

Launchers 發射器

Launcher Technology

Launchers or more specifically for this project Catapults were mighty handy for sailors during the 17th century. Medieval knights used them centuries earlier for taking down massive castle walls. Even Greeks and Romans used catapults about 2,000 years ago! These machines are very useful, as long as you know how to aim them! In this STEM activity students learned about, energy, force and making predictions on distance and height of the projectiles launched.

Engineering a Catapult

At first glance the task looked simple and students were very excited to engineer launchers and shoot projectiles at specific targets. The students studied the material, put a plan together and started the important process of trial and error as they determined which one of the three objects (cotton ball, ping pong ball or foam ball) made the best projectile, and what was the best way to arrange the craft sticks to maximize launch angle and transfer the potential energy (ready) into kinetic energy (moving). Through the testing process the students had to complete a report with five questions to help them understand the process and results. For example, what happened to the ball? Did it fly? Did it go high or low? Where did it land? What do you expect will happen when you push the cap farther down? Will this make it fly higher, farther? 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 STEM 活動中，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。

設計發射器

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，並向特定目標發射火箭。學生們研究材料及制定計劃，並開始了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動能（準備）到動能（移動）的最好方法是什麼。透過測試過程，學生必須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？當你把手再往下推時，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 ASK + IMAGINE 提問 + 創思

We thought about the materials we need to build the catapult, and ways to make it launch successfully. 我們思考製造發射器所需的材料，以及成功發射的方法。



3 PLAN 計畫

We designed a catapult that could launch objects far away. 我們設計可以將物體發射至遠方的發射器。



4 CREATE 創造

The materials were simple, but it took some time and group work to make this work. 材料很簡單，但需要一些時間及團隊合作來促使發射器運作。



5 IMPROVE 改進

We tried several times to see if our catapult could launch effectively, and made changes to our plan as needed. 我們試了幾次，看看我們的發射器能否有效發射，並根據計畫需求進行了修改。

