

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 | 第一單元活動 1 槓桿原理 The Principle of Leverage | | 教材來源 | 康軒版 |
| 教學內容 | | | | |
| 第一節 (本節) | 認識槓桿：槓桿原理 | | | |
| 設計依據 | | | | |
| 學習 重點 | 學習 內容 | INb- III -4 力可藉由 簡單機械傳遞 | 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 | ah- III -1 利用科學知識理解 日常生活觀察到的 現象。 | | |
| 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"> 知道槓桿原理、支點、施力點、施力臂、抗力點、抗力臂的意義。 Understand the principle of leverage, fulcrum, effort, load, resistance arm, and effort arm. 從實驗過程中了解怎樣利用槓桿省力。 Express the principle of leverage through the exploration. | | | |
| 教學設備／資源 | Video clip, erasers, rulers, a stick, and Powerpoint slides | | | |
| 語言學習目標 | Language <i>of</i> learning | | | |
| | leverage (槓桿原理)、fulcrum (支點)、effort (施力點)、load (抗力點)、effort arm (施力臂)、resistance arm (抗力臂)、balance (平衡), seasaw (翹翹板), object (物品) | | | |
| | Language <i>for</i> learning | | | |
| | <ol style="list-style-type: none"> The farther the objects from the fulcrum, the less objects you need. Poles can/cannot be reversed. If the effort arm is longer, you need less effort. | | | |

| 教學活動設計 | | | |
|---|---|-----|--|
| 教學目標 | 主要問題與引導 | 時間 | 評量重點 |
| 知道槓桿原理、支點、施力點、施力臂、抗力點、抗力臂的意義。 Understand the principle of leverage, fulcrum, effort, load, resistance arm, and effort arm. | ◆ Engage 參與 1. 透過生活經驗引發學生學習動機與思考 https://www.youtube.com/watch?v=YIYEi0PgG1g 2. 有玩過翹翹板的經驗嗎？ (Have you ever played seesaw?) (Who played seesaw before? Raise your hand, please.) 3. Think- Pair- Share 如果坐在對面的人比你重，你要往前坐還是往後坐呢？ (If your friend sitting on the other side of the seasaw and s/he is fatter than you, do you move your seat backward or forward?) | 5' | Students can discuss and answer questions. |
| | ◆ Explore 探索 動手探索 1.1. Simple seesaw 教師引導學生動手設計簡易翹翹板。 Look what I have here. We can use erasers, magnets, a ruler to make a simple seesaw. Try to balance the seesaw. 1. 將橡皮擦放在尺的中間下方位置。Put an eraser under a ruler and put that eraser in the middle of the ruler. 2. 把鉛筆盒放在尺的左側。Put a stapler on the left side of the ruler. 3. 再來用手試試看讓翹翹板保持平衡！Then,press it to balance the seasaw! 動手探索 1.2. Simple seesaw 請思考後和同學們討論下列的問題，討論後會請同學分享。 Please think, discuss, and share with your group members: 4. 當老師放上更多的鉛筆盒時為了平衡翹翹板，另一邊你需要更多的物品嗎？The teacher gives you more staplers... To balance the seasaw, do you need more objects on the | 10' | Students can follow the steps of exploration and articulate their exploration. |

| | | | |
|--|--|----------------------|---|
| <p>能運用槓桿原理舉起書包 (Can use the principle of lever to lift up the bookbag)</p> | <p>other side of the fulcrum?</p> <p>5. stapler 的位置、重量不變時，當你將物品移得越遠，你會需要更多還是更少的物品來平衡翹翹板? The weight and position of the staplers are not changed. If you move the objects farther from the fulcrum, do you need more or less objects?</p> <p>◆ Explain 說明</p> <p>請在自然課本上畫下這幅圖。Draw this picture on your science student book.</p> <p>動手探索 2.</p> <p>Look at me. I use the stick and a chair to lift up the bookbag. 老師示範用棍子和椅子，並運用槓桿原理舉起書包。</p> <p>1. 觀察一下老師的示範與投影片上的圖，請問支點、施力點、抗力點、施力臂和抗力臂各在哪處呢? Please observe my demonstration and look at the picture on the slide. Where is the ...</p> <p>fulcrum load effort resistance arm effort arm</p> <p>請再跟著老師重複一次這些名詞的英文。Please repeat the terms after me.</p> <p>2. 如果施力臂較長，那我會需要施更多還是更少的力呢? If the effort arm is longer, you need (more / less) effort.</p> <p>阿基米德曾說過：「給我一個支點，我就能移動地球。」 Archimedes said, "Give me a place (fulcrum) to stand on, and I will move the earth."</p> <p>最後我們先看一個短片，下次來討論及分享。Watch the video now and please discuss and share next time (or later).</p> <p>1. Where is the fulcrum of the catapult? 投石器的支點在哪裡?</p> <p>2. When the catapult fires the marshmallow farther, how can you adjust the length of the effort arm? Make it longer or</p> | <p>5'</p> <p>10'</p> | <p>Students can illustrate a sketch picture of the leverage.</p> <p>Students can identify terms of leverage and articulate the terms.</p> <p>Students can discuss</p> |
|--|--|----------------------|---|

| | | | |
|--|---|-----|--|
| | <p>make it shorter? 當投石器發射的棉花糖太遠時，可以怎麼調整施力臂改變它？</p> <p>3. When the catapult fires the marshmallow farther, how can you adjust your effort? More effort or less effort? 當投石器發射的棉花糖太遠時，可以怎麼調整力道改變它？</p> | 10' | and apply their knowledge after watching the video clip. |
|--|---|-----|--|

參考資料

References

CATAPULT LAB | Students create designs using rubber bands
and LAUNCH marshmallows off SECOND STORY!!

<https://www.youtube.com/watch?v=ky6APmIZRmA>

How to balance a seesaw

<https://www.tes.com/news/how-balance-seesaw>

Unit 1 Simple machine 簡單機械

應聽懂及認讀的生字

| | |
|--|---|
| <p>1. <input type="checkbox"/> 槓桿 lever</p> <p>2. <input type="checkbox"/> 滑輪 pulley</p> <p>3. <input type="checkbox"/> 輪軸 axle (輪 wheel/軸 axle)</p> <p>4. <input type="checkbox"/> 動力的/動態的 dynamic*</p> <p>5. <input type="checkbox"/> 支點 fulcrum</p> | <p>生活用品</p> |
| <p>8. <input type="checkbox"/> 施力點 <u>effort</u>* point</p> <p>9. <input type="checkbox"/> 抗力點 <u>resistance</u>*point</p> <p>10. <input type="checkbox"/> 施力臂 <u>effort</u> arm*</p> <p>11. <input type="checkbox"/> 抗力臂 <u>resistance</u> arm*</p> <p>12. <input type="checkbox"/> 槓桿原理 <u>principle</u> of lever*</p> | <p>1. <input type="checkbox"/> 尖嘴鉗 needle-nose pliers</p> <p>2. <input type="checkbox"/> 開瓶器 can opener</p> <p>3. <input type="checkbox"/> 榨汁器 squeezer</p> <p>4. <input type="checkbox"/> 鑷子 tweezer</p> <p>5. <input type="checkbox"/> 麵包夾 bread tong</p> <p>6. <input type="checkbox"/> 釘書機 stapler</p> <p>7. <input type="checkbox"/> 拔釘器 nail puller</p> |
| <p>13. <input type="checkbox"/> 砝碼 <u>standard</u> weight*</p> <p>15. <input type="checkbox"/> 定滑輪 fixed pulley</p> <p>16. <input type="checkbox"/> 動滑輪 movable pulley</p> <p>17. <input type="checkbox"/> 鍊條 chain*</p> <p>18. <input type="checkbox"/> 齒輪 gear*</p> | <p>8. <input type="checkbox"/> 剪刀 scissors</p> <p>9. <input type="checkbox"/> 握把 handle*</p> <p>10. <input type="checkbox"/> 垂直的 vertical*</p> <p>11. <input type="checkbox"/> 彈簧秤 spring balance</p> <p>12. <input type="checkbox"/> 棉線 cotton thread</p> <p>13. <input type="checkbox"/> 起重機 crane*</p> <p>14. <input type="checkbox"/> 旗桿 flagpole*</p> |

Force application on wheel

施力在

輪上的物品：

15. 旋轉式水龍頭 rotary faucet

16. 削鉛筆機 pencil sharpener

17. 螺絲起子 screwdriver

18. 喇叭鎖 knob

Force application on axle

施力在軸上的物品：

19. 竹蜻蜓 bamboo dragonfly*

20. 擀麵棍 rolling pin

21. 電風扇 electric fan*

*表示學測指考 7000 單字

內

1. When the fulcrum is in the middle,...

(1) effort arm > resistance arm, effort-saving (1) 施力臂 > 抗力臂，可以省力；

(2) effort arm < resistance arm, effort-spending (2) 施力臂 < 抗力臂，比較費力；

(3) effort arm = resistance arm, neither effort-saving nor effort-spending

(3) 施力臂 = 抗力臂，不省力也不費力。

2. When the point of resistance is in the middle, effort arm > resistance arm, effort-saving. 抗力點在中間的工具，施力臂 > 抗力臂，可以省力。

3. When the point of application is in the middle, effort arm < resistance arm, effort-spending. 施力點在中間的工具，施力臂 < 抗力臂，比較費力。

※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.