

神奇魔力感應的” 木工手機架”

Magical sensor "woodworking mobile phone holder"

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一、旨趣 Learning Objectives

資源回收再利用是保護地球、愛惜環境的行為表現，當廠商把物品送來學校後，承載貨物的木棧板，就會被丟棄。如果將這些木板加工製作成有用的器物，不僅能使學生做到資料回收再利用，更能藉由創作作品當中，學習科技機具的使用和對科學原理的認識與應用。

Recycling and reusing resources are ways to protect the Earth and the environment. When manufacturers deliver goods to school, the wooden pallets they carry are often discarded. By processing these wooden pallets into useful objects, students can not only recycle and reuse materials but also learn to use technology and understand and apply scientific principles through their creative work.

本次主題的設計分為兩個部分，首先是木工手機架作品造型設計，藉由木棧板的加工處理，讓學生體驗木工工具的使用與操作器具時的安全意識。其次，手機放置的角度可以木工的設計找到最佳的視覺效果。

This design's main idea is divided into three parts. The first involves the design of a woodworking phone holder. By processing wood pallets, students will experience the use of woodworking tools and safety awareness when operating them. The second is angle of the phone placement can be optimized for visual effects within the woodworking design.

最後是風扇馬達電路迴路的設計，藉由磁簧開關的控制元件來開關風扇馬達，再利用杯子下方的磁鐵來感應磁簧開關，學生們不僅能認識電路系統的控制元件，更使得整體作品富有神秘的趣味性。

The last is the design of the fan motor circuit loop. The fan motor is turned on and off using the control element of a reed switch, and the magnet under the cup is used to sense the reed switch. This not only allows students to understand the control elements of the circuit system, but also makes the overall work mysterious and interesting.

二、活動設計 Event Design

(一)活動一：木工手機架元件製作與組裝

Activity 1: Making and assembling components of a woodworking mobile phone stand

回收進來的木工元件板材大部分會有尺寸太大或太小，不符合製作需求的情況。回收板材的表面也都是非常粗糙的，因此需要做基本的切割、打磨或鑽孔以符合作品的需求。此外，手機擺放的角度大小不同，也會影響閱讀的視覺效果，所以手工具的操作與手機擺放角度的測量是本活動的主要的活動內容。

Recycled woodworking components are often too large or too small to meet production requirements. The surface of recycled wood is also very rough, requiring basic cutting, sanding, or drilling to meet the needs of the project. Furthermore, the angle of a mobile phone can affect the visual experience, so the operation of hand tools and the measurement of the phone's placement angle are the main activities of this activity.

(二)活動二：電路組裝磁力開關測試

Activity 2: Circuit Assembly and Magnetic Switch Testing

電路迴路的設計和安裝是影響馬達是否正常工作的關鍵，因此，迴路的通路、短路和斷路是製作作品時所要學習的重要概念。其次，本作品使用了磁簧開關做為磁感應的開關電路元件，透過作品與杯子的組合讓使用者產生錯覺，誤以為杯子會有神奇的魔力，引發學生的好奇心進而引起學習的動機。

The design and installation of circuit loops are crucial to the proper functioning of motors. Therefore, circuit opening, short circuiting, and open circuiting are crucial concepts to learn when creating this work. Secondly, this work utilizes a reed switch as a magnetic induction switching circuit element. By combining the work with a cup, the user is misled into believing the cup possesses magical powers, sparking students' curiosity and ultimately motivating them to learn.

三、實驗器材 Experimental Materials

(一)手搖鑽、手持線鋸、砂紙

Hand drill, handheld saw, sandpaper

(二)馬達、電池、電線、接線盒、磁簧開關

Motor, battery, wires, junction box, reed switch

四、活動過程(操作步驟) Operational steps

(一) 操作項目：利用水管鉗剪取適當長度的竹筷子，使手機能正常擺放。

Operation Item 1: Use pipe cutters to cut bamboo chopsticks of appropriate length so that the phone can be placed properly.

竹筷長度 Length of bamboo chopsticks	0.5 公分 0.5cm	1 公分 1cm	1.5 公分 1.5cm
視覺效果 Visual Effects	☐ 良好 Good ☐ 普通 Average ☐ 不良 Poor	☐ 良好 Good ☐ 普通 Average ☐ 不良 Poor	☐ 良好 Good ☐ 普通 Average ☐ 不良 Poor



(二) 操作項目：拿起茶杯放置感應區與非感應區，觀察風扇是否轉動。

Operation item: Pick up a teacup and place it in the sensing area and the non-sensing area to observe whether the fan rotates.

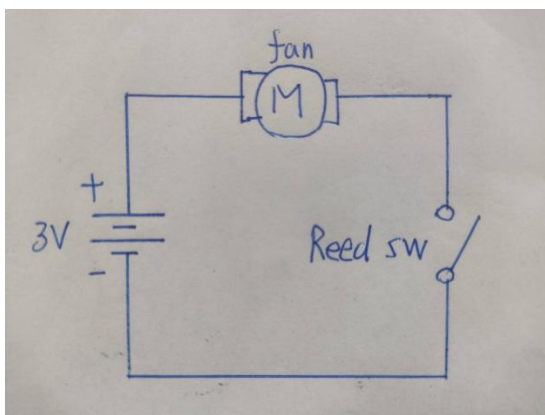
茶杯放置的位置 The location of the teacup	感應區 Sensing area	非感應區 Non-sensing area
風扇的狀況 Fan condition	☐ 轉動 Rotation ☐ 不轉動 No rotation	☐ 轉動 Rotation ☐ 不轉動 No rotation



五、原理探討 Principle Discussion

短路是電流不經過過風扇直接形成低電阻迴路，產生過大電流，是發生電器火災的主要原因；斷路是電路中的某處斷開，電流無法流通，造成風扇無法供電轉動；通路則是電流能夠完整通過電源、導線和風扇的閉合迴路，能使作品正常運作。

A short circuit occurs when the current forms a low-resistance loop without passing through the fan, generating excessive current and is the main cause of electrical fires. An open circuit occurs when a disconnection occurs somewhere in the circuit, preventing the current from flowing and causing the fan to be unable to power and rotate. A pass circuit occurs when the current can completely pass through a closed loop of power, wires, and fan, allowing the work to operate normally.



磁簧開關的工作原理是利用玻璃磁簧管內兩片可磁化的簧片，當磁吸力超過本身的彈力時，這兩片簧片會因磁力作用吸合導通電路，當磁力消失後，簧片由於本身的彈性而分開，觸面就會因分開而形成斷開電路。

The working principle of a reed switch is to use two magnetized reeds inside a glass reed tube. When the magnetic attraction exceeds the elastic force of the reed, the two reeds will be attracted together due to the magnetic force, turning on the circuit. When the magnetic force disappears, the reeds will separate due to their own elasticity, and the contacts will separate to open the circuit.

