Launchers
發射器

Launcher Technology

During the 17th century, sailors found launchers, specifically catapults, to be incredibly useful. Centuries before, medieval knights utilized them to bring down enormous castle walls. Even the Greeks and Romans employed catapults approximately 2,000 years ago! These machines prove highly advantageous, provided one possesses the skill to aim them accurately. In this project, students gained knowledge about energy, force, and the ability to predict the distance and height of launched projectiles.

Engineering a Catapult

Upon initial observation, the task appeared straightforward, and the students were filled with excitement as they embarked on engineering launchers and aiming projectiles at specific targets. The students diligently studied the materials, devised a plan, and commenced the crucial trial and error process. They sought to determine which of the three objects (cotton ball, ping pong ball, or foam ball) served as the optimal projectile, as well as the most effective arrangement of craft sticks to maximize launch angle and convert potential energy (ready) into kinetic energy (movement). Throughout the testing phase, the students documented their findings in a report consisting of five questions aimed at comprehending the process and outcomes. For instance, they explored the behavior of the ball, its flight trajectory, whether it reached a high or low altitude, and its landing location. Additionally, they contemplated the anticipated effects of pushing the cap further down, pondering whether it would result in increased height or distance during flight. The students had a great time being mechanical engineers, testing and adjusting their launchers.

發射器技術

發射器，或是更具體描述此專題的「彈射器」，對於十七世紀的水手是非常方便的。幾個世紀以前，中世紀騎士就使用它們來拆除巨大的城牆。大約兩千年前，希臘人和羅馬人甚至也使用過彈射器！這些機器非常實用，只要你知道如何瞄準它們！在此次的專題，學生們學習能量以及力量，並對發射彈的距離和高度進行預測。

設計彈射器

乍看之下，這項任務看起來很簡單，學生們非常興奮地設計發射器，並向特定目標發射拋射物。學生們研究材料及制定計劃，並開始重要的反覆試驗過程。他們確定三種物體（棉球、乒乓球或泡沫球）中，哪一種是最好的拋射物，以及安排飛船杆以最大化發射角度和轉移勢能（準備）到動能（移動）的最好方法是什麼。透過測試過程，學生完成一份包含五個問題的報告來幫助他們理解過程和結果。舉例來說，球怎麼了？它飛了嗎？它是飛起來還是掉下來了？它在哪裡降落的？當你把蓋子再往下推時，你期望會發生什麼？這會讓它飛得更高更遠嗎？學生們很高興成為機械工程師，測試和調整他們的發射器。

1 2 ASK + IMAGINE 提問 + 創思

We thought about the objectives and shared ideas and knowledge.
我們思考目標並一起分享想法和知識。

4 CREATE 創造

5 IMPROVE 改進

After several tests mixing and matching materials and launching various projectiles we reported our findings.
發射器在經過數次測試後，我們發表我們的發現。

3 PLAN 計畫

We designed launchers with basic materials in mind.
我們用基礎材料來設計發射器。

Various rubber bands and craft sticks were used to get the best combination for launching projectiles.
使用各種橡皮筋和木棒來組合最棒的發射器。