國小自然領域教學研究中心
第二屆國小自然科學實驗雙語教學影片製作競賽

<table>
<tr><td colspan="2">領域/科目
Subject</td><td>自然</td><td>設計者
Designer</td><td></td></tr>
<tr><td colspan="2">單元名稱
Unit</td><td colspan="3">Walking Rainbow 🌈</td></tr>
<tr><td colspan="5">設計依據</td></tr>
<tr><td colspan="2"></td><td>學科領域 (content)</td><td colspan="2">英語文 (language)</td></tr>
<tr><td>學習
重點</td><td>學習表現
Students' performance</td><td>【探究能力-思考智能】
ti-Ⅱ-1 能在指導下觀察日常生活現象的規律性，並運用想像力與好奇心，了解及描述自然環境的現象。
tr-Ⅱ-1 能知道觀察、記錄所得自然現象的結果是有其原因的，並依據習得的知識，說明自己的想法。
【探究能力-問題解決】
po-Ⅱ-1 能從日常經驗、學習活動、自然環境，進行觀察，進而能察覺問題。
pa-Ⅱ-2 能從得到的資訊或數據，形成解釋、得到解答、解決問題。並能將自己的探究結果和他人的結果（例如：來自老師）相比較，檢查是否相近。
pc-Ⅱ-2 能利用簡單形式的口語、文字或圖畫等，表達探究之過程、發現。
【科學的態度與本質】
Ai-Ⅱ-3 透過動手實作，享受以成品來表現自己構想的樂趣。</td><td colspan="2">【聽】
◎ 1-Ⅱ-7 能聽懂課堂中所學的字詞。
◎ 1-Ⅱ-8 能聽懂簡易的教室用語。
【說】
◎ 2-Ⅱ-3 能說出課堂中所學的字詞。
◎ 2-Ⅱ-4 能使用簡易的教室用語。
◎ 2-Ⅱ-5 能使用簡易的日常生活用語。
【讀】
◎ 3-Ⅱ-2 能辨識課堂中所學的字詞。
◎ 3-Ⅱ-3 能看懂課堂中所學的句子。
【寫】
◎ 4-Ⅱ-3 能臨摹抄寫課堂中所學的字詞。</td></tr>
</table>

Learning focus	**學習內容 Learning content**	INc-Ⅱ-6 水有三態變化及毛細現象。	◎ Ac-Ⅱ-2 簡易的生活用語。 ◎ B-Ⅱ-1 第二學習階段所學字詞及句型的生活溝通。 ◎ D-Ⅱ-1 所學字詞的簡易歸類。
核心素養 Core competency		**【自然領域】** 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。 自-E-C2 透過探索科學的合作學習，培養與同儕溝通表達、團隊合作及和諧相處的能力。 **【英語領域】** 英-E-A1 具備認真專注的特質及良好的學習習慣，嘗試運用基本的學習策略，強化個人英語文能力。 英-E-B1 具備入門的聽、說、讀、寫英語文能力。在引導下，能運用所學、字詞及句型進行簡易日常溝通。	
議題融入 Issue integration		□人權教育 □環境教育 □海洋教育 □品德教育 □生命教育 □法治教育 □科技教育 □資訊教育 □能源教育 □安全教育 □防災教育 □閱讀素養 □國際教育 □家庭教育 □原住民教育 □戶外教育 □多元文化教育 □性別平等教育 □生涯規劃教育 ■ 無	
與其他領域/科目的連結 Connections to other subjects		□音樂 □體育 ■ 藝術 □社會 □科技 □生活 □綜合活動 □健康與體育 □其他：_____	
教材來源 Materials **參考資料 References**		111南一版自然四下課本第二單元 111翰林版自然四下課本第三單元 111康軒版自然四下課本第三單元 STEM and play 親子學習社群	

<table>
<tr><td>教學設備/資源
Teaching aids/equipment</td><td>PowerPoint slides, video, paper, newspaper, pigments, plastic bag, tissue paper, plate, magnifying glass, strew paper cover.</td></tr>
<tr><td>*學生背景
Students' Background</td><td>
【Science Field】
<table>
<tr><td>Cognition 認知能力</td><td>1. Students can understand the basic inquiry process of natural science.
2. Students can understand that there are some principles behind natural phenomenon.</td></tr>
<tr><td>Operational ability 操作能力</td><td>1. Students can follow the instructions to operate the experiment.
2. Students can be careful and pay attention to their safety during the process of the experiment.
3. Students can collaborate with each other to complete the tasks.</td></tr>
<tr><td>Inquiry ability 探究能力</td><td>1. Students can find out the differences and the principles under the guidance.
2. Students can notice the factors affecting the experiment and think of the solving solution.</td></tr>
</table>
Knowledge:
1. 水可以溶解許多物質，是生活中經常運用到的物質。
2. 水有液態、氣態和固態三種形態，在生活中各有不同用途。
3. 液態的水沒有固定形狀，而且會流動。
4. 衛生紙、布料會吸水，吸水後會變得溼。

【English Field】
1. Students can understand simple instructional language in English.
2. Students can use the single words, phrases, or short sentence patterns they have learned to answer the questions.
3. Students can read short sentences patterns.
4. Students can write simple sentence patterns.
</td></tr>
<tr><td>學習目標
Learning Objectives</td><td>
<table>
<tr><th>學科領域（content）</th><th>英語文（language）</th></tr>
<tr><td>Students will be able to :
C-1 measure how far the water rises after 30 seconds.
C-2 distinguish which items can absorb water the most.
C-3 understand the common characteristics of items that can absorb water.
C-4 explain the principle of capillary action in the experiment.
C-5 use the knowledge they have learned to crack the task.</td><td>Language of learning
Students will be able to understand the words:
● Absorb 吸收
● Material 材料
● Soak 浸泡
● Capillary action 毛細現象
Students will be able to speak out the words:
● Capillary action 毛細現象
● Rise 上升
Students will be able to write down the words:
● Capillary action 毛細現象</td></tr>
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</td></tr>
</table>

（請編號）		● Paper 紙 ● Newspaper 報紙 ● Plastic bag 塑膠袋 ● Tissue 衛生紙 ● Rise 上升 ● Water 水 Sentence Pattern: It can/can't absorb the water.

Language *for* learning

教師用語 For teachers	學生用語 For students
Classroom language: ● Guess it. ● Observe it. ● Speak out. ● Write it down. ● Work in group. ● Great job! ● Try to do it again. ● Raise your hand before talking, please. Academic language: ● Which items can the water move in? ● Which item can absorb water the most?	● ____ can absorb the most water. ● The smaller the gap, the more ____ the water level rise.

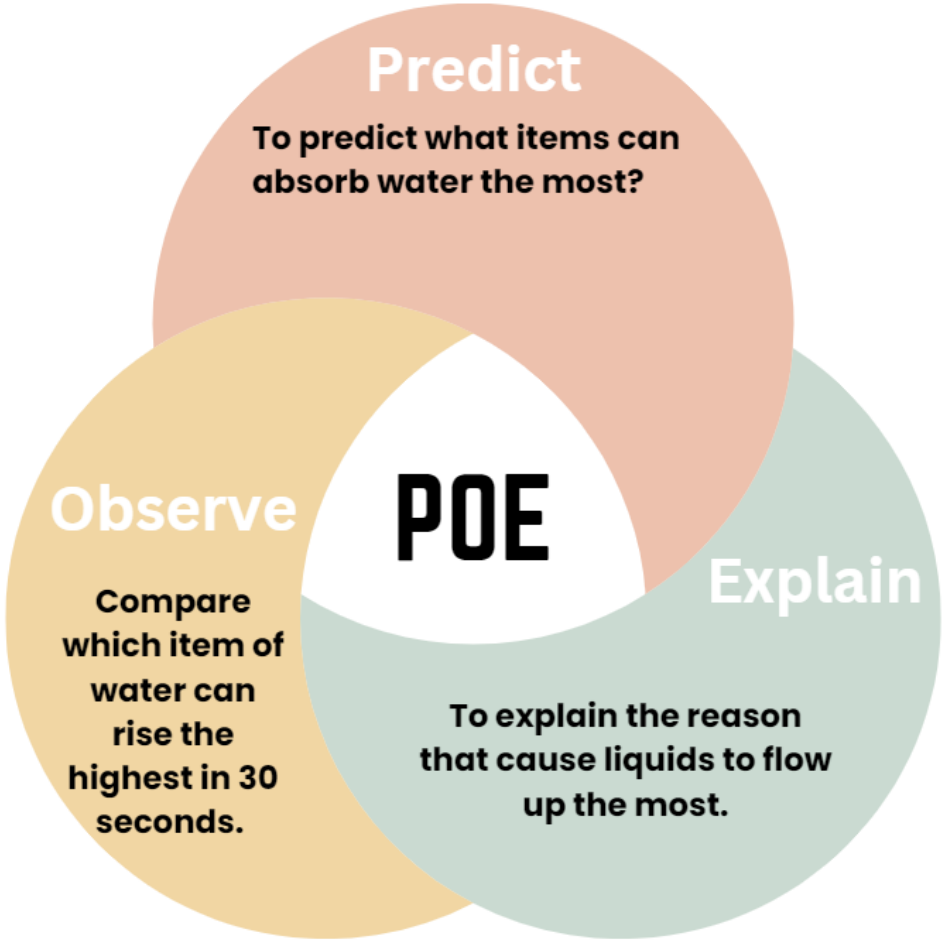
Translanguaging

1. Teacher allow students to discuss with group members in Chinese but encourage them to speak out their ideas in English.
2. Teacher explain the key words in Chinese, and if students hardly understand them in English, they are allowed to speak in Chinese.

情境脈絡 （文化/社區/公民實踐）	The concept of capillary action can be applied in real life: We can use tissue to clean the water on the table but how does it work? ● Capillary action is the ability of a liquid to flow upward in narrow spaces without the assistance of external forces. ● Capillary action allows water to move upward due to surface tension of the water molecules and intermolecular forces between the water and the surrounding surface. Different surfaces will exhibit different levels of adhesion of the water molecule.

POE

Teacher creates the worksheet for students to **think about** the result.
Teacher led students to **observe** the experiment.
Teacher asks students to **explain** the reason or phenomenon behind the experiment.



教學活動設計　Classroom procedure		
教學重點及學科概念說明 Main points of teaching		
節 (period)	**學科領域 (content)**	**英語文 (language)**
1	● 能藉由觀察生活現象發現水會沿著細縫移動。 ● 利用實驗了解有細縫的物品才能讓水在物品中移動。 ● 設計實驗製造細縫，讓水可以在沒有細縫的物品中移動，同時了解細縫的大小會影響水的移動。	● Which items can the water move in? —Tissue can absorb the water. ● Which item can absorb water the most? —Tissue can absorb water the most.
2	● 知道生活中應用毛細現象的情形。	● How can you walk the water without your hands? ● What happen when you drip the water on the straw paper cover? —It absorbs the water and move.

學習目標 Learning objectives	**教學活動 Teaching activities**		**教學設備/資源 Teaching Aids/equipment**	**時間(分) Time**	**評量 Evaluation**
	中文 (In Chinese)	英語文 (In English)			
C-1 SWBAT measure how far the water rises after 30 seconds.	----------第一節課---------- 事前請學生從家中帶認為能夠吸水的物品一樣(15公分 x 3公分) Pre-task 1. 提問 （１）老師先將一些水打翻在桌面上，問各位同學：「可以怎麼做將水移除桌面呢?」 學生可能回答：用抹布擦乾、用衛生紙擦拭。 （２）老師用地心萬有引力的概念來解釋水向下流動的概念，並提出問題：「你認為水可以向上流動嗎？」 學生們分成小組討論這個問題，並由一個人給出答案。	----------First period---------- Please bring something that you think can absorb water from your home in advance (15cm x 3cm) Pre-task 1. Ask question: （１）Teacher first spread some water on the table and ask all the students: “What can I do to remove the water on the table?” Students may answer “Wipe the table with a dry cloth or tissue.” （２）The teacher used the concept of law of universal gravitation to explain the idea of water flowing downward and posed the question, "Do you think water can flow upwards?" The students discussed this in small groups, and one person presented their answer.	PPT slides Worksheet (Attachment1) Water Square plate Rack Binder clip Watercolor Tissue paper Newspaper Printer paper Plastic bag	3mins	**Oral evaluation** Classroom observation for Students' participation in answering the question

	2. 預測 老師將自己事先準備好的實驗器具發給各組，並請學生先猜一猜: (1)哪些物品能吸水。 (2)比較物品浸泡在水中30秒後，哪樣物品能讓水攀升的最高。 請學生將預測的答案填入學習單中。 3. 將物品的底部泡入水中。(教師確認物品長度後，學生可以用他們帶的物品) (實驗器具分別是裝水方盤、支架、長尾夾、水彩、水、條狀衛生 紙、條狀報紙、條狀一般影印紙及 條狀塑膠袋)	2. Predict Teacher distributed the materials to each group, and ask students to guess: (1) which items can absorb water? (2) Compare which item of water can rise the highest in 30 seconds. (Ask students to fill in the predicted answer into the worksheet) 3. Let the bottom of the item soak in the water. (After the teacher confirms the length of the items, students can use the items they bring)		10mins	**Task** Students are able to follow the procedures to finish the task
C-2 SWBAT distinguish which items can absorb water the most. C-3 SWBAT understand the common characteristics of items that can absorb water.	During-task 1. **觀察** 請學生根據自己的觀察，將四個物品以及自己攜帶的物品的吸水程度填入學習單。 2. **解釋** 小組討論水能在哪些物品中移動?以及試著解釋水的移動和物品之間的關係。 3. 學生總結能吸水的物品之共同特性，以及利用故事講解毛細現象的原理。 4. 競賽活動 遊戲規則: 各組找出最能夠吸水的材料，並小組討論1分鐘怎麼樣可以讓這個材料吸更多水，例如：加寬、加厚、縮短尺與尺之間的縫隙等。在30秒內	**Durning-task** 1. **Observe** Students are asked to fill in the study sheet for the water absorption of the four items based on their own observations. 2. **Explain** The group discusses which items can the water move in? and try to explain the reason that cause liquids to flow up. 3. Teacher summarized the common characteristics of objects that can absorb water and explained the principle of capillary phenomenon. 4. Competition Rules: Each group selects the most water absorbing material, and discusses in groups how to make this material absorb more water for 1 minute, such as: widening, thickening, shortening the gap between the rulers, etc. The group with	PPT slides Worksheet (Attachment1)	10mins 10mins	**Oral evaluation** Students are able to answer the questions and share their finding. **Worksheet** Students are able to complete the worksheet **Task** Students are able to follow the procedures to finish the task. **Teamwork** Students are able to demonstrate teamwork,

	水爬最高的組獲勝。 學生分享心得並討論能夠讓水上升高與低的材料的特性。	the highest water climbs within 30 seconds wins. Students share their experiences and discuss the properties of materials that can raise and lower water			collaboration, and communication skills.
	Post-task 1. 老師說明並給予放大鏡讓各組觀察各個材料的縫隙大小及毛細現象的原理，並利用爬牆的概念來說明縫隙越小，水能夠爬得越高。 2. 思考 提問學生:現在因為疫情的關係，大多數的人都必須戴上口罩才能夠外出，但是你覺得戴上口罩運動能夠有效阻擋病毒擴散嗎? 小組討論出答案並發表原因及推論 觀看一則新聞 https://www.youtube.com/watch?v=dmhBQbF2KfU 老師: 這是今天的課程，我們學習到水能夠在縫隙中移動稱為毛細現象! ----------第一節課結束----------	Post-task 1. The teacher explained and gave a magnifying glass to each group to observe the gap size and capillary phenomenon of each material, and used the concept of climbing walls to explain that the smaller the gap, the higher the water can climb. 2. Thinking Asking students : “ Due to COVID-19, most of us must wear mask when we go outside. What about wearing mask during exercise outside? Do you think it can really block the virus?” The group discusses the answers and publishes reasons and inferences. Vedio: https://www.youtube.com/watch?v=dmhBQbF2KfU T: This is the end of today’s class, we learned that water can move between the gap and we call it capillary action! ----------The end of first period----------	PPT slides Magnifying glass Vedio	7mins	**Task** Students are able to follow the procedures to finish the task. **Oral evaluation** Students are able to answer the questions and share their finding.

C-4 SWBAT explain the principle of capillary action in the experiment.	----------第二節課---------- Pre-task 1. 複習上一節課的內容 ● 根據上一堂課的實驗，水在哪些物品中會移動？ ● 水可以在有____（細縫）的物品中移動 ● 細縫越小，水位上升越____（明顯、高） 2. 銜接任務提問 老師: 上一堂課我們學到液體會沿著隙縫往上或往其他地方移動的現象稱為毛細現象，那請大家想想看，利用毛細現象可以做哪些好玩的遊戲呢?	----------Second period---------- Pre-task 1. Review ● According to the experiment of the last lesson, in which objects does water move? ● Water can move in items with ____ ● The smaller the gap, the more ____ the water level rise. 2. T: In the last lesson, we learned that the phenomenon that the liquid will move up or to other places along the gap is called the capillary action, so please think about it, what kind of fun games can be made by using the capillary phenomenon?		10mins	**Oral evaluation** Students are able to answer the questions and share their finding.
C-5 use the knowledge they have learned to crack the task.	During-task 小組破解任務 任務一：製作會行走的彩虹 每組會有七個杯子，且只會拿到紅色、黃色、藍色、紫色的顏料，任務是利用毛細現象的原理讓剩下的三個空杯子有橙色、綠色、靛色形成會行走的彩虹！ 	**During-task** Task for groups TASK1: Walking Rainbow There will be seven cups in each group, and only red, yellow, blue, and purple pigments will be obtained. The task is to use the principle of capillary action to make the remaining three empty cups in orange, green, and indigo colors.	Straw paper cover Water Paper Plastic cups Pigments	15mins	**Task** Students are able to follow the procedures to finish the task.

	任務二：復活毛毛蟲 每個學生會拿到一根吸管以及吸管紙套，將吸管紙套擠成皺皺的，並想辦法在不用手的情況下，讓毛毛蟲移動出圈圈外面。 	TASK2: Get the caterpillar moving Each student will get a straw and straw paper cover, squeeze the straw paper cover into wrinkles, and try to make the caterpillar move out of the circle without hands		10mins	
	Post-task 1. 討論、分享 老師讓各組上台解釋自己怎麼做，並請學生描述自己選擇的材料、做法後拍照。 2. 老師給予回饋。 ----------第二節課結束----------	Post-task 1. Share and Discuss Teacher invites groups to introduce their work and describe how they decide the materials and share their idea about their actions. 2. Teacher gives feedbacks. ----------The end of second period----------		5mins	**Show and Tell** Students are able to share their idea and describe their work

附件（學習單、字卡、評量單）

WALKING RAINBOW

P

1. Think about it! Which items can absorb water?

Plastic bag

It (can/ can't) absorb the water.

_____

It (can/ can't) absorb the water.

_____

It (can/ can't) absorb the water.

_____

It (can/ can't) absorb the water.

2. Think about it! Who's the winner?

I think _____ is the winner!

Because_____

WALKING RAINBOW

1. Observe it! Which items can absorb water?

Plastic bag

It (can/ can't) absorb the water.

_____

It (can/ can't) absorb the water.

_____

It (can/ can't) absorb the water.

_____

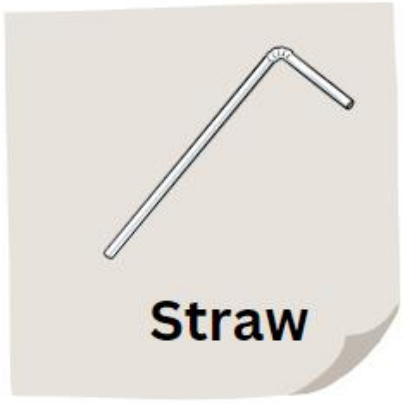
It (can/ can't) absorb the water.

2. Who's the winner?

I find out _____ is the winner!

_____>_____>_____>_____

Vocabulary Flashcards



Assessment

1. 比例：認知25% 操作25% 探究25% 情意25%
2. 方法

評量項目	100%		20-25%	10-20%	低於10%
Cognitive Domain **認知能力**	**25%**	**Worksheet & Oral evaluation** Students can understand the concept of capillary action	大部分時候做到	有時候做到	未做到
Operational ability **操作能力**	**25%**	**Task** Students can follow the procedures to finish the task	大部分時候做到	有時候做到	未做到
Inquiry ability **探究能力**	**25%**	**Observe, Show and Tell** Students can share their idea and describe their work.	大部分時候做到	有時候做到	未做到
Affective Domain **情意領域**	**25%**	**Teamwork** Students can demonstrate teamwork, collaboration, and communication skills.	大部分時候做到	有時候做到	未做到