

高雄市 113 年度第 43 屆國民中小學科學園遊會 高雄市大寮區忠義國小  
The 43<sup>rd</sup> Kaohsiung Primary and Junior High School Science Fair  
Zhongyi Elementary School in Daliao District, Kaohsiung

## 應用流體力學創作多種模型

①AI 解密：從天而降的幻影舞者

②翻轉吧！旋轉紙飛機

## Applying Fluid Mechanics to Create Various Models

①AI Decryption: The Phantom Dancer Falling from the Sky

②Flip It! Spinning Paper Airplane

作者：謝奕洵、吳奕萱、吳曉潔、羅彬瀚

李正鵬、林千晴、趙亭瑜、蔡宗宸

### 一、活動主旨 Activity Objectives

觀察到忠義國小校園中有一種神奇的種子，只要將該種子拿起並放手，種子就像神秘的舞者，在空中一邊旋轉，一邊優雅地掉落至地上，非常美妙！

為了揭開幻影舞者的神秘面紗，運用 AI 圖片辨識的功能，將平板或手機對著幻影舞者拍張照片，就能知道該名舞者為「桃花心木」的種子，就連它的植物特徵、分佈範圍、生長條件……等資訊，都能一併認識。

另外，為了在任何季節都能欣賞及體驗「流體力學：白努利定律」的美，所以藉由使用不同材質的新紙張，甚至是回收再利用的紙張，動手創作出多種「旋轉降落器」、「旋轉紙飛機」之紙模型。

期望透過 AI 資訊科技結合國小自然科學認識植物的單元，加以了解桃花心木種子；科學與藝術創作的跨域結合，思考不同實驗變因，設計出多元的造型，分析各個設計模型的成敗影響因素，讓同儕互相欣賞、討論、實驗，達到寓教於樂的效果。

In the campus of Zhongyi Elementary School, a magical seed has been observed. When this seed is picked up and released, it spins gracefully in the air like a mysterious dancer, elegantly descending to the ground—it's truly wonderful!

To unveil the mystery of the Phantom Dancer, you can use AI image recognition. By pointing a tablet or smartphone at the Phantom Dancer and taking a photo, you can discover that this dancer is the seed of the Mahogany tree. You will also learn about its plant characteristics, distribution, growth conditions, and other relevant information.

Additionally, to appreciate and experience the beauty of "Fluid Mechanics: Bernoulli's Principle" in any season, various paper models of spinning parachutes and spinning paper airplanes can be created by using different types of new paper, including recycled materials.

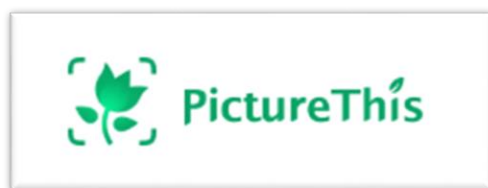
It is hoped that through the integration of AI information technology with the elementary school's natural science unit on plant recognition, students will understand the Mahogany seed. By combining science and artistic creation across disciplines, students will consider various experimental variables, design diverse shapes, and analyze the factors influencing the success or failure of each design model. This will allow peers to appreciate, discuss, and experiment with each other, achieving an educational and enjoyable experience.



## 二、活動流程 Activity Procedure

(一) 參加者觀察現場的木莢和種子，體驗種子從空中旋轉而下的樣態。

(二) 參加者使用平板，開啟 AI 應用程式：**PictureThis**，對著木莢或種子拍照，認識及了解「桃花心木」的相關資訊。



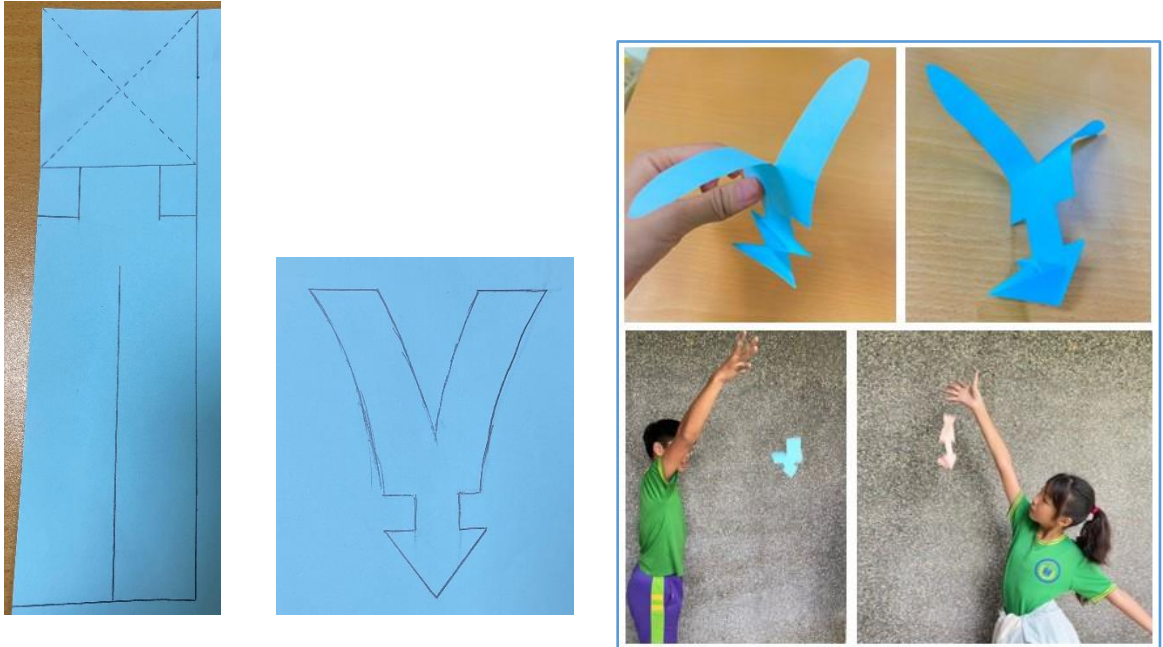


(三) 參加者思考和預測：可以成功使旋轉降落器、旋轉紙飛機，在掉落的過程中，達到旋轉、平衡狀態的造型是什麼？

(四) 實際動手做出旋轉降落器、旋轉紙飛機，依據旋轉、飛翔成功或失敗的經驗，探索會是什麼原因造成的。

## 1. 旋轉降落器

(1) 依照範例圖剪裁，實線以剪刀剪開，虛線則摺成一個立體的箭頭。



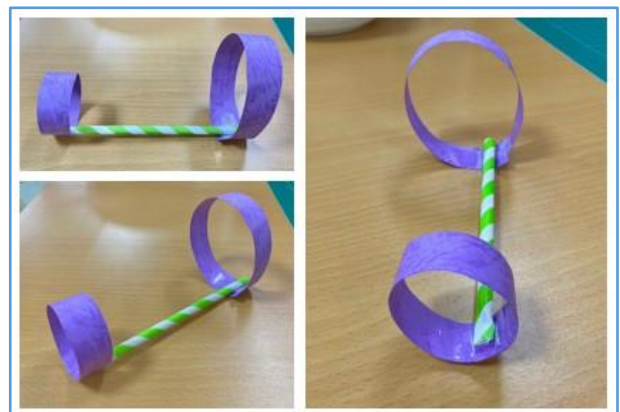
(2) 頂部剪開後，朝不同方向捲成兩個微彎曲的尾翼。

(3) 箭頭朝下，從高處放下降落器，觀察是否有旋轉。

## 2. 旋轉紙飛機

(1) 剪下兩張不同寬度的長方形紙條。

(2) 將這兩張紙條分別捲成圓環狀，並黏住圓環的開口。



(3) 將兩個圓環分別黏在一根吸管的前後兩側。

(4) 手握吸管，較小圓環紙朝前方，以拋物線飛出，觀察是否有旋轉。

(五) 觀察、討論更多種成功或失敗的造型，思考如何創新或修改。

- (1) Participants observe the wooden pods and seeds on site, experiencing the appearance of seeds spinning down from the air.
- (2) Participants use a tablet to open the AI application **PictureThis**, taking photos of the pods or seeds to learn more about the Mahogany seed and its related information.
- (3) Participants think and predict: what designs of **spinning parachutes** and **spinning paper airplanes** can successfully achieve a spinning and balanced state during their descent?
- (4) Participants create **spinning parachutes** and **spinning paper airplanes**, exploring the reasons for their success or failure based on their spinning and flying experiences.

## 1. Spinning Parachute

Step 1. Cut according to the sample image: cut solid lines with scissors and fold dotted lines to make a 3D arrow.

Step 2. After cutting the top, curl the two wings in different directions.

Step 3. With the arrow pointing down, drop the parachute from a height and see if it spins.

## 2. Spinning Paper Airplane

Step 1. Cut two rectangular strips of paper with different widths.

Step 2. Roll each strip into a circle and glue the ends.

Step 3. Attach the circles to the front and back of a straw.

Step 4. Hold the straw with the smaller circle facing forward and throw it to see if it spins.

- (5) Observe and discuss more successful or failed designs, considering how to innovate or modify them.

### 三、討論與結論 Discussion and Conclusion

應用「流體力學：白努利定律」，成功使**旋轉降落器**、**旋轉紙飛機**達成旋轉、平衡的關鍵為：

#### (一) 旋轉降落器



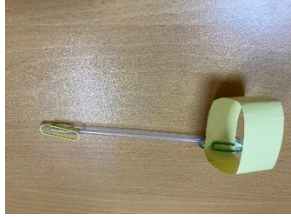
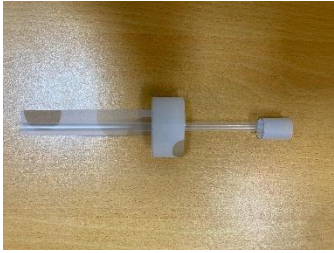
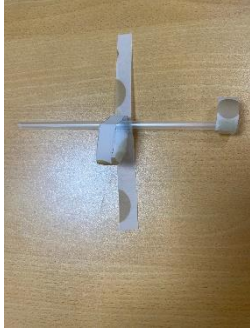
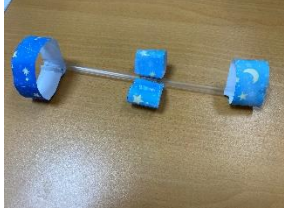
1. 圖形是對稱的，且兩邊的翅膀只要稍微彎曲即可，彎曲程度不可太多，否則無法旋轉。
2. 底部多增加重心，可增加穩定性，比較不會亂飄，而是直線掉落。不過，底部不額外添加重心還是會旋轉喔！
3. 翅膀造型、數量都可以有許多變化！

#### (二) 旋轉紙飛機

1. 需要選擇重量輕的吸管、圓環狀的紙。如果選太重，還是可以飛，但不會旋轉。
2. 射出紙飛機的力道要放輕、有弧度的射出，較易成功看見其旋轉狀態。
3. 創意變化版的多元造型，是有可能成功達成平衡的。

		
<p>翅膀鋸齒狀</p>	<p>翅膀短、中間</p>	<p>尖尾翅膀</p>
		
<p>芒果造型翅膀</p>	<p>愛心型翅膀</p>	<p>三條翅膀造型</p>
		
<p>沒有底部重心</p>	<p>特殊造型(一)</p>	<p>特殊造型(二)</p>



		
大圓環加兩小尾翼	瓦楞紙、環保紙吸管	以迴紋針取代小圓環
		
添加長條翅膀(一)	添加長條翅膀(二)	中間添加兩小圓環

Applying "Fluid Mechanics: Bernoulli's Principle," the key to successfully achieving rotation and balance with the spinning parachute and spinning paper airplane includes:

#### Spinning Parachute

1. The shape should be symmetrical, and the wings only need to be slightly bent; excessive bending will prevent it from spinning.
2. Adding weight to the bottom can increase stability, allowing it to drop in a straight line rather than drifting randomly. However, it can still spin without extra weight!
3. The shape and number of wings can vary greatly!

#### Spinning Paper Airplane

1. Choose lightweight straws and circular paper rings. If the materials are too heavy, the plane can still fly but won't spin.
2. The force used to launch the paper airplane should be gentle and arched to make it easier to see the spinning motion.
3. Creative variations in design can potentially achieve balance successfully.

#### 四、參考資料 References

(一) 旋轉降落器 (作者：MI STEM)。

(二) 一飛沖天～吸管飛機 (高雄市科學園遊會，建國國小，指導老師：李媛祺)。