

主題：科學雄厲害，FUN 膽說雙語(Play FUN 高雄 磁來運轉)

Theme: Science Rocks—Boldly Speak Bilingual (Play FUN Kaohsiung: Magnetic Wonders)

說明：

illustrate:

關卡一：磁轉玩偶 <https://www.youtube.com/watch?v=te6Wl9xKCe4&t=184s>

Level 1: Magnetic Action Figure

利用磁鐵、瓶蓋與五子棋製作不倒玩偶，再利用不同磁力矩讓它轉動並移動，完成 play 高雄地圖即可過關。

Create a roly-poly toy using a magnet, a bottle cap, and a Go-bang piece; then, use varying magnetic torques to make it spin and move. Complete the "Play Kaohsiung" map to clear the level.



關卡二：磁浮列車

Level 2: Magnetic Levitation Train

將兩條平行的軟性長磁鐵，排列成輕軌形狀，使圓形磁鐵可以漂浮其上，闖關者輕輕一推即可繞輕軌一周。

Two long, flexible magnets are arranged in parallel to form a track resembling a light rail, allowing a circular magnet to levitate above them; a gentle push from a challenger is enough to send it completing a full circuit of the track.

手作關卡三：磁轉小風車 <https://www.youtube.com/watch?v=MrPTdgJ9yJ8>

Level 3: Magnetic Spinning Windmill

利用大、中、小吸管、磁鐵與紙卡，製作手動式磁鐵小風車。

Use large, medium, and small straws, magnets, and cardstock to make a hand-operated magnetic pinwheel.



製作方法

Preparation Method

磁轉玩偶：

Magnetic Action Figure

1. 將五子棋黏在圓形磁鐵上並將玩偶固定於磁鐵上。
Glue the Go-moku piece onto the round magnet and secure the figurine onto the magnet.
2. 在瓶蓋內黏傾斜的磁鐵。
Glue a tilted magnet inside the bottle cap.

玩法與原理

Gameplay and Principles

將瓶蓋輕輕靠近玩偶，因為傾斜的磁鐵產生不同的磁力矩，使玩偶旋轉，在輕推瓶蓋將玩偶推至目的地。

Gently bring the bottle cap close to the doll; the tilted magnet generates varying magnetic torques that cause the doll to rotate, allowing you to nudge the cap and guide the doll to its destination.

磁轉小風車製作方法：

Instructions for making a Magnetic Spinning Windmill:

1. 將磁鐵固定於一般吸管中的一端，再剪下兩小段(約 0.8cm)養樂多吸管，並利用膠帶將之固定於有磁鐵吸管端的兩邊。
Secure a magnet to one end of a standard drinking straw; then, cut two short segments (approximately 0.8 cm) from a Yakult straw and use tape to attach them to either side of the end containing the magnet.
2. 將上述完成的吸管塞入粗吸管中。
Insert the assembled straw into the wide straw.
3. 另利用紙卡製作風車形狀(可以上色增加美感)，並在背後中心粘一個相同磁鐵。
Additionally, use cardstock to create a pinwheel shape (you can color it to make it look more attractive) and attach an identical magnet to the center of the back.

玩法與原理

Gameplay and Principles

將紙風車吸附於粗吸管上頭，輕輕拉動吸管，因為吸管内磁鐵被養樂多吸管隔開，無法完全貼合於紙風車上的磁鐵，兩個磁鐵於是產生角度，造成不同磁力矩，吸力強的摩擦力大，吸力弱的摩擦力小，使得拉動時紙風車開始旋轉。

Attach the paper pinwheel to the top of the thick straw and gently pull the straw. Because the magnet inside the straw is separated from the magnet on the pinwheel by the wall of the Yakult straw, they cannot sit flush against each other; this creates an angle between the magnets, resulting in varying magnetic torques—stronger attraction leads to greater friction, while weaker attraction leads to less friction—causing the pinwheel to rotate as the straw is pulled.

所需材料

Required Materials

磁轉玩偶 Magnetic Action Figure	五子棋一盒、磁鐵(直徑 2cm)100 顆、熱熔膠條 20 條、瓶蓋 20 個、 One box of Gomoku pieces, 100 magnets (2 cm diameter), 20 hot glue sticks, 20 bottle caps.
磁浮列車 Magnetic Levitation Train	長型軟磁鐵 20 條(30cm) 、 20 Flexible Magnetic Strips (30cm)
磁轉小風車 Magnetic Spinning Windmill	強力磁鐵(8X1mm)1000 個、粗吸管 1000 個、一般吸管 1000 個、養樂多吸 管 100 個、透明膠帶(直徑 1cm)10 捲 1,000 strong magnets (8x1mm), 1,000 wide straws, 1,000 standard straws, 100 Yakult-style straws, 10 rolls of clear tape (1cm diameter)

其他展示品

Other Exhibits

漂浮陀螺，電池漂浮列車

Levitating top, battery-powered maglev train