

Unit 4 Force and movement 教材分析

資料來源	康軒版自然與生活科技 第五冊	設計者	鄭穎蔚	每週 教學節數	4
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教材分析	<p>【力與運動】 藉由體驗與觀察，知道力的大小會對物體產生不同的影響，並知道力與重量的關係。 Through experience and observation, they will learn that the amount of force affects an object in different ways, and that force is related to weight.</p> <p>1. Part1: 力的作用 The role of force Awareness can change the shape of an object or change the movement of an object. (察覺力可以改變物體的形狀或改變運動情形。)</p> <p>2. Part2: 物體運動的快慢 The speed of the object's movement Will use time and distance to compare the speed of animal movement (會運用時間與距離，比較動物運動的速度。)</p> <p>3. Part3: 摩擦力 Friction Know the effect of friction on an object in motion. (知道摩擦力對運動中的物體產生的影響。)</p>				
Part1: The role of force		Part2: The speed of the object's movement		Part3: Friction	
主要學習內容					
<p>INc-III-3 本量與改變量不同，由兩者的比例可評估變化的程度。</p> <p>INc-III-5 力的大小可由物體的形變或運動狀態的改變程度得知。</p> <p>INd-III-2 人類可以控制各種因素來影響物質或自然現象的改變，改變前後的差異可以被觀察，改變的快慢可以被測量與了解。</p> <p>INf-III-3 自然界生物的特徵與原理在人類生活上的應用。</p> <p>INf-III-4 人類日常生活中所依賴的經濟動植物及栽培養殖的方法。</p>		<p>Nc-III-3 本量與改變量不同，由兩者的比例可評估變化的程度。</p> <p>INc-III-5 力的大小可由物體的形變或運動狀態的改變程度得知。</p> <p>INd-III-2 人類可以控制各種因素來影響物質或自然現象的改變，改變前後的差異可以被觀察，改變的快慢可以被測量與了解。</p> <p>INf-III-3 自然界生物的特徵與原理在人類生活上的應用。</p> <p>INf-III-4 人類日常生活中所依賴的經濟動植物及栽培養殖的方法。</p>		<p>INc-III-3 本量與改變量不同，由兩者的比例可評估變化的程度。</p> <p>INc-III-5 力的大小可由物體的形變或運動狀態的改變程度得知。</p> <p>INd-III-2 人類可以控制各種因素來影響物質或自然現象的改變，改變前後的差異可以被觀察，改變的快慢可以被測量與了解。</p> <p>INf-III-3 自然界生物的特徵與原理在人類生活上的應用。</p> <p>INf-III-4 人類日常生活中所依賴的經濟動植物及栽培養殖的方法。</p>	
主要學習表現					
<p>ti-III-1 能運用好奇心察覺日常生活現象的規律性會因為某些改變而產生差異，並能依據已知的科學知識科學方法想像可能發生的事情，以察覺不同的方法，也常能做</p>		<p>i-III-1 能運用好奇心察覺日常生活現象的規律性會因為某些改變而產生差異，並能依據已知的科學知識科學方法想像可能發生的事情，以察覺不同的方法，也常能做出不同的成品。</p>		<p>ti-III-1 能運用好奇心察覺日常生活現象的規律性會因為某些改變而產生差異，並能依據已知的科學知識科學方法想像可能發生的事情，以</p>	

<p>出不同的成品。</p> <p>tr-III-1 能將自己及他人所觀察、記錄的自然現象與習得的知識互相連結，察覺彼此間的關係，並提出自己的想法及知道與他人的差異。</p> <p>tm-III-1 能經由提問、觀察及實驗等歷程，探索自然界現象之間的關係，建立簡單的概念模型，並理解到有不同模型的存在。</p> <p>pa-III-1能分析比較、製作圖表、運用簡單數學等方法，整理已有的資訊或數據。</p> <p>an-III-1透過科學探究活動，了解科學知識的基礎是來自於真實的經驗和證據。</p>	<p>tr-III-1 能將自己及他人所觀察、記錄的自然現象與習得的知識互相連結，察覺彼此間的關係，並提出自己的想法及知道與他人的差異。</p> <p>tm-III-1 能經由提問、觀察及實驗等歷程，探索自然界現象之間的關係，建立簡單的概念模型，並理解到有不同模型的存在。</p> <p>pa-III-1能分析比較、製作圖表、運用簡單數學等方法，整理已有的資訊或數據。</p> <p>an-III-1透過科學探究活動，了解科學知識的基礎是來自於真實的經驗和證據。</p>	<p>察覺不同的方法，也常能做出不同的成品。</p> <p>tr-III-1 能將自己及他人所觀察、記錄的自然現象與習得的知識互相連結，察覺彼此間的關係，並提出自己的想法及知道與他人的差異。</p> <p>tm-III-1 能經由提問、觀察及實驗等歷程，探索自然界現象之間的關係，建立簡單的概念模型，並理解到有不同模型的存在。</p> <p>pa-III-1能分析比較、製作圖表、運用簡單數學等方法，整理已有的資訊或數據。</p> <p>pc-III-2能利用簡單形式的口語、文字、影像（例如：攝影、錄影）、繪圖或實物、科學名詞、數學公式、模型等，表達探究之過程、發現或成果。</p> <p>an-III-1透過科學探究活動，了解科學知識的基礎是來自於真實的經驗和證據。</p>
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課程架構

力與運動(Force and movement)

活動一：力的作用

(Part1: The role of force)

1-1 力對物體的影響(The effect of force on an object)

察覺力可以改變物體的形狀或改變運動情形。

(Awareness can change the shape of an object or change the movement of an object..)

1-2 怎樣測量力的大小(How to measure the magnitude of force)

知道力與重量的關係，會用彈簧測量力的大小。

(Know the relationship between force and weight, and measure the magnitude of the force with a spring..)

1-3 力的方向性(Directionality of forces)

察覺物體同時受到兩個大小不同、方向相反的力，物體會往力量大的方向移動。

(Notice that when an object is subjected to two forces of different magnitudes and opposite directions at the same time, the object will move in the direction of the greater force.)

活動二：物體運動的快慢 (The speed of the object's movement)

2-1 怎樣比較快慢(How to compare the speed)

The criteria that will determine the speed of movement.(會決定運動快慢的標準。)

2-2 速度比一比(Speed comparison)

會運用時間與距離，比較動物運動的速度。

(Will use time and distance to compare the speed of animal movement)

活動三：摩擦力(Friction)

3-1 物體的運動與摩擦力(The motion of an object and friction)

察覺摩擦力在生活中的現象。

(To notice the phenomenon of friction in life.)

Unit 4 Aspects of the plant world

應會認讀/聽懂的字彙

4-1

force(力)	object(物體)	influence(影響)
shape(形狀)	non contact force (超距力)	Contact force(接觸力)
spring(彈簧)	weight(砝碼)	Flexibility Limit (彈性限度)

4-2

distance (距離)	time (時間)	speed (速度)
kilometer (公里)	fast (快)	slow (慢)

4-3

friction (摩擦力)	material (材質)	
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應聽懂/說出的科學概念

4-1

1. The action of force can change the shape and state of motion of an object.
2. Force can be divided into contact force and non-contact force.
3. When the force of the spring is different, the length of extension is also different.
4. Under the elastic limit of the spring, the heavier the suspended weight, the longer the length.
5. In a tug of war, the rope is subjected to two opposite forces .

4-2

1. Measure time within the same distance. The shorter the time, the faster the movement speed; the longer the time, the slower the movement speed.
2. Measure the distance moved in the same time. The longer the distance, the faster the speed; the shorter the distance, the slower the speed.

4-3

1. Friction is influenced by the material of the contact surface of the object.

For Further Watching Unit 4

4-1

- [Work, Force & Energy](https://www.youtube.com/watch?v=5-2NLHB4Gxg): <https://www.youtube.com/watch?v=5-2NLHB4Gxg>
- [Force and Motion](https://www.youtube.com/watch?v=rfeVINL7d9U): <https://www.youtube.com/watch?v=rfeVINL7d9U>
- [**What is Force?**](https://www.youtube.com/watch?v=LIwqZQOnMKc) : <https://www.youtube.com/watch?v=LIwqZQOnMKc>
- [What Is A Force](https://www.youtube.com/watch?v=uoKo3DbfYZk): <https://www.youtube.com/watch?v=uoKo3DbfYZk>
- [Magnetism](https://www.youtube.com/watch?v=yXCeuSiTOug): <https://www.youtube.com/watch?v=yXCeuSiTOug>

4-2

- [What is Speed?](https://www.youtube.com/watch?v=S9Z1a3sZfHY): <https://www.youtube.com/watch?v=S9Z1a3sZfHY>
- [What is speed?](https://www.youtube.com/watch?v=e28-lcdAMHg): <https://www.youtube.com/watch?v=e28-lcdAMHg>
- [Top 10 Fastest Animals in the World:](https://www.youtube.com/watch?v=fey2JshCNng)
<https://www.youtube.com/watch?v=fey2JshCNng>
- [These Are 10 Fastest Animals On This Planet:](https://www.youtube.com/watch?v=Jy_gXQ6GQxo)
https://www.youtube.com/watch?v=Jy_gXQ6GQxo
- [What is Train Travel like in Taiwan:](https://www.youtube.com/watch?v=Zknqsd0AwQM)
<https://www.youtube.com/watch?v=Zknqsd0AwQM>

4-3

- [What is Friction in Physics?](https://www.youtube.com/watch?v=C7NPD9W0kro): <https://www.youtube.com/watch?v=C7NPD9W0kro>
- [Top 10 Crashes from London's Red Bull Soapbox Race:](https://www.youtube.com/watch?v=lq3mF06LAsM)
<https://www.youtube.com/watch?v=lq3mF06LAsM>

教學活動規劃

週	日期	活動名稱	各節次教學策略	節
15	12/5-12/11	力的作用	討論力的形式 / 彈珠滑動實驗 / 彈簧伸長實驗 / 彈簧伸長實驗	4
16	12/12-12/18	力的作用	物體測重實驗 / 影片(840 創意科技) / 拔河實驗設計 / 拔河實驗記錄	4
17	12/19-12/25	物體運動的快慢	探討速率 / 自制玩具車 / 自制玩具車 / 競賽活動	4
18	12/26-1/1	摩擦力	摩擦力實驗設計 / 摩擦力實驗操作 / 討論現實中的摩擦力運用 / 完成習作	4

教學活動設計

教學活動 Teaching activities		教學設備 /資源	時間
中文 In Chinese	英文 In English	Teaching aids/equip ment	(分) Time
活動一 一、熱身活動 由老師引導，透過三題熱身問題，複習上課所學過的包含力造成的影響、力的分類以及彈性限度的意義。	Activity 1 1. Warm-up activity Through three warm-up questions guided by the teacher, we will review what we have learned in the previous class, including the effects of forces, the classification of forces and the meaning of elastic limits.	單槍 學習單	5
二、主要活動 進行小組討論，完成「language」的填空，藉由小組討論彼此可以更加熟悉每個單字的意思。之後再由老師進行統整和	2. Main Activities Through group discussions, students will become more familiar with the meaning of each word. Afterwards, the teacher will	單槍 學習單	15

<p>引導，使學生更加精熟每個單字的使用方式。</p>	<p>help students become more familiar with the use of each word.</p>		
<p>觀看影片「What is Force?」，透過介紹力的影片，進而熟悉句子裡面介系詞的使用。先完整看完一遍，認識與瞭解影片內容，看第二次去認識介系詞的使用。</p>	<p>Watch the video "What is Force?" to become familiar with the use of prepositions in sentences through the introduction of force. Watch the video once to understand the content of the video, and then watch it a second time to understand the use of prepositions.</p>	<p>單槍 影片</p>	<p>10</p>
<p>三、延伸活動 請學生朗讀「Thinking」的句子，複習力學的相關知識，並且練習如何使用英文句子完整說明。</p>	<p>3. Extension Activity Ask students to read aloud the "Thinking" sentences to review the knowledge of mechanics and to practice how to use English sentences to explain it completely.</p>	<p>單槍</p>	<p>10</p>
<p>活動二 一、熱身活動 由老師引導討論熱身三題，複習課本所提到的相關內容。</p>	<p>Activity 2 1. Warm-up activity The teacher will lead a discussion on the three warm-up questions to review the relevant contents mentioned in the textbook.</p>	<p>單槍</p>	<p>10</p>
<p>鼓勵學生嘗試完全使用英文書寫完整的句子。</p>	<p>Encourage students to try to write complete sentences entirely in English.</p>	<p>黑板</p>	<p>5</p>
<p>請有寫下完整英文句子的學生寫在黑板上進行發</p>	<p>Students who have written down complete English</p>		

<p>表。</p> <p>二、主要活動 進行小組討論，完成「language」的填空，藉由小組討論彼此可以更加熟悉每個單字的意思。之後再由老師進行統整和引導，使學生更加精熟每個單字的使用方式。</p>	<p>sentences will be asked to write them on the board for presentation.</p> <p>2. Main Activities Through group discussions, students will become more familiar with the meaning of each word. Afterwards, the teacher will help students become more familiar with the use of each word.</p>	<p>單槍</p>	<p>10</p>
<p>三、延伸活動 觀看影片「What is speed?」，透過小組討論，完成學習單的三個問題。</p>	<p>3. Extension Activity Watch the video "What is speed?" and complete the three questions in the study sheet through group discussion.</p>	<p>單槍 學習單</p>	<p>10</p>
<p>請學生唸出「Thinking」的句子，對於速度的觀念進行一個完整的結論。</p>	<p>Ask students to read out the sentence "Thinking" and draw a complete conclusion about the concept of speed.</p>		<p>5</p>
<p>活動三 一、熱身活動 由老師引導討論熱身三題，複習課本所提到的相關內容。 鼓勵學生嘗試完全使用英文書寫完整的句子。</p>	<p>1. Warm-up activity The teacher will lead a discussion on the three warm-up questions to review the relevant contents mentioned in the textbook. Encourage students to try to write complete sentences</p>	<p>單槍</p>	<p>10</p>

<p>請有寫下完整英文句子的學生寫在黑板上進行發表。</p>	<p>entirely in English.</p> <p>Students who have written down complete English sentences will be asked to write them on the board for presentation.</p>	<p>黑板</p>	<p>5</p>
<p>請學生朗讀「language」的句子，清楚認識如何表達摩擦力的句子。</p>	<p>Ask students to read aloud the sentences of "language" to clearly understand how to express the sentence of friction.</p>	<p>單槍</p>	<p>5</p>
<p>二、主要活動</p> <p>觀看影片「Top 10 Crashes from London's Red Bull Soapbox Race」，認識皂飛車大賽的規則和了解車子對於地心引力和本身摩擦力的影響，討論我們即將進行的小型皂飛車大賽！</p>	<p>2.Main Activities</p> <p>Watch the video "Top 10 Crashes from London's Red Bull Soapbox Race" to learn about the rules of soapbox racing and understand the effects of gravity and friction on the cars, and discuss our upcoming mini-soapbox race!</p>	<p>單槍 學習單</p>	<p>10</p>
<p>三、延伸活動</p> <p>繪製皂飛車的設計圖：包含使用的材料和造型。</p>	<p>3. Extension Activities</p> <p>Draw the design of the soapbox : include the materials used and the shape.</p>		<p>10</p>
<p>活動四</p> <p>一、熱身活動</p> <p>將自己帶來的材料進行組裝和測試，製造自己的皂飛車。</p>	<p>Activity 4</p> <p>I. Warm-up activity</p> <p>Assemble and test the materials you bring to build your own soap car.</p>	<p>皂飛車軌道 皂飛車所需要的材料</p>	<p>20</p>

<p>二、主要活動</p> <p>進行迷你皂飛車大賽！讓學生享受競賽的過程。懂得欣賞別人的作品和如何精進自己的作品。</p>	<p>2. Main Activities</p> <p>Conduct a mini-soapbox race! Let students enjoy the process of competition. Appreciate other people's work and how to improve their own work.</p>		10
<p>三、延伸活動</p> <p>請學生完成學習單最後 KWL 的部分，多讓學生有時間進行思考和書寫，提醒學生可以想清楚這三部分的內容：K 是學習前就知道的內容。W 是學習後多增加的知識。L 是學習的過程中，覺得記憶最深刻的部分，或是教學需要改進或維持的部分。</p>	<p>3. Extension Activities</p> <p>Ask students to complete the KWL section at the end of the learning sheet, giving them more time to think and write, reminding them that they can think clearly about the content of these three sections: K is what they knew before learning, W is what they added to their knowledge after learning, and L is the part of the learning process that they feel they remember the most, or the part of the lesson that needs to be improved or maintained.</p>	學習單	10

The role of force

Warmer

1. What happens when an object is subjected to force ?
2. What are the two types of force ?
3. What is the Flexibility Limit (彈性限度)?

Language

force(力)	object(物體)	influence(影響)
shape(形狀)	non contact force (超距力)	Contact force(接觸力)
spring(彈簧)	weight(砝碼)	Flexibility Limit (彈性限度)

1. _____ is a type of force that needs the objects to touch for the force to work.
2. The length(長度) of the _____ is related to the force.
3. A force can change the _____ of an object.
4. Magnetic force(磁力) is a _____.
5. _____ can measure force.
6. A force can make an _____ move.

Content

Watch a video of [What is Force? \(3:52\)](#) and complete the following sentences in a small group.

1. A force _____ change the direction _____ a moving object.
2. Non contact force is a type _____ force _____ can happen without the objects touching.
3. A magnet _____ magnetic objects.
4. Gravitational force- the force _____ attracts objects towards the Earth's center.
5. Planets _____ around the sun.
6. Water falling _____ a mountain.
7. Snow falling _____ winter.

Thinking: please read the sentence.

1. The action of force can change the shape and state of motion of an object.
2. Force can be divided into contact force and non-contact force.
3. When the force of the spring is different, the length of extension is also different.
4. Under the elastic limit of the spring, the heavier the suspended weight, the longer the length.
5. In a tug of war, the rope is subjected to two opposite forces.

Force and movement- Speed of movement

Warmer

1. What does it mean when the car speedometer shows 60?
2. What is the speed of the cheetah(獵豹) in the textbook?
3. What is the maximum speed of Taiwan's high-speed rail?

Language

distance (距離)	time (時間)	speed (速度)
kilometer (公里)	fast (快)	slow (慢)

1. Trains can reach speeds of up to 130 _____ per hour.
2. Eating more _____ly is better for your health.
3. The _____ between my home and school is not far.
4. The MRT has an average _____ of 80 kilometers per hour.
5. _____ is running out, you have to speed up.
6. He is a _____ runner

Content

Watch a video of [What is speed? \(1:00\)](#) and discuss the following questions in a small group.

1. At first, how does the film compare the speed of speed?
2. What is the formula(公式) for speed?
3. According to the video, what does an average speed of 60 km/h mean?

Thinking: please read the sentence.

1. Measure time within the same distance. The shorter the time, the faster the movement speed; the longer the time, the slower the movement speed.
2. Measure the distance moved in the same time. The longer the distance, the faster the speed; the shorter the distance, the slower the speed.

Force and movement- Friction

Warmer

1. What happens if the classroom floor loses friction?
2. In daily life, what are the items produced by reducing friction?
3. In daily life, which items are produced by increasing friction?

Language : Please read the following sentences

friction (摩擦力)	material (材質)	
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1. Friction is influenced by the material of the contact surface of the object.

Content

Watch a video of [Top 10 Crashes from London's Red Bull Soapbox Race \(5:40\)](#) and make a car to be a race.

design diagram Material(材料): Modeling(造型):

Thinking

K(what I know)	W(What I want to know)	L(What I learned)