主題：鳳陽動力雄厲害，樂學永續轉起來！

Topic: Fong Yang in Motion, Joyful Learning Keeps Spinning

標題：一拉一轉，動力無限！

Title: Pull it, Spin it, Power with No Limit

校名：鳳陽國小

指導教師：洪長明、陳毓婷、王蕎芸、楊宙芝

想法緣由：

The reason behind the idea

在新課綱編定後，橡皮筋動力車的內容被移除了，這讓我們感到非常可惜。其實，**科學不只存在於課本裡，它就藏在我們的日常生活中**。因此，我們希望透過科園會的機會，讓現在的學生重新認識橡皮筋動力車，體會到**只需要一個橡皮筋這樣的生活小物，就能玩出「充滿動能」的科學**！

With the new curriculum, the topic of rubber band powered cars was removed, which we thought was a pity. But in reality, science isn't just in textbooks. It's all around us in our life. Therefore, we hope to take this opportunity to help students rediscover rubber band powered cars and understand how a simple item like a rubber band can explore the science of kinetic energy.

此外，在帶學生玩風火輪時，我們靈光一閃：如果能用它的**慣性**作為動力來源，那會是多麼有趣的科學實驗！於是，我們也將風火輪的製作想法加了進來，希望能藉由這兩種看似簡單的玩具，讓大家發現**生活中的物品都能成為探索科學奧秘的絕佳工具**。

While playing with a spinner with bottle cap, we suddenly came to the idea: How cool would it be to use its inertia as power in a science experiment. So, we added this idea of making it. We hope that through these two simple toys, everyone will realize that items in daily life can be great tools for exploring the wonders of science.

我們希望透過這些實作，證明**科學其實是隨手可得的樂趣**，讓學生們從動手做的過程中，感受科學的無限魅力。

We seek that through these hands-on activities, we can demonstrate that science is easily accessible and joyful, allowing students to experience the endless charm of science by creating things themselves.

❋❋製作挑戰：橡皮筋動力車【彈力就是動力！】❋❋

Challenge: Rubber Band Powered Car –The Power Comes from Elasticity

1.科學原理：Scientific Principle:

(1)「**儲存**」**能量**：把橡皮筋轉緊【彈力】。

(2)「**轉換**」**能量**：把【彈力】轉換成【動力】。

(3)「**釋放**」**能量**：放手後，【動力】推著車子往前跑。

(1) First, store energy by twisting the rubber band, tightening its elastic tension.

(2) Second, convert that tension into motion, transforming stored energy into movement.

(3) Third, release energy. After letting the car go, the energy pushes the car forward.

2.準備材料：Materials:

(1)養樂多瓶身*1(作為車身)(2)瓶蓋*1(3)橡皮筋*1 (4)小竹籤*1(5)鐵絲*1

(6)螺帽*3(減少摩擦力和作為配重)(7)衛生筷(8)膠帶臺和膠帶

(1) Yakult bottle x 1 (used as the body of the car)

(2) bottle cap x1

(3) rubber band x1

(4) small bamboo sticks x1

(5) the wire x1

(6) nut x3 (reduce friction and act as weight)

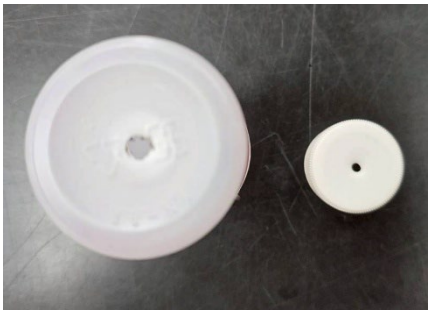
(7) chopsticks (one pair)

(8) tape dispenser and tape

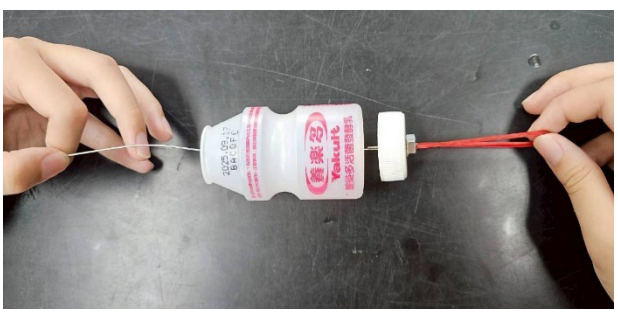
3.製作步驟(完整版) Steps (Complete Version)

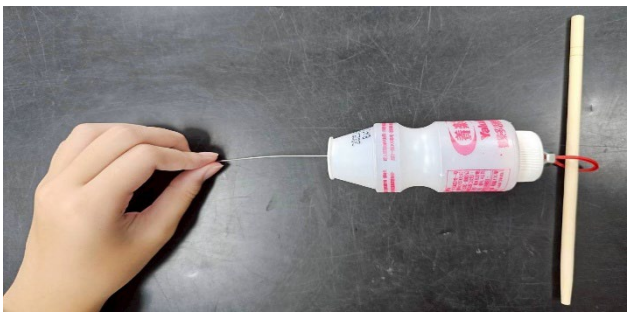
(1)製作動力軸：

A.在養樂多瓶身的底部和瓶蓋中央，分別鑽一個孔。



B.利用鐵絲將橡皮筋穿過瓶身、瓶蓋、螺帽，最後用衛生筷橫向卡住橡皮筋，作為動力軸。





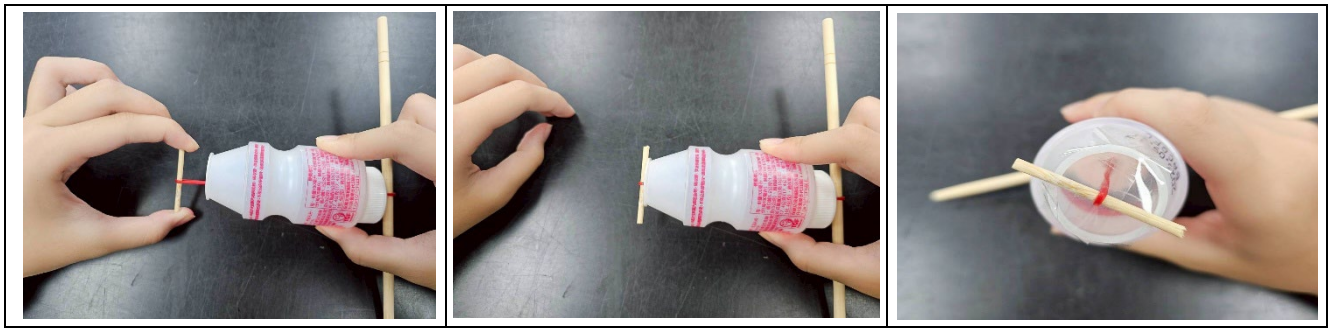
(1) Make a Drive Axle

A. Drill a hole in the bottom of the Yakult bottle. Then, drill another hole in the center of the cap.

B. Use a wire to thread the rubber band through the bottle, cap, and nut. Then, use the chopsticks to clamp the rubber band, like a drive axle.

(2)固定動力：

A.將橡皮筋另一端拉到瓶身前方，用小竹籤和膠帶將其固定在瓶口。



B.用膠帶將兩顆螺帽黏在瓶口兩側，用來增加重量和穩定性。

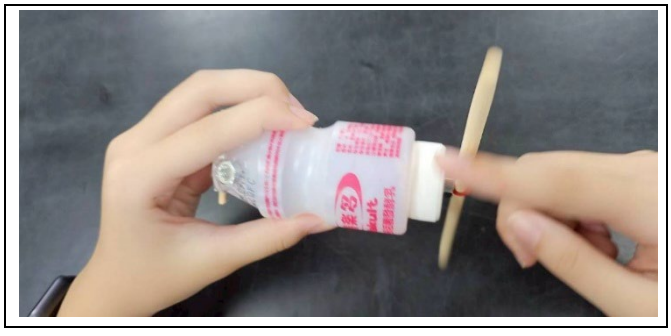
(2) Fix the Power

A. Pull the other end of the rubber band to the front of the bottle. Use a small stick and tape to hold it at the top of the bottle.

B. Use tape to stick two nuts on both sides of the top of the bottle. This adds weight and stability.

(3)給足動力：

握住瓶身，用另一隻手轉動衛生筷，使橡皮筋纏繞變緊，儲存彈力。

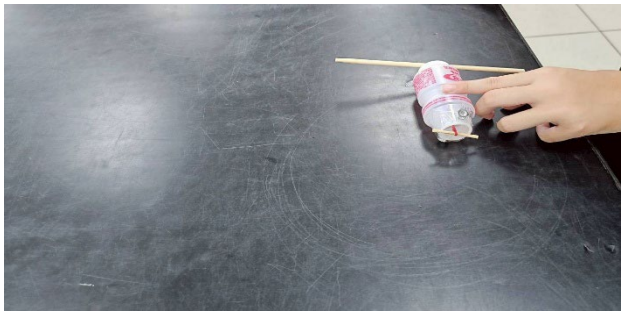


(3) Enhance the Energy

Hold the bottle with one hand. Use the other hand to turn the chopsticks and tighten the rubber band to store energy.

(4)彈力轉動力：

將車子放在平坦的桌面上，放手後，彈力轉成車子前進的動力。



(4) Use Elasticity to Generate Power

Place the rubber band powered car on a flat table. Let the car go, and the rubber band will push the car forward.

3.製作步驟(簡易版) Steps (Simple version)

(1)製作動力軸：在瓶蓋與瓶身上鑽孔，並用橡皮筋、螺帽和衛生筷組合成動力軸。

(2)固定動力：

A.將橡皮筋另一端拉到瓶口用小竹籤和膠帶固定。

B.在瓶口黏貼兩顆螺帽，增加重量和穩定性。

(3)給足動力：轉動衛生筷使橡皮筋纏緊，儲存彈力。

(4)彈力轉動力：放手後，彈力轉成車子前進的動力。

(1) First, make a drive axle: Drill the holes in the bottle and the bottle cap. Use a rubber band, nuts, and chopsticks to form a drive axle.

(2) Second, fix the energy:

A. Pull the other end of rubber band to the top of the bottle. Use a stick and tape to hold it.

B. Stick two nuts on top of the bottle to add weight and stabilize it.

(3) Third, enhance the energy: Twist the chopsticks to tighten the rubber band , so we can store the energy.

(4) Finally, use elasticity to generate power: Let the car go, and the rubber band moves the car forward.

❋體驗挑戰：風火輪【靜者恆靜；動者恆動！除非外力改變它(慣性)】❋

Challenge: A Spinner with Bottle Cap-Objects stay still or keep moving unless something pushes or pulls them.

1.科學原理： Scientific Principle:

(1)「**儲存」能量**：用力轉拉繩子，讓**瓶蓋**快速旋轉 ，儲存**【轉動能量】**。

(2)「**轉換與釋放」能量**：放手後，瓶蓋的**【轉動能量】**會因為【慣性】繼續轉動前進。

(1) Store Energy: Pull the string hard to make the bottle cap spin fast and store rotational energy.

(2) Change and Release Energy: Let the bottle cap go, it keeps spinning and moving forward because of inertia.

2.準備材料：Materials:

(1)有軸心的瓶蓋*2(製作風火輪的圓盤) (2)棉繩(纏繞在軸心上，啟動動力) (3)泡棉(黏貼瓶蓋)

(1) Two bottle caps with centers (to make the spinning top)

(2) Cotton string (wrap around the center to activate the motion)

(3) Foam (stick the bottle caps together)

3.製作步驟(完整版) Steps (Complete Version)

(1)製作動力軸

A.將 2 個瓶蓋背對背用泡棉黏貼，並在 2 個瓶蓋中央各鑽 2 個孔，作為軸心。

B.將棉繩穿過 2 瓶蓋的 2 孔，在另一端打結固定，作為動力軸。

(2)給足動力：用力拉動棉繩，讓瓶蓋快速旋轉。

(3)慣性轉動前進：當雙手放開棉繩後，瓶蓋會因為慣性繼續轉動前進。

(1) Make the Drive Axle:

A. Stick the two bottle caps back to back with foam. Drill two holes in the center of each cap for the axle.

B. Put the cotton string through the two holes in the bottle caps. Tie a knot at the other end to fix it as the power axle.

(2) Enhance the Power: Pull the cotton string hard to make the bottle caps spin fast.

(3) Inertia causes it to spin: After releasing the cotton string, the bottle cap keeps spinning and moving forward because of inertia.