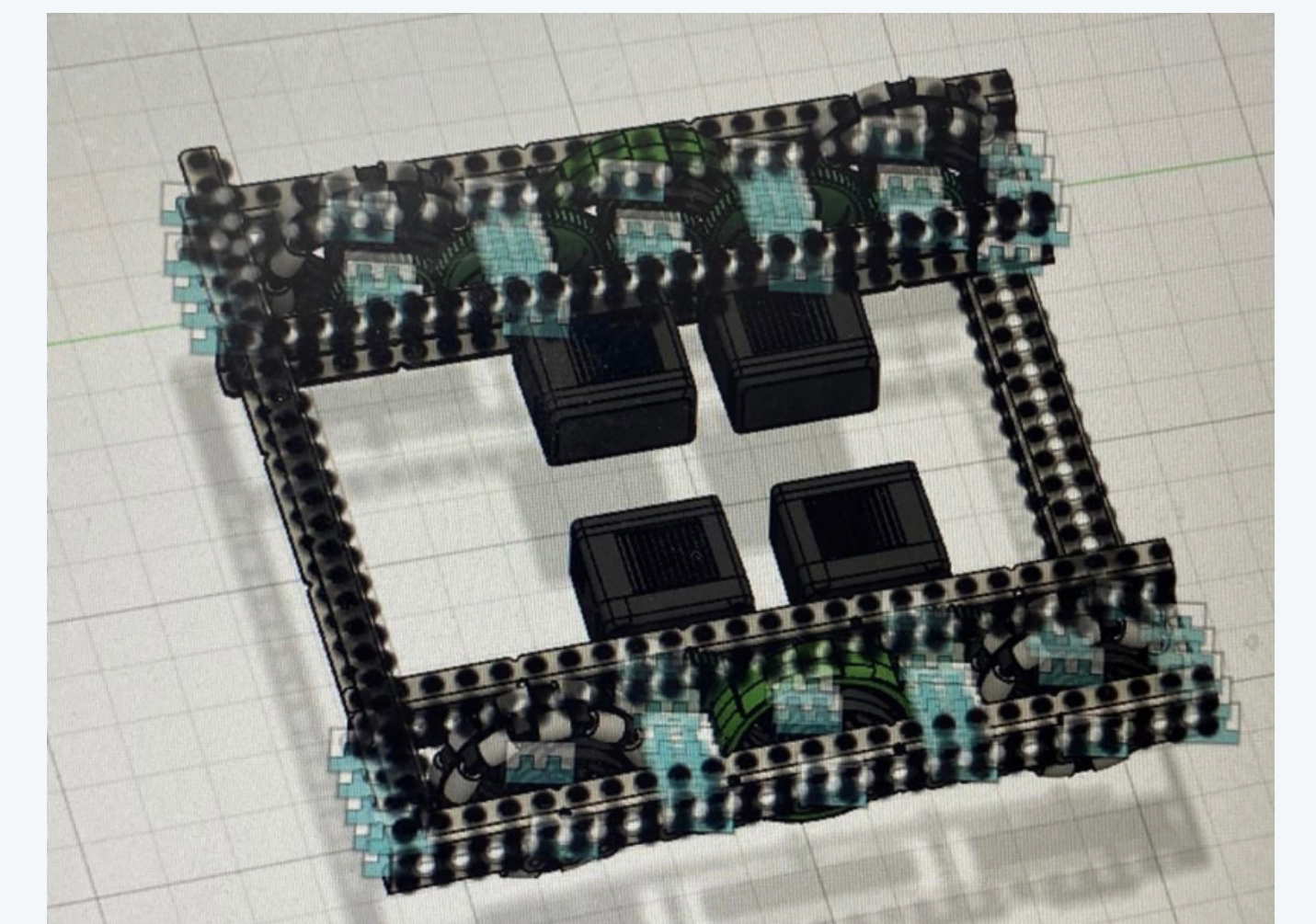
RESEARCH AND PLANNING:

- **Robotics:** Conducting research of various concepts through the design brief, decision matrix and team discussion.
- **Drug Discovery:** Carrying out in-depth research to look into biological processes, disease mechanisms, and possible therapeutic targets.



CONCEPTUALIZATION:

- **Robotics:** Generating ideas and concepts (for potential mechanisms) for solutions based on research so we can pinpoint how to resolve the problem based off research and planning.
- **Drug Discovery:** Creating hypotheses for potential medication choices that could target the specified pathway or focus.

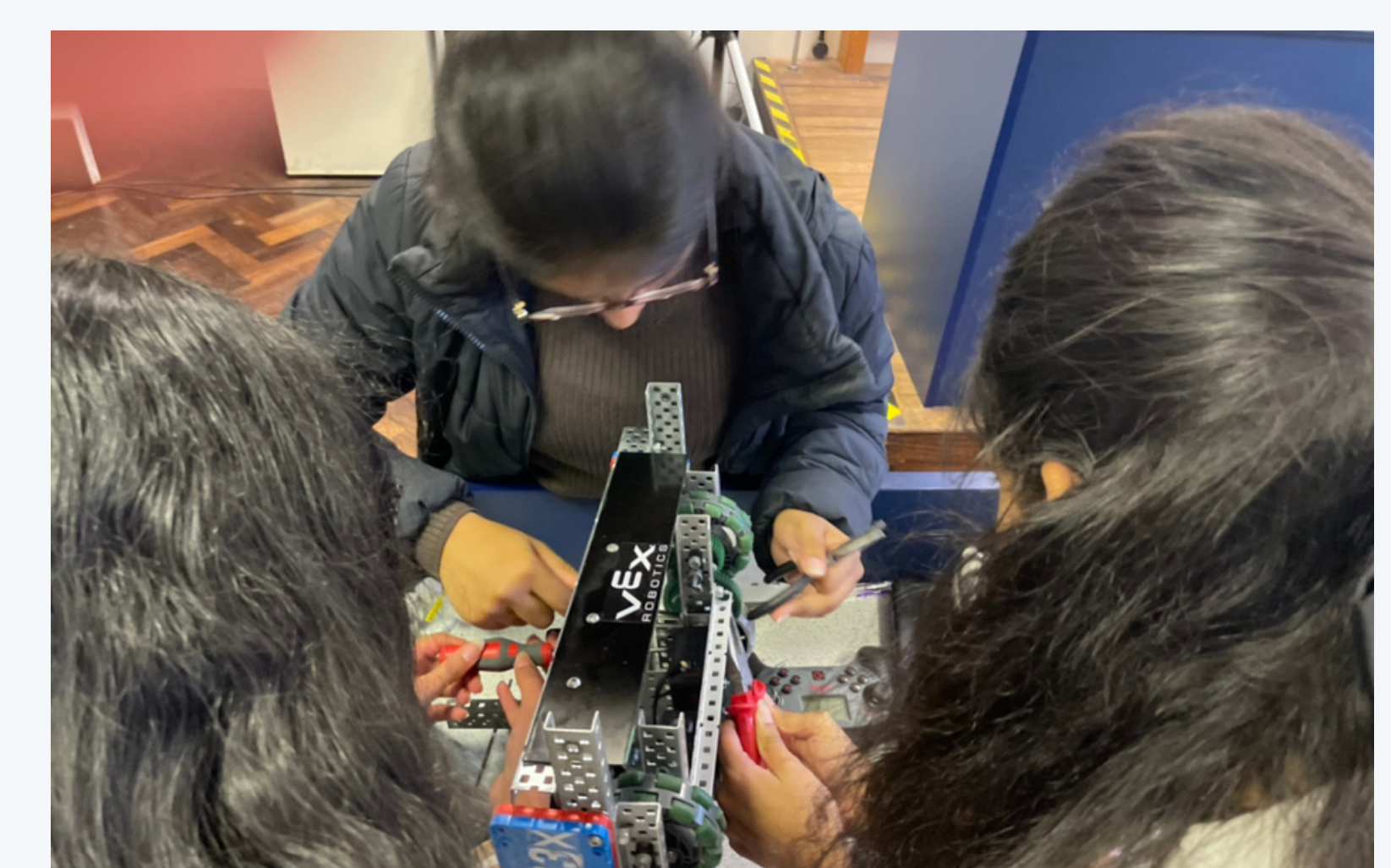


DESIGNING AND BUILDING:

- **Robotics:** Sketching detailed prototypes our notebook and leading onto the building process for this solution or component.
- **Drug Discovery:** Designing and synthesising potential drug compounds for in laboratory settings.

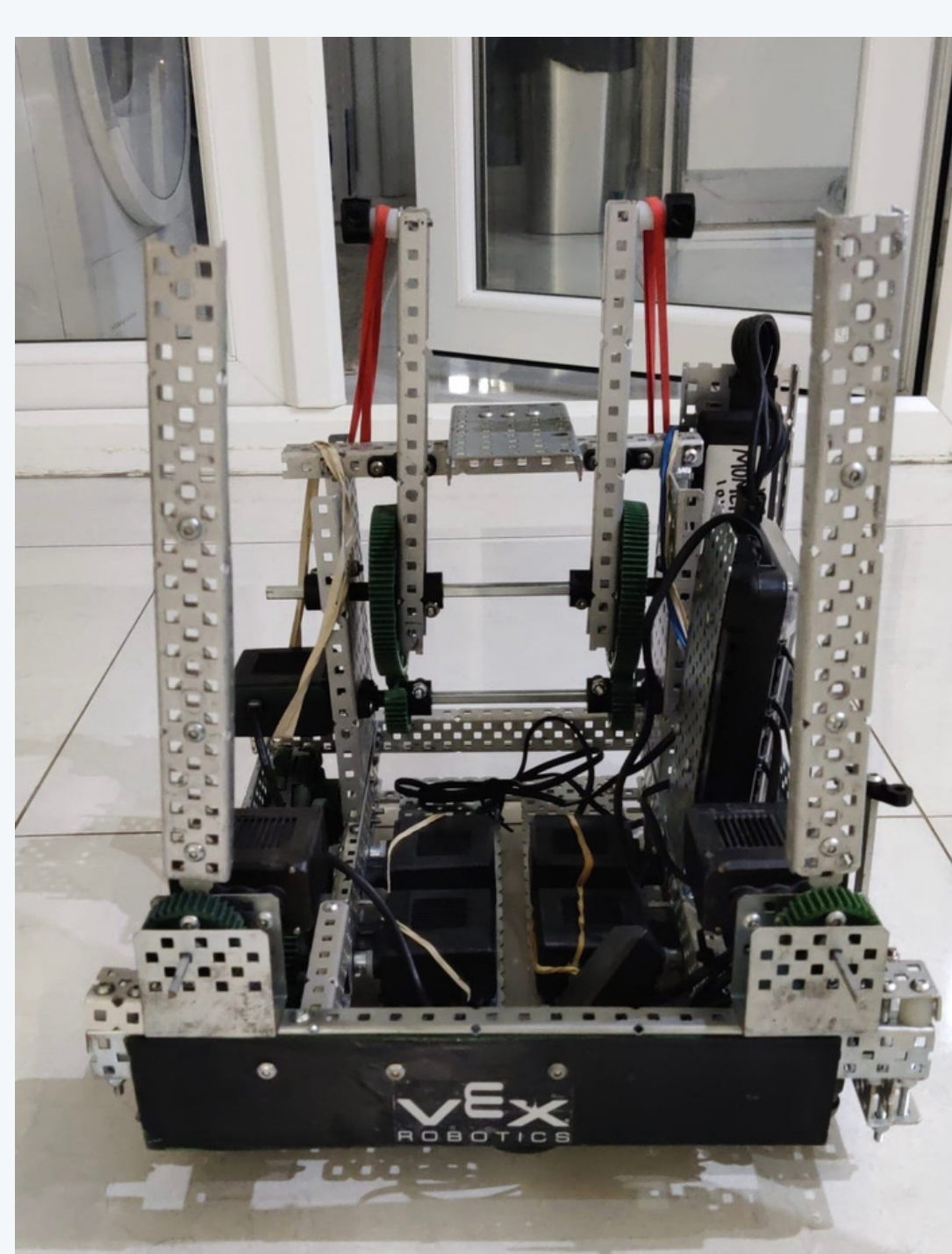
TESTING AND EVALUATION:

- **Robotics:** Continually testing the new solution or mechanism, so drivers can adapt to the new state of the robot and competition strategy, ensuring all is recorded in the notebook.
- **Drug Discovery:** Performing preclinical testing of drug candidates to assess safety, efficacy, and pharmacokinetics before conducting several stages of clinical trials to evaluate toxicity, efficacy, and dosage in human subjects.



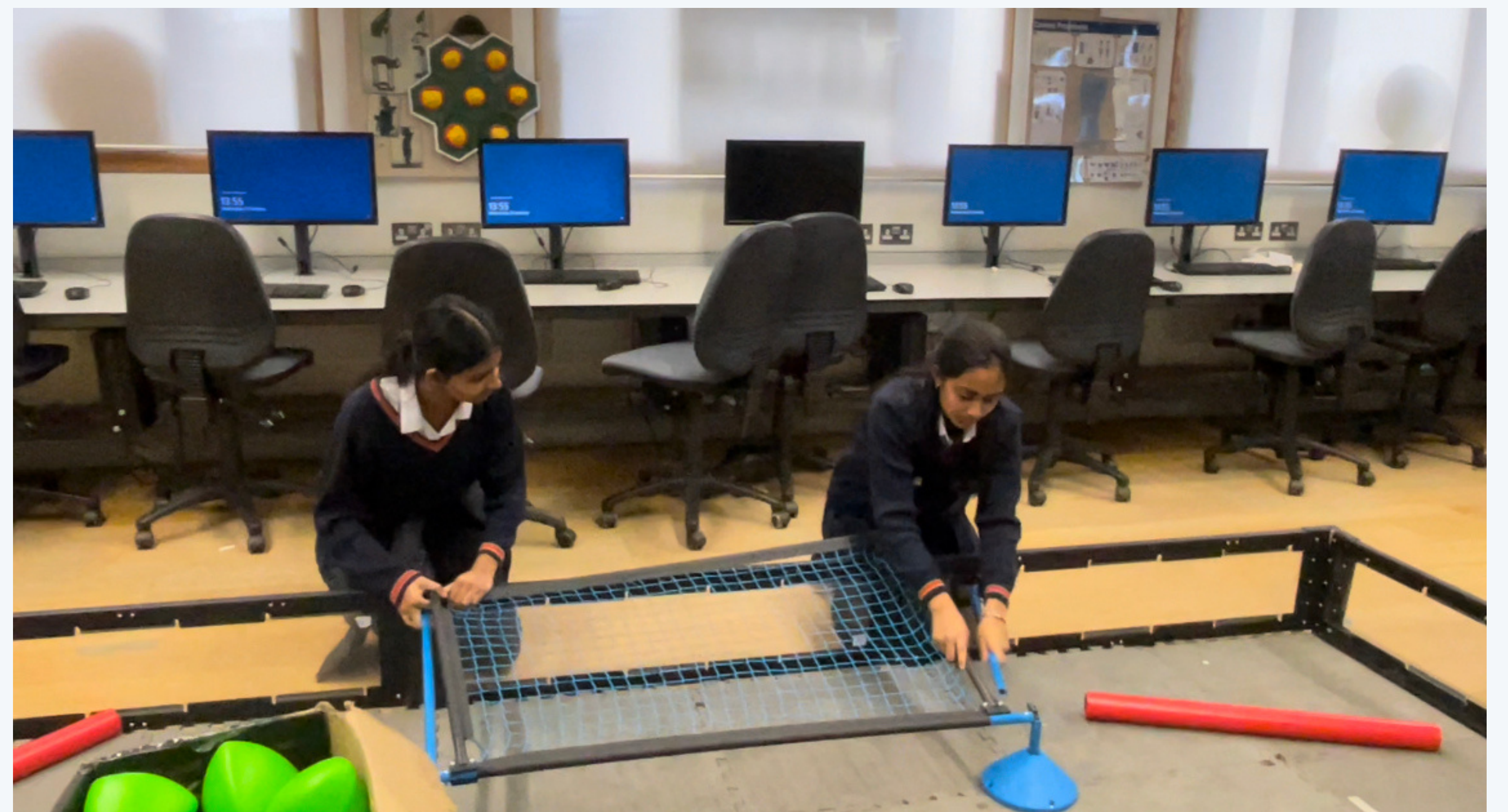
DEVELOPMENT AND FINALISATION

- **Robotics:** Making improvements based on testing results and competition performance through post-competition analysis. We ensure we test our robot regularly in timed structures to flesh out our strategy.
- **Drug Discovery:** Continuously refining the drugs based on preclinical and clinical trial results, to launch the product and previous studies



The Reiteration of Processes in Engineering and Pharmaceutical Science

Within both the pharmaceutical science industry and engineering, a greatly overlapping sector is the reiteration of processes. Each season, our team iterates multiple design, research and planning processes to refine and improve our robot daily. In this way, the pharmaceutical science involves a great deal of communicative reiteration of drug planning, research and testing in order to plan, research and test drugs until they are finalised in terms of dose, efficacy and toxicity.



How has participation in VEX Robotics prepared me for my future career?

Technology in the world is continually branching its influence to several careers, especially in the jobs of pharmaceutical scientists. In this context, it allows for new drug development e.g abaucin, an effective drug against *A baumannii*, which is a bacteria that can cause dangerous infections. Robotics has given me exposure to the growing technology and allowed me to grow varied skillset in how to design, engineer and build, all useful for drug discovery and development as shown above.

The role of sketchbooker has helped me to design and develop an idea using the engineering design process. Furthermore, the competitive and high stakes nature of VEX Competitions has improved my ability to make decisions in a high pressure environment and perform well under pressure, especially as this is useful in industrial pharmacy. I am thankful for the communication and teamwork skills VEX robotics has hosted so I can be confident in what I think and contribute. I think all careers, STEM or not, are valuable to improving our quality of lives in the future and I hope that my passion to be a Pharmaceutical Scientist has interested you!



Resources:

- <https://www.fda.gov/patients/drug-development-process/step-1-discovery-and-development>
- <https://www.frontiersin.org/articles/10.3389/fdds.2023.1201419/full>
- <https://www.theguardian.com/technology/2023/may/25/artificial-intelligence-antibiotic-deadly-superbug-hospital>
- <https://www.biostock.se/en/2023/01/drug-development-the-four-phases/>
- <https://www.pfizer.co.uk/science/developing-new-medicines>
- <https://www.fda.gov/patients/learn-about-drug-and-device-approvals/drug-development-process>
- <https://phys.org/news/2023-08-explore-ai-covid-drug.html>

Credits and thanks to all my team members: Lakshiya, Vaishni, Saadia, Srinithi and Ishita