

■ 附錄

「廚房裡的科學—水溶液如何去除污漬」雙語自然教案設計

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| 教案名稱 Title of the lesson plan | 水溶液知多少 | | 重要名詞 Important Concepts | baking soda, citric acid, acid solution, basic solution, neutral solution, anthocyanidin(花青素) |
| 單元名稱 Unit title | 廚房裡的科學 | | 學習階段 Learning stage | 年級(grade) 三年級 |
| 總節數 Total teaching Time | 3 節 (periods) | 節次架構與名稱 Period structure & titles | 第一節：辨識水溶液 第二節：水溶液變變變 第三節：水溶液怎麼讓污漬不見了！ | |
| 設計者 Designer | 蔡亭芳、詹家驊、劉雨柔 | | | |
| 設計理念 Design Idea | 廚房是我們日常生活中常會接觸到的地方，本課程藉由實驗操作，讓學生將廚房中常見的鹽、醬、醋、小蘇打等物質及若干水溶液進行酸鹼性分類，透過圖表製作、預測、觀察、解釋及小組報告等方式，不僅加深其對水溶液的認識，更能夠運用於生活中解決污漬清除的困擾。 | | | |
| 設計依據 | | | | |
| 領域 | | 自然領域 (content) | 英語文 (language) | |
| 學習重點 Learning focus | 學習表現 Learner performance | 第一節：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。 ah-II-1 透過各種感官了解生活週遭事物的屬性。 第二節：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。 pe-II-1 能了解一個因素改變可能造成的影響，進而預測活動的大致結果。在教師或教科書的指導或說明下，能了解探究的計畫。 | 1-II-7 能聽懂課堂中所學的字詞。 2-II-3 能說出課堂中所學的字詞。 | |

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| | | 第三節：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。 | |
| | 學習內容 Learning content | <p>第一節：INa-II-3 物質各有其特性，並可以依其特性與用途進行分類。</p> <p>第二節：INe-II-4 常見食物的酸鹼性有時可利用氣味、觸覺、味覺簡單區分，花卉、菜葉會因接觸到酸鹼而改變顏色。</p> <p>第三節：INa-II-3 物質各有其特性，並可以依其特性與用途進行分類。</p> | <p>Ac-II-3 第二學習階段所學字詞。</p> <p>B-II-1 第二學習階段所學字詞及句型的生活溝通。</p> |
| | 核心素養 Core competency | <p>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。</p> | <p>英-E-A2: 具備理解簡易英語文訊息能力，能運用基本邏輯思考策略提升學習效能。</p> <p>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。</p> |
| | 學生背景 Students' Background | <ol style="list-style-type: none"> 1. 學生能透過感官（觸覺、嗅覺、視覺）辨別不同的物質。 2. 學生已經了解水溶液如何形成。 3. 學生已經知道利用紫色高麗菜汁能夠辨別水溶液的酸鹼。 4. 學生已經認識 water, salt, sugar 等英語單字。 5. 學生已經認識 blue, red, white, yellow 等顏色的英語單字。 | |
| | 本單元之學習目標 Learning Objectives (請依節次順序編號) | <p>1-1 學生能運用感官觀察廚房裡的物質，進行測試是否溶於水及檢驗酸鹼變化，並記錄。(ah-II-1 、INa-II-3)</p> <p>1-2 學生能夠運用文字及表格呈現實驗結果。(pc-II-2 、INa-II-3)</p> | |

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| | <p>2-1 學生能夠利用紫色高麗菜以外的其他天然物質檢測水溶液的酸鹼。(pc-II-1、INe-II-4)</p> <p>2-2 學生能夠運用酸性、鹼性及中性水溶液製作無字天書，使用天然指示劑讀取無字天書，再以口頭方式發表結果。(pc-II-2、INe-II-4)</p> <p>3-1 學生透過實驗、觀察、運用文字紀錄酸性、中性及鹼性水溶液的去污結果，再以口頭形式進行發表。(pc-II-2、INa-II-3)</p> |
| <p>表現任務 Performance Tasks</p> | <p>1-1 學生以觸覺、嗅覺及視覺觀察廚房裡的物質(砂糖、食鹽、小蘇打粉、麵粉、檸檬酸)，將其分別加入水中，測試是否溶於水，再利用紫色高麗菜汁檢驗水溶液的酸鹼，並將實驗結果用表格及文字呈現，呈現於學習單，進行分享。</p> <p>2-1 學生透過觀察紫色高麗菜汁的外觀及特性，運用 e 度搜尋可以檢測水溶液酸鹼性的天然物質(如：葡萄皮、蝶豆花)，利用酸性、中性及鹼性水溶液繪製「無字天書」，再使用天然指示劑(葡萄汁)讀取無字天書，最後以口頭方式發表結果。</p> <p>3-1 學生透過討論生活中衣物被弄髒的經驗，再提出可以去污的方法，運用廚房中常見的水溶液進行去污實驗，最後將實驗結果進行口頭發表。</p> |
| <p>教材來源 Materials/ 參考資料 References</p> | <p>康軒五上 第四章節 廚房裡的科學</p> |

| 第三節課 | | | |
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| <p>本節課名稱 Title of this period</p> | <p>水溶液怎麼讓污漬不見了！</p> | <p>教學者</p> | <p>蔡亭芳、詹家驊、劉雨柔</p> |
| <p>本節課的學習目標 Learning Objectives</p> | <p>3-1 學生透過實驗、觀察、運用文字紀錄酸性、中性及鹼性水溶液的去污結果，再以口頭形式進行發表。 (pc-II-2、INa-II-3)</p> | | |
| <p>學科/領域 subject</p> | <p>Content (自然)</p> | <p>Language (English)</p> | |

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| 學習表現 Learner Performance | 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。 | 1-II-7 能聽懂課堂中所學的字詞。 2-II-3 能說出課堂中所學的字詞。 |
| 學習內容 Learning content | INa-II-3 物質各有其特性，並可以依其特性與用途進行分類。 | Ac-II-3 第二學習階段所學字詞。 B-II-1 第二學習階段所學字詞及句型的生活溝通。 |
| 表現任務 Performance Tasks | 3-1 學生透過討論生活中衣物被弄髒的經驗，再提出可以去污的方法，運用廚房中常見的水溶液進行去污實驗，最後將實驗結果進行口頭發表。 | |
| 語言學習內容 Language of Learning | <ul style="list-style-type: none"> ● target words: black vinegar stains, tomato juice, neutralization reaction ● _____ (black vinegar/tomato juice) stains are _____ (acid / neutral / basic). Cup A is _____. It is (acid / neutral / basic). ● Basic solution can clean (acid / neutral / basic) stains. It' s because of neutralization reaction. | |
| 課室互動語言 Language for learning | <ul style="list-style-type: none"> ● Those answers are great! ● Let' s see what happened? ● You have 3 minutes to finish the worksheet. ● Ok! Very good! So you can write it on your worksheet. ● See you next time. Good bye. | |
| 跨語言實踐 Translanguaging | For teacher | For students |
| | The teacher will use Chinese to explain difficult concepts and terms. The teacher will ask the students to repeat the proper nouns after replying in English. | The students can use Chinese while having a peer and group discussion or answering some questions. |

| 對應的學習目標與學習表現 Learning objectives & Learner performance | 教學流程之 POE 對照 POE Teaching Process | 學習活動 & 教學步驟 Learning activities & Teaching procedures | 教學設備/資源 Teaching aids/equipment | 時間 Time | 評量方式/工具 Assessment |
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| 3-1 | | <p>I. Warm up Tr: Good morning, everyone. Ss: Good morning, teacher. Tr: Look at those pictures! What happened? (Show pictures on PPT) Ss: 衣服噴到柳橙汁! Tr: Yes! We call it stain. Tr: I made orange juice yesterday. Then guess what happened? Ss: 翻倒了? Ss: 被噴到! Tr: You are right! Orange juice splashed on my favorite white shirt. Tr: Did anyone have the same experience? Tr: Tell me what happened to you? Ss: 上次吃薯條的時候, 我就不小心把番茄汁噴了一身, 結果媽媽超生氣的。 Ss: 有一次我弟弟用黑醋潑到我的衣服。 Tr: Wow, that's so bad! Tr: Did you clean it? Tr: I cleaned it. Tr: Guess! How did I clean it? (出示沾上 orange juice 污漬的衣服</p> | PPT | 5 mins | |

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| 3-1 | <p>照片)</p> <p>Ss: 用水沖</p> <p>Tr: If water doesn't help? Then what can I do?</p> <p>Ss: 肥皂，可以用肥皂搓</p> <p>Ss: 我會用洗衣粉</p> <p>Tr: Those answers are great!</p> <p>Tr: But I tried it. It didn't work.</p> <p>Tr: Some stains can only be cleaned with special cleaner.</p> <p>Tr: How to choose the best cleaner?</p> <p>Ss: 清潔力比較強</p> <p>Tr: We can figure it out together.</p> <p>Tr: I will show you an experiment.</p> <p>II. Core Content</p> <p>Experiment1</p> <p>(Teacher teaching)</p> <p>Tr: First, I bring some things from the kitchen.</p> <p>Tr: I have three solutions from the kitchen and one stain on my table. I want to clean the stain. (老師出示實物)</p> <p>Tr: What should I do first?</p> <p>Ss: 直接丟進去</p> <p>Tr: But those solutions can be acid, neutral or basic. (PPT 呈現此三字的中文與英文)</p> <p>If you put the stain in each one, it will be more difficult to clean.</p> <p>Tr: So, we need to know what the solution is.</p> <p>Tr: And they are acid,</p> | PPT、學習單、沾上黑醋污漬的棉布條、小蘇打水、檸檬酸水、鹽水、葡萄皮汁 | 10 mins | 實作評量 (實際操作) 紙筆測驗及表單 (學習單) |
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| | | <p>neutral or basic first. (Tr. 指著 PPT 上此三字的中 文與英文)</p> <p>Tr: Can anyone tell me ? Tr: How to know what the solution is? Ss: Use butterfly pea flower solution. Ss: Cabbage juice. Ss: 用蝶豆花或紫色高麗 菜汁去測試是什麼水溶 液。</p> <p>Tr: Yes! We can use butterfly pea flower solution and red cabbage juice to test the solutions. Tr: Last time we used grape juice to test solutions. Tr: So today we will also use grape juice to test solutions.</p> <p>(Teacher drops grape juice into four different solutions) Tr: Let's see what will happen. Ss: They change color. Tr: We can see that Solution A changes to blue. So, what is the solution? Ss: 小蘇打水 Ss: Baking soda. Tr: Solution B doesn't change color. So what is the solution? Ss: 鹽水 Ss: Salt. Tr: Solution C's color changes to red. So what is the solution? Ss: 檸檬酸 Ss: Citric acid.</p> | | | |
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| | <p>and takes them out <u>after 3 minutes.</u>)</p> <p>Tr: Let's see what happened?</p> <p>Ss: 哇變乾淨了！</p> <p>Tr: which one is the best cleaner?</p> <p>(Tr shows the three pieces of clothe to students.)</p> <p>Ss: 小蘇打水那一個變得好乾淨喔！</p> <p>Ss: 鹽水好像還是一樣髒。</p> <p>Ss: 檸檬酸水好像有變乾淨一點，但還是有點髒。</p> <p>Tr: 所以我們在這裡能觀察到，中性的鹽水無法進行污漬的清潔，而鹼性的小蘇打水跟酸性的檸檬酸水都有清潔的效果。</p> <p>Tr: 但是小蘇打水的清潔效果比檸檬酸水好，是因為黑醋是酸性的，小蘇打水是鹼性的，我們運用酸鹼中和的方式，還達到去污的效果。</p> <p>Tr: 我們把它稱作 neutralization reaction 酸鹼中和 neutralization reaction。(PPT 呈現此中文與英文)</p> <p>Tr: It's called neutralization reaction.</p> <p>Tr: Everyone repeats after me. Neutralization</p> | | |
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| 3-1 | E | <p>reaction. Ss: Neutralization reaction. Tr: Basic solution can clean acid stains. It's because of neutralization reaction. (PPT 呈現此句的中文與英文) Read again! Ss: Basic solution can clean acid stains. It's because of neutralization reaction.</p> <p>《老師解釋 E》 Tr: You have 3 minutes to finish the "O" and "E" parts of your worksheet. Tr: Time's up! Eyes on me. Ss: Eyes on you. Tr: Are you done? Ss: Yes! Tr: Check the answer with your group member. (Ss check answers with group members for 10 seconds.) Tr: Eyes on me! Ss: Eyes on you! (Tr shows Part 2's answers on PPT) Tr: So this part needs to be done like this.</p> <p>Experiment2 (Students hands-on experiment) Tr: Now it's your turn to do the experiment. Tr: Each group will get a baking soda solution, a citric acid solution, a salt solution, and a tomato juice stains.(老師展示) Tr: Now, flip your worksheet. Watch part 3. Tr: You need to test the</p> | 學習單、沾上番茄汁污漬的棉布條、小蘇打水、檸檬酸水、鹽水、葡萄皮汁 | 10 mins | 實作評量 (實際操作) 紙筆測驗及表單 (學習單) |
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| | | <p>tomato juice stains first. Tr: Decide if it is acid, neutral or basic. Then write it down on the worksheet.</p> <p>Ss: 番茄汁也是酸性的 Tr: Ok! Very good! So you can write it down on your worksheet.</p> | | | |
| | P | <p>《預測 P》 Tr: Next, you need to guess which one is a good cleaner to clean tomato juice stains. Tr: Then finish the “P” part of the worksheet. (Tr points to the “P” part of the worksheet on PPT)</p> | | | |
| | O | <p>《觀察 O》 Tr: Now you need to put the three pieces of clothe with tomato juice stains into each solution then watch what happens. (PPT shows the picture of putting three pieces of clothe with tomato juice stains separately into the three different solutions) (Ss puts the three pieces of clothe with black vinegar stains separately into the three different solutions and takes them out <u>after 3 minutes.</u>) Ss: 哇！小蘇打水那一個番茄汁污漬變得好乾淨喔！ Tr: Which solution is good for cleaning the tomato juice stains? Ss: Baking soda solution. Tr: How about citric acid</p> | | | |

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| | E | <p>solution? Ss: 有洗掉一些污漬，但還是有點髒。 Tr: How about salt solution? Ss: 好像一樣髒。 Tr: Why?</p> <p>《學生解釋 E》 Ss: 因為番茄汁也是酸性的，所以用鹼性的水溶液清潔效果比較好。 Tr: You are right. Tomato juice is acid; baking soda is basic. So baking soda can best clean tomato juice stains. Tr: 是很好的發現喔！ Tr: So we know basic solution can clean acid stains. It's because of? Ss: neutralization reaction Tr: Read it together! (PPT 呈現此句的中文與英文) Ss: Basic solution can clean acid stains. It's because of neutralization reaction. Tr: Now you have 3 minutes to finish the O and E parts of the worksheet. Tr: Time's up. Tr: Eyes on me! Ss: Eyes on you! Tr: Are you done? Ss: Yes! Tr: Check the answer with your group member. (Ss check answers with group members for 10 seconds.) Tr: Eye on me! Ss: Eye one you!</p> | | | |
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| | <p>(Tr shows Part3's answers on PPT) Tr: So this part needs to be done like this.</p> <p>Experiment3 (Teacher experiment) Tr: Everyone, I brought three cleaners from home. (出示實體物) Tr: This is dish cleaner. (Tr shows the dish detergent) Tr: This is soap. (Tr shows the soap) Tr: This is laundry detergent. (Tr shows the laundry detergent) Tr: Are they acid, neutral or basic? Tr: I am going to test it. (The teacher drops grape juice into the three different cleaners.) Tr: Those cleaners' colors all change to blue. Tr: So, are they acid, neutral or basic? Ss: Basic! Tr: 那大家會不會好奇，為什麼這些清潔劑都是鹼性的呢？ Tr: 因為我們生活中很多食物都是酸性的，所以我們需要靠鹼性的清潔劑來協助清潔。 Tr: That's why many cleaners are basic in our life. Tr: Now you have 3 minutes to finish the worksheet.</p> <p>III. Wrap up Tr: Time's up. Eyes on</p> | <p>PPT、學習單、洗碗精、洗衣精、肥皂、小蘇打水、檸檬酸水、鹽水、葡萄皮汁</p> | <p>10 mins</p> | <p>實作評量 (口頭報告)</p> |
| | <p>III. Wrap up Tr: Time's up. Eyes on</p> | <p>PPT</p> | <p>5 mins</p> | |

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| | | <p>me.</p> <p>Ss: Eyes on you.</p> <p>Tr: Now, Tell me! How did I clean my orange juice stain yesterday? (Teacher shows the picture on PPT)</p> <p>Ss: 用小蘇打水或是檸檬酸水。</p> <p>Tr: Excellent! But how did I know if baking soda or citric acid is good?</p> <p>Ss: 先測看看柳橙汁是酸性還是鹼性的。</p> <p>Tr: 沒錯！昨天我有先上網查查看柳橙汁的污漬是酸性還是鹼性的，查出來是酸性的！</p> <p>Tr: So, which solution is better to clean my clothes? (Teacher points to the baking soda and the citric acid pictures on the PPT.)</p> <p>Ss: Baking soda</p> <p>Tr: Why can baking soda clean orange juice stains?</p> <p>Ss: 因為果汁是酸性，小蘇打水是鹼性，所以可以用酸鹼中和把污漬清乾淨。</p> <p>Tr: So what did we learn today?</p> <p>Ss: Basic solution can clean acid stains. It's because of neutralization reaction.</p> <p>Tr: 所以從今以後，當大家要清潔污漬時，可以先想想看或上網搜尋這污漬是什麼酸性還是鹼性，再來選擇適合的清</p> | | | |
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| | | 潔劑來進行去污，就能達到有效的清潔效果。 Tr: Hand in your worksheets. Tr: See you next time. Good bye. | | | |
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Group: Class:

Part1_What are those solutions?



It is _____.

- acid
- neutral
- basic



It is _____.

- acid
- neutral
- basic



It is _____.

- acid
- neutral
- basic

Part2_Let's clean black vinegar stains!



It is _____.
 acid neutral basic

| | Cup A It is _____. <input type="checkbox"/> acid <input type="checkbox"/> neutral <input type="checkbox"/> basic | Cup B It is _____. <input type="checkbox"/> acid <input type="checkbox"/> neutral <input type="checkbox"/> basic | Cup C It is _____. <input type="checkbox"/> acid <input type="checkbox"/> neutral <input type="checkbox"/> basic |
|---|--|--|--|
| P | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work |
| O | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work |
| E | Black vinegar stains are _____ (acid / neutral / basic). Cup A is _____. It is _____ (acid / neutral / basic). Basic solution can clean _____ (acid / neutral / basic) stains. It's because of the _____. | | |

Part3_Let's clean tomato juice stains!



It is _____.
 acid neutral basic

| | <p>Cup A</p> <p>It is _____.</p> <input type="checkbox"/> acid <input type="checkbox"/> neutral <input type="checkbox"/> basic | <p>Cup B</p> <p>It is _____.</p> <input type="checkbox"/> acid <input type="checkbox"/> neutral <input type="checkbox"/> basic | <p>Cup C</p> <p>It is _____.</p> <input type="checkbox"/> acid <input type="checkbox"/> neutral <input type="checkbox"/> basic |
|----------|---|---|---|
| P | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work |
| O | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work | <input type="checkbox"/> clean well <input type="checkbox"/> left some stain <input type="checkbox"/> doesn't work |
| E | | | |

Part4_Are they acid, neutral or basic?

請問家中的清潔劑通常都是什麼性質的呢？

Most cleaners in my home are _____.

It's because of _____.