

## 自然領域教學單元案例

領域	自然科學領域		設計者	陳美卿
實施年級	六年級		總節數	2 節
單元名稱	第四單元活動 3 電磁鐵的應用		教材來源	康軒版
教學內容				
第一節	生活中的電磁鐵			
第二節(本節)	製作電磁鐵玩具			
設計依據				
學習重點	學習內容	INe- III -10 磁鐵與通電的導線皆可產生磁力，使附近指北針偏轉。改變電流方向或大小，可以調控電磁鐵的磁極方向或磁力大小。	核心素養	自-E-A2 能運用好奇心及想像能力，從觀察、閱讀、思考所得的資訊或數據中，提出適合科學探究的問題或解釋資料，並能依據已知的科學知識、科學概念及探索科學的方法去想像可能發生的事情，以及理解科學事實會有不同的論點、證據或解釋方式。
	學習表現	pe-III-2 能正確安全操作適合學習階段的物品、器材儀器、科技設備與資源。能進行客觀的質性觀測或數值量測並詳實記錄。		
跨域連結	英文領域			
學習目標	<p>By the end of the course, students will be able to</p> <ol style="list-style-type: none"> <li>能說出電磁鐵的運作原理，在日常生活中的應用。 Identify the use of electromagnetism in daily life.</li> <li>能運用電磁鐵運作原理製作簡易小玩具。 Create a toy based on electromagnetism.</li> </ol>			
教學設備／資源	Videos, copper wire, battery, magnet, PPT			
語言學習目標	Language <i>of</i> learning			
	electromagnet (電磁鐵)、current (電流)、magnet (磁鐵)、magnetic field (磁場)、battery (電池)、copper wire(銅線), repel and repulsion(排斥), attract and attraction(吸引), poles(磁極)			
	Language <i>for</i> learning			
	<ol style="list-style-type: none"> <li>Magnetic field can/cannot be changed.</li> <li>Poles can/cannot be reversed.</li> <li>Need electric current to act as a magnet.</li> </ol>			

教學活動設計

教學目標	主要問題與引導	時間	評量重點
<p>能說出電磁鐵運作原理 (Explain how electromagnets work)</p>	<p><b>Engage 參與</b></p> <ul style="list-style-type: none"> <li>◆ 關於電磁鐵，你學到什麼？電磁鐵有哪些特性？ (Point out the characteristics of electromagnets.)</li> <li>◆ 影片觀賞(Homopolar motor)，請學生說說看在影片中看到什麼？ (What do you see in this video?)</li> <li>◆ 老師問，這與電磁鐵有什麼關係？ What does this have to do with electromagnets?</li> <li>◆ 電磁鐵需要哪些材料？ As an electromagnet, what materials do we need?</li> <li>◆ 小組討論，影片銅線為什麼會轉動 (Discuss in groups. Why does the copper wire spin in the video?)</li> </ul> <p><b>Explore 探索、Explain 解釋</b></p> <ul style="list-style-type: none"> <li>◆ 動手探索(一) 教師拿出自製電磁鐵玩具—舞者，請學生上台操作試試看如何讓舞者跳舞。 Look what I have here. This is a dancers. Who would like to try to make it dance.</li> </ul> <ol style="list-style-type: none"> <li>1. 舞者有哪些裝置？ What materials do we need?</li> <li>2. 你們觀察到什麼現象？為什麼？ (引導學生說出當銅線碰觸強力磁鐵形成通路時，電流流經銅線，銅線周圍便會形成磁場，而強力磁鐵本身的磁場與銅線的磁場產生吸引或排斥現象，因此舞者會不停的旋轉。)</li> </ol> <p>When a copper wire touches a strong magnet to form a path, a current flows through the copper wire, and a magnetic field is formed around the copper wire. The magnetic field of the strong magnet itself and the magnetic field of the copper wire cause attraction or repulsion, so the dancer will keep spinning.</p>	<p>8'</p> <p>10'</p>	<p>Students can identify the characteristics of electromagnets.</p> <p>Students can present and answer questions</p>
<p>能運用電磁鐵運作原理製作簡易小玩具</p>		<p>15'</p>	<p>Students can make simple toys</p>

<p>(Can use the principle of electromagnets to make simple toys)</p>	<p>◆ 動手探索(二)</p> <ol style="list-style-type: none"> <li>1. 老師發下相關材料，學生依照電磁鐵原理，動手做做自己的創意旋轉玩具。</li> <li>2. 每小組一位學生發表： 會旋轉，為什麼? Why does it spin? 無法旋轉，為什麼? If it won't spin, why not?</li> </ol> <p><b>Evaluate 評量</b></p> <p>◆ 為什麼創意旋轉玩具會旋轉? Why does the copper wire spin?</p> <p>◆ 生活中，還有哪些日常生活用品或高科技機器同樣是善用「電磁鐵」的原理而完成的? Where can we see the use of electromagnets?</p> <p>◆ 這堂課你學到什麼? What have you learned in this class?</p>	<p>7'</p>	<p>successfully and publish them</p> <p>Students can summarize</p>
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## 參考資料

How To Make A Homopolar motor | DIY Science Experiment At Home | Science Videos By Hooplakidz Lab(單極磁鐵)

<https://www.youtube.com/watch?v=oMX5189bG4M>(3' 40)

Homopolar motor FJFI/ (很簡單又清楚)旋轉摩天輪

<https://www.youtube.com/watch?v=yUToL9WAK8I&list=PLOMD9CrvBcWfSc034cU9pDVR68Nelqfc3>

# Worksheet

## The Characteristics of an Electromagnet

Please check it

group: \_\_\_\_\_

108.12.26

magnetism (磁力的產生)	Strength of Magnetic fields (磁力的大小)	The poles (磁極)
<input type="checkbox"/> Requires electric current to act as an electromagnet.  <input type="checkbox"/> Does not need electric current to act as a magnet.	<input type="checkbox"/> Strength of the magnetic field cannot be changed.  <input type="checkbox"/> Strength of the magnetic field can be changed.	<input type="checkbox"/> N and S poles can be reversed.  <input type="checkbox"/> N and S poles cannot be reversed.

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## Unit 4 電磁作用

## 應會認讀及聽懂的生字

1. <input type="checkbox"/> compass**	指北針
2. <input type="checkbox"/> magnet**	磁鐵
3. <input type="checkbox"/> electromagnet	電磁鐵
4. <input type="checkbox"/> electromagnetic	電磁的
5. <input type="checkbox"/> current**	電流
6. <input type="checkbox"/> magnetic field**	磁場
7. <input type="checkbox"/> maglev train	磁浮列車
8. <input type="checkbox"/> magnet crane**	電磁起重機
9. <input type="checkbox"/> geomagnetism	地磁
10. <input type="checkbox"/> battery**	電池
11. <input type="checkbox"/> magnet**	磁鐵
12. <input type="checkbox"/> magnetic**	磁力的
13. <input type="checkbox"/> magnetism	磁性
14. <input type="checkbox"/> enameled wire	漆包線
15. <input type="checkbox"/> sand paper**	砂紙
16. <input type="checkbox"/> wood stick**	木棒
17. <input type="checkbox"/> telephone**	電話
18. <input type="checkbox"/> remote control**	遙控器
19. <input type="checkbox"/> electric motor	小馬達
20. <input type="checkbox"/> flashlight**	手電筒
21. <input type="checkbox"/> dryer**	吹風機
22. <input type="checkbox"/> electric bell**	電鈴
23. <input type="checkbox"/> electrical wire	電線
24. <input type="checkbox"/> induction coil	線圈
25. <input type="checkbox"/> paper clip**	迴紋針

應了解與運用的句型	
1. 同極相斥;異極相吸	
Like poles of magnets repel each other, and unlike poles attract each other.	
2. 線圈越多，電磁鐵磁性越強。	
The more the number of induction coils, the stronger the magnetic will be.	
3. 電池數量越多，電磁鐵磁性越強。	
The more the number of batteries, the stronger the magnetic will be.	
(The more batteries in series(串聯), the stronger the magnetic will be).	
學測指考單字**	
※本頁完成日期：_____	

# Classroom Language

1. Please take out your notebook/student book/workbook.
2. 5 points for on time.
3. Today is \_\_\_\_\_, please add 3 points for books 、 stationery and on time.
4. Clean (up) your table/desk.
5. Put the book/your books away. /Put it in the drawer.
6. (Add) One point for you. Minus one point.
7. Come up, and take what do you need.  
Take back your tools.
8. Let's sum up.
9. Let's stop here.
10. Push in your chairs. Push your chairs in
11. Turn in your tools. /Bring your tools back.
12. Don't pick the picture. Go back to your seat.
13. Write down your group score on your notebook.
14. Group \_\_\_\_ you may /can go.
15. Can anyone point out the mistake?
16. Let me check your answer.
17. Watch/Listen carefully!
18. Pay attention! Be quiet!
19. Try your best.
20. You did a great job!
21. Raise your hand before you talk (Raise your hand if you have any questions).
22. Awesome! Excellent!
23. What do you observe? What happened?
24. Does anyone have any other ideas?
25. Why does it happen?
26. What's this kind of change called?
27. How does it change?
28. Can you think of any examples in your daily life?
29. Please be careful when you're using \_\_\_\_\_.
30. Let's review \_\_\_\_\_ together.
31. What else can you think of ?



32. Can you explain more about it?
33. Why do you think so?
34. Please discuss \_\_\_\_\_ with your group members.
- 35 Please write \_\_\_\_\_ down in your notebook.