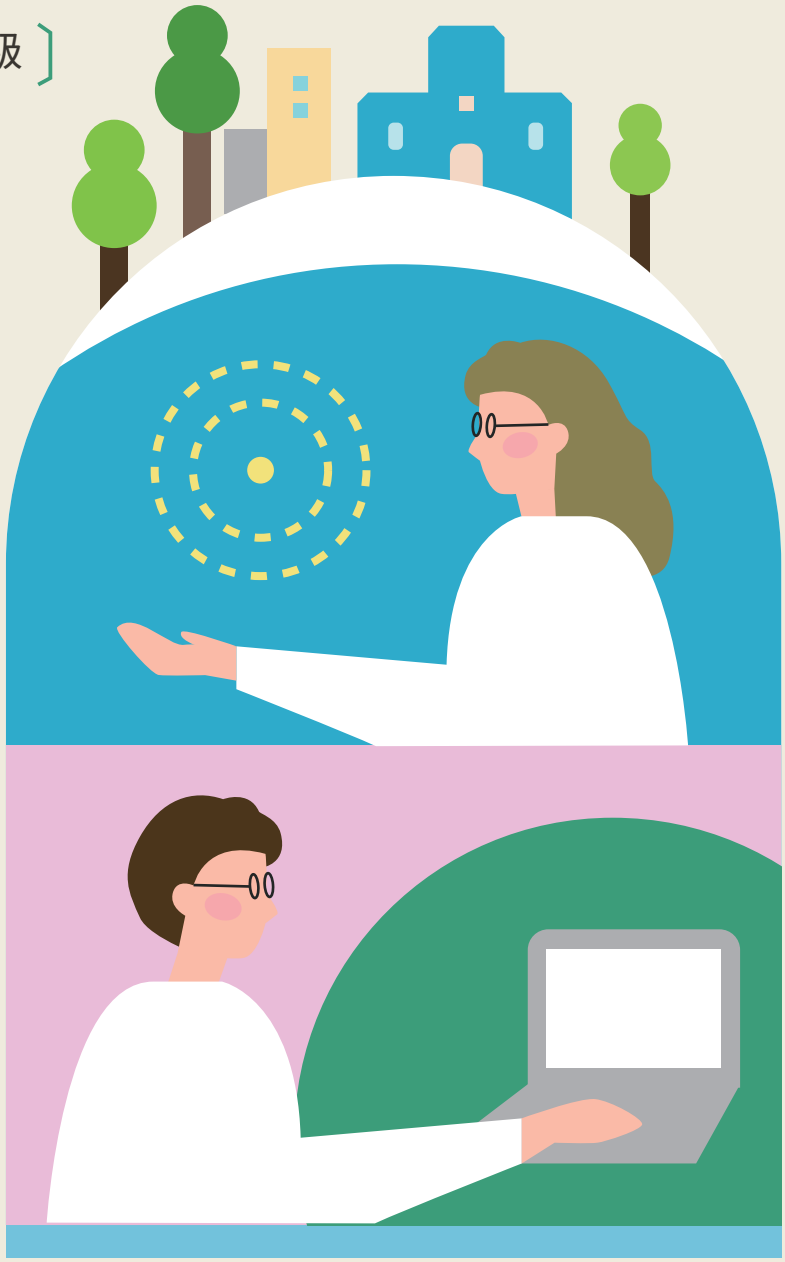
國中科技領域

雙語教學資源手冊

生活科技 英語授課用語

A Reference Handbook for Junior High School Bilingual Teachers in the Domain of Technology (Living Technology) : Instructional Language in English

〔國中八年級〕



高師大全英語與雙語教學推動中心 發行

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單元一 認識能源
Learning Many Kinds of Energy Conversion in Daily Life

桃園市立中壢國民中學 陳儀璟老師

■ 前言 Introduction

本單元的目標，是讓學生認識能源的種類，了解生活中所運用的能源有哪些？如何轉換、儲存，以及電力科技系統如何運作？讓學生學習實際製作能源轉換的作品，並進一步探討能源轉換在生活中的應用。

In this unit, students are expected to learn about many types of energy, to understand how energy turns into forms of power which we need and use in our lives, and to convert and store power, as well as to operate energy systems. Students will learn how to make products of energy conversion. Then, they will discuss how energy can also be used in daily life.

活動一，學生認識能源的種類，並區分再生能源與非再生能源。

In Activity 1, students learn many kinds of energy conversion in daily life, and recognize renewable energy and non-renewable energy.

活動二，學生了解生活中各種能量的轉換方式，熟悉發電過程並嘗試發電。

In Activity 2, students understand several methods of energy conversion in life and know well the procedure of generating power, moreover try to generate power by themselves.

活動三，學生認識生活中的電力與能源科技系統的運作，思考未來將如何發展，並完成學習單。

In Activity 3, students know the operation of electric and energy systems in life and think about their future development. They then complete the worksheet.

活動四，學生實際設計使用手搖發電轉換為機械能的作品，並在過程中學習問題解決與修正設計。

In Activity 4, students design works that are driven by rotating handily the generator to gain electrical power for converting mechanical energy. They, then, learn to solve any problems and modify their designs during the process.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
electricity	(n.) 電力	electrical electronic	(adj.)電力的 (adj.)電子的
energy	(n.) 能源	mechanical	(adj.) 機械的
renewable energy	(n.) 再生能源	conversion	(n.) 轉換
non-renewable energy	(n.) 非再生能源	power	(n.) 能量
Thermal energy	(n.) 熱能	generate	(v.) 產生
nuclear energy	(n.) 核能	power plant	(n.) 發電廠

■ 教學句型與實用句子 Sentence Frames and Useful Sentences

❶ Do you know what _____ is?

例句：**Do you know what** renewable energy **is**?

你知道什麼是再生能源嗎？

❷ Yes/No, I do. _____ can _____ all the time.

例句：**Yes, I do.** Renewable energy **can** keep receiving energy from nature **all the time.**

是的，知道。再生能源可以不斷地從大自然中得到能量來源。

❸ Which _____ is/are used to _____?

例句：**Which** electronic components **are used to** generate power?

請問哪個電子元件被用來發電？

■ 對話 Dialogues

對話一 Dialogue 1

Teacher: Hello, everyone. We are going to learn the application of energy in our lives. Before the class, I would like to question everyone. How can you receive energy in your life?

Student: By eating food.

Teacher: In addition, what types of energy do we usually use in our lives?

Student: I think it's electricity because there are many devices which rely on electricity.

Teacher: Yes! So, which types of energy that we use can generate power?

Student: We can generate power from the wind, right?

Teacher: That's a part of the correct answer. We also get the energy that we need from nature. Especially: coal, petroleum, and nuclear power, they take a long time storing underground deeply before they can produce energy. Therefore, we call these non-renewable energy sources.

Student: I get it!

Teacher: Renewable energy is an unexhausted energy that comes from nature. Can anyone tell me what are some types of renewable energy?

Student: I can. They are solar energy, wind energy, hydro energy, geothermal energy, and biogas.

Teacher: Great! Let's watch a video to understand how to generate power from each energy source. Plus, let's try to generate power from non-renewable energy!

Student: OK!

老師： 嗨！各位同學，我們將要學習生活中能源的應用。在上課前，我要問你們，在生活中，你是如何獲得能量的呢？

學生： 經由吃食物。

老師： 除此之外，我們在生活中，最常用到的能源是什麼呢？

學生： 我想應該是電能。因為很多電器都需要依靠電。

老師： 是的！那麼，我們使用什麼電能來轉換成能源呢？

學生： 可以用風發電，對嗎？

老師： 這是部分正確的答案。我們會利用大自然中的能源轉換為我們需要的能源。其中，特別像是煤、石油、核能等，它們需要長時間才能產生能源，因此，我們稱它們為非再生能源。

學生： 原來如此！

老師： 再生能源則是在大自然中可以不斷產生的能源。有同學可以告訴我哪些是再生能源嗎？

學生： 我可以。它們是太陽能、風能、水能、地熱能和生質能。

老師： 很好，讓我們來觀看影片，認識各種能源如何發電的過程。並且，讓我們試著從非再生能源發電吧！

學生： 好！

對話二 Dialogue 2

Teacher: Do you remember which type of energy we tried to generate power from during our last class?

Student: Yes, I do. We can generate power from solar energy, wind energy, and human power. I feel a sense of accomplishment that I can generate power by myself.

Teacher: Excellent! We are going to make a flashlight which is powered by a human whirl the hand crank generator.

Student: Teacher, are we going to connect a circuit on our own?

Teacher: Yes, we are. We will make the torch by using electronic components like: LEDs, capacitors, motors, etc.

Student: I can't wait to do it!

老師： 你們記得上一堂課，我們用什麼能源發電嗎？

學生： 是的，我記得。我們利用太陽能、風能、人力進行發電，我覺得可以自己發電很有成就感。

老師： 太棒了！我們將做一個可以手搖發電的手電筒。

學生： 老師，我們可以自己接電路嗎？

老師： 是的，可以。我們將使用發光二極體、電容、馬達等電子元件來完成作品。

學生： 我迫不及待要開始製作了！

單元二 創意線控仿生獸設計
The Designs of Creative Wire-controlled Bionic Creatures

桃園市立中壢國民中學 陳儀璟老師

■ 前言 Introduction

本單元的目標，是讓學生學習如何使用簡單的電子元件，和仿生技術，設計出自己的線控仿生獸，並練習測試與修正，優化其設計。最後，進行比賽檢測成果。

In this unit, students are expected to know how to use simple electronic components and bionics technology to design their own wire-controlled bionic creatures. Besides, they can practice testing, refining and optimizing their design. Finally, we will hold a competition to test the results.

■ 活動目標 Activity Goals

活動一，學生認識仿生學，如動、植物生命的結構、功能、運作等方面的模擬與應用，並嘗試將其應用到機械設計中。

In activity 1, students learn bionics which involves simulating and applying the structures, functions, and movements of living organisms, such as animals and plants. They will also attempt to apply this knowledge to mechanical design.

活動二，學生了解電子元件和線控仿生獸的原理，並透過電腦，模擬機器在不同參數的活動樣態。

In activity 2, students understand the principles of electronic components and wire-controlled bionic creatures. They use computers to simulate the movements and patterns of machines in different parameters.

活動三，學生利用馬達和木材去製作線控仿生獸，並觀察仿生獸在走動中，對摩擦力及軸與腳長距離的影響，並配合長度與重量，調整其設計。

In activity 3, students use motors and wood to create wire-controlled bionic creatures. They observe the influence of wire-controlled bionic creatures toward friction and distance between the transmission shaft and the foot parts` length while moving. And then they adjust the design of

the bionic creatures according to their observation about changing the length and weight parameters.

活動四：學生透過競賽，來修正與檢驗成果

In activity 4, students revise and test their results through a contest game.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
bionic	(adj.) 仿生的	move	(v.) 移動
battery	(n.) 電池	movement	(n.) 動作
wood	(n.) 木板	creature	(n.) 生物
motor	(n.) 馬達	linkage	(n.) 連桿
wire	(n.) 電線	circuit	(n.) 電路
wire-controlled	(adj.) 線控的		

■ 教學句型與實用句子 Sentence Frames and Useful Sentences

❶ We are going to _____.

例句：**We are going to** design wire-controlled bionic creatures.

我們要來製作線控仿生獸。

❷ _____ is 比較級 than _____.

例句：The leg he made **is longer than** mine.

他做的腳比我的長。

❸ I want to know how to _____.

例句：**I want to know how to** modify our work.

我想知道如何修正我們的作品。

■ 對話 Dialogues

對話一 Dialogue 1

Teacher: Hello, students. Let's watch a video. Please tell me what you see in the video?

Student: Wow, it looks so cool. I saw the robotic arm making coffee.

Teacher: Yes. In our daily lives, machines we use can simulate the movements of human beings. Therefore, we could also try to make bionic creatures.

Student: Then, how is it going to operate?

Teacher: We can take proper electric power from batteries to drive the motor, make legs with wooden sticks or boards, and make a controller to activate the movement of the bionic creature forward.

Student: I have no idea how to design it.

Teacher: We can use the computer program "Linkage" to simulate the linkage of the mechanism first, and then divide into groups to complete the work.

Student: Can we test it on the computer first before making it?

Teacher: Yes, you can. This allows you to test and refine the design before physically constructing it. The position of the shaft also affects the range of motion of the legs. However, friction and gravity cannot be simulated in the program for the movement of the bionic creature. We must adjust these after finishing the work.

Student: I get it. We can give it a try now.

老師： 各位同學好。讓我們看一下影片 。請告訴我你們在影片中看到了什麼？

學生： 哇！看起來好酷！我看到機械手臂在泡咖啡。

老師： 沒錯。在我們日常生活中，我們使用的機器是會模擬人類的動作的。因此，我們也可以來試著製作仿生獸。

學生： 那麼，它要怎麼運作呢？

老師： 我們可以使用電池驅動馬達，用木板製作腳，並且製作遙控器，來控制仿生獸前進。

學生： 我不知道應該怎麼設計。

老師： 我們可以先用電腦程式「linkage」模擬機器的連動。然後，我們在分組，完成作品。

學生： 我們可以先用電腦測試後，再來製作嗎？

老師： 是的，你可以。這會讓你在實作之前，測試與修正設計。軸的位置也會影響腳的擺動幅度。儘管如此，摩擦力及重力是沒有辦法在程式上模擬其行動的，我們必須完成作品後，調整其重心與重量。

學生： 我了解了！我們可以現在試試看！

對話二 Dialogue 2

Teacher: Today, we are going to provide strength for the bionic walking. Do you remember which electronic components we can use?

Student: I know! Motors, remote controllers, and batteries.

Teacher: Partially correct. We will also use wood boards and nails to make the remote control. Different circuits are formed by the contacts among the copper nails, and they are connected to the motor with wires. Please follow the circuit diagram and try to connect the nails and wires in the right order.

Student: All right. It looks quite challenging.

Teacher: You can ask me if you have any questions during the process.

Student: Teacher, we almost finished it. But it still can’t move. I want to know how to fix the work.

Teacher: First of all, please check if the copper nails are making contact with each other, otherwise, the circuit won't be connected.

Student: Yes, it’s no problem.

Teacher: Secondly, check if the motor is receiving power. Finally, check if the legs are moving properly or not.

Student: OK. I will check it again.

Teacher: If your creation can move well, then you can start testing and challenging it!

Student: OK. I believe our group can be the first!

老師： 今天，我們要來製作動力。你們還記得我們能用哪些電子元件呢？

學生： 我知道！馬達、遙控器、還有電池。

老師： 部分正確。我們還要用木板及釘子來製作搖控器。藉由銅釘間的接觸，可形成不同迴路，而且，它們可以用電線接上馬達。請按照電路圖，試著將釘子與電線連接在正確的排列上。

學生： 好的。看起來很有挑戰性。

老師： 在製作過程中，如有問題，都可以問我。

學生： 老師，我們幾乎快完成了。但是仍然不會動。我想知道如何修正作品。

老師： 首先，請檢查銅釘間有否確實碰觸。否則，不會形成通路。

學生： 是的，它沒有問題。

老師： 其次，檢查馬達有沒有通電。最後，再檢查腳的部分有否移動自如。

學生： 好的。我再檢查看看。

老師： 如果你的作品可以好好地移動，那麼，你就可以開始測試及挑戰了！

學生： 好的。我相信我們這一組可以拿第一！

單元三 能源與生活周遭的關聯
The Relationship Between Energy Technology and Daily life

桃園市立中壢國民中學 陳儀璟老師

■ 前言 Introduction

本單元的目標，是讓同學了解能源科技與生活的關係，並認識更多智慧電網，在生活中的應用。同學可藉由分組報告，分析一種綠色能源，並製作簡報與模型，推薦分享，讓其他同學也能了解綠色能源的發展與應用。

In this unit, students are expected to know the relationship between energy technology and daily life. Moreover, they can learn the applications of smart grid technology. Students will work in groups to analyze one type of green energy, give a theme presentation, and model to share their findings with other classmates. And then, they all can understand the development and applications of green energy.

■ 活動目標 Activity Goals

活動一，學生認識生活中應用的能源系統與設備。

In activity 1, students learn many kinds of energy systems and devices in daily life, plus how they can be used.

活動二，學生認識能源對環境與社會的影響。

In activity 2, students understand the impact of energy on the environment and society.

活動三，學生分組，並且製作簡報，上台報告分享給同學聽。

In activity 3, students are assigned to many crews learning how electric and energy systems operate. Later they have to make a topic brief reporting to other students.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
fan	(n.) 電風扇	air-conditioner	(n.) 冷氣機
Smart Grid	(n.) 智慧電網	product	(n.) 產品
AI (Artificial Intelligence)	(n.) 人工智慧	light	(n.) 燈
integrate	(v.) 整合	eco-friendly	(adj.) 對環境友好的
robot	(n.) 機器人	environment	(n.) 環境
negative	(adj.) 負面的	positive	(n.) 正面的

■ 教學句型與實用句子 Sentence Frames and Useful Sentences

❶ Is it possible to _____?

例句：**Is it possible to** integrate the remote controls together?

有沒有可能將遙控器整合在一起呢？

❷ We will _____ in the future.

例句：**We will** pay attention when we buy things **in the future.**

我們以後買東西時會注意。

❸ Let's _____!

例句：**Let's** get started on it now!

我們現在就開始製作吧！

■ 對話 Dialogues

對話一 Dialogue 1

Teacher: Hello, everybody. It's so hot today. Can we turn on the fan?

Student: Sure! How about we turn on the air-conditioner?

Teacher: Yes, please. But it seems too much of a bother.

Student: Yes. Is it possible to integrate the remote controls together?

Teacher: Yes! Nowadays, it is possible to set up a smart grid by using Wi-Fi. It allows us to use a central remote control to operate all devices.

Student: It sounds convenient! How about having it turn on and off automatically? For example, if I accidentally fall asleep it still operates.

Teacher: That sounds like a good idea and it would need the help of AI. We can let the machine recognize whether we have fallen asleep or not, and it will automatically control the switches. It's just like a robot cleaner that doesn't need to be taught how to clean. It can function on its own.

Student: I got it! It's really convenient!

Teacher: Yes. Besides, in order to save electricity, we should also purchase environmentally friendly products so as not to waste energy.

Student: OK! We will pay attention to this when we buy them.

老師： 各位同學好，今天好熱，我們可以開電風扇嗎？

學生： 當然好！我們開冷氣如何？

老師： 可以。不過，似乎挺麻煩的。

學生： 對啊。有沒有可能將遙控器整合在一起呢？

老師： 可以啊！現在我們可以透過 Wi-Fi 架設智慧電網，它可以讓我們使用總遙控器來統整操作。

學生： 聽起來很方便！它可以自動開關嗎？例如，我不小心睡著了時，它仍可以運作嗎？

老師： 聽起來是不錯的想法，那就需要 AI 的協助了。我們可以讓機器辨識我們是否睡著，並且自動控制開關。就像掃地機器人，不需要教它如何掃地，它會自己運作。

學生： 原來如此！真的很方便！

老師： 沒錯。另外，為了節約用電，我們也要盡量購買對環境友善的產品。這樣，才不會浪費能源。

學生： 好！我們買東西時會注意。

對話二 Dialogue 2

Teacher: Do you remember that we introduced renewable energy and non-renewable energy before?

Student: Yes, we do. Wind power generation is an example of renewable energy.

Teacher: Yes. Renewable energy is also known as green energy. We will focus on this topic for a group competition this week.

Student: What is the competition?

Teacher: We are having a competition to see who can be the best salesperson. Instead of selling products, each group will find out the best green energy that is most suitable for our city. Finally, we will vote to choose the best group that has the most complete and suitable introduction about a particular type of green energy.

Student: Teacher, how do we know what kind of energy is appropriate?

Teacher: Previously, we learned many ways of converting green energy into electricity. We also need to examine factors such as the climate and terrain of our city. It is particularly important to note that both positive and negative impacts on society and/or the environment must be taken into consideration.

Student: OK. Then, what should we do?

Teacher: You will make a model and give a presentation to showcase the findings.

Student: How much time do we have to work on this?

Teacher: You have one week to finish it. You can search for the type of energy that your group wants to do, finish the homework and will present the results in class next week.

Student: Sure. Let's get started on it now!

老師： 我們還記得之前我們介紹過再生能源與非再生能源嗎？

學生： 是的，記得。風力發電就是再生能源的例子。

老師： 沒錯。再生能源又稱為綠能。這週我們將關注此議題，進行小組比賽。

學生： 是什麼比賽呢？

老師： 我們要比賽誰是最佳推銷王！但是，我們不是要推銷產品，而是請各組找一個最適合我們城市的綠色能源。最後，同學將投票選出介紹得最完整及最適合的組別。

學生： 老師，我們如何知道哪種能源最合適呢？

老師： 之前，我們已經有認識了各種綠能轉換成電能的方式。我們還需要檢查城市的氣候、地形等因素。特別注意的是，無論對社會或環境的正面及負面影響，我們都必須要考慮到。

學生： 好的。那我們還需要做什麼呢？

老師： 你們要製作模型，並用簡報來呈現結果。

學生： 我們有多少時間製作呢？

老師： 給你們一週的時間。你們可以先查你們小組想要的能源，完成家庭作業，下週上課時做簡報。

學生： 好！我們現在就開始製作吧！

單元四 動力與運輸
Power and Transportation

桃園市立中壢國民中學 陳儀璟老師

■ 前言 Introduction

本單元的目標，是讓學生學習運輸科技系統，及其在生活中的應用，並認識各種動力的運作方式。再讓學生練習用再生能源的太陽能，做為能源，用馬達作為動力，製作太陽能動力車。

In this unit, students learn transportation technology systems and their applications in daily life. They also understand different types of power sources. Then they practice using solar energy as a renewable energy source and utilize a motor as the driving force to create a solar-powered vehicle.

■ 活動目標 Activity Goals

活動一，學生認識運輸科技系統的發展，及各種運輸系統的形式。

In activity 1, students become familiar with the development of transportation technology systems and various forms of transportation systems.

活動二，學生了解在運輸載具內各種能源，和動力的應用，並學習不同動力轉換的形式。

In activity 2, students learn the application of different energy sources and power systems in transportation vehicles. They will also explore different forms of power conversion.

活動三，學生利用馬達、太陽能板、以及木板等材料，製作太陽能發電動力車。

In activity 3, students use materials, such as motors, solar panels, and wooden boards to construct a solar-powered vehicle.

活動四：學生透過競賽修正與檢驗成果

In activity 4, students participate in a competition to test and evaluate their solar-powered vehicles.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
vehicle	(n.) 載具	drive	(v.) 開車/驅動
terminal	(n.) 場站/終端	power	(a.) (n.) 動力
way	(n.) 通路	train	(a.) (n.) 火車/列車
communication	(n.) 電訊	MRT	(n.) 捷運
management	(n.) 經營	airplane	(n.) 飛機
transport	(v.) 運輸	high speed rail	(n.) 高速鐵路
system	(n.) 系統	transportation	(n.) 運輸
material	(n.) 材料	friction	(n.) 摩擦力

■ 教學句型與實用句子 Sentence Frames and Useful Sentences

❶ How do you go to _____ every day?

例句：**How do you go to school every day?**

你每天如何去上學？

❷ I go to _____by_____.

例句：**I go to** Nantou **by** train.

我坐火車去南投。

❸ _____ has different ways of _____.

例句：Everyone **has different ways of** going to school.

每個人有不同的方式上學。

■ 對話 Dialogues

對話一 Dialogue 1

Teacher: Good morning, everyone. How do you usually commute to school? Can anyone share their experience?

Student 1: I take the bus to school.

Student 2: My parents drive me to school.

Teacher: It seems that everyone has different ways of going to school. These methods are parts of the transportation system. Can you guess what the earliest type of transportation was?

Student: Was it the ox cart? I saw it on TV.

Teacher: That's one of them. Now, can anyone tell me other transportation we have today?

Student: We have MRT, train, bus, airplane, high-speed rail, etc.

Teacher: Exactly. In addition to transportation itself, the actual transportation system includes terminal, channel, communication, and management.

Student: I see. The transportation system is so extensive.

Teacher: Communication has been constantly improving and has made transportation and traffic more convenient for us. For example, the World Wide Web (WWW) technology allows us to receive real-time updates on various aspects for immediate management and scheduling.

Student: Oh, I see. It's like when I shop online, I can track the progress of my package.

Teacher: Exactly. Now, you can search online for different types of power sources in transportation vehicles and then write them down on your worksheets.

Student: All right, no problem!

老師： 早安，各位。你們通常是如何上學呢？有沒有人可以分享他們的經驗？

學生 1： 我是搭公車上學的。

學生 2： 我是家長開車接送上學。

老師： 每一個人似乎都有不同的方式上學，這些多元的方式，都是運輸系統的一環。你們猜一猜最早的運輸工具是什麼呢？

學生： 是牛車嗎？我在電視上看過。

老師： 那是其中之一。現在，有人告訴我，目前我們還有哪些運輸工具呢？

學生： 我們有捷運、火車、公車、飛機、高鐵等。

老師： 絕對是。此外，運輸系統還包括，場站、通路、電訊和經營。

學生： 了解。運輸系統是如此廣泛。

老師： 電訊一直不斷在進步，讓我們在運輸、交通上更加方便。例如，物聯網可以即時更新最新動態，以便立即管理與安排。

學生： 喔！我知道了。就像我網購時，我可以看到包裹的運輸進度。

老師： 沒錯。現在，請同學上網搜尋運輸載具所運用的各種動力，並且將它們寫在學習單上。

學生： 好的，沒問題！

對話二 Dialogue 2

Teacher: Today, we're going to make a solar-powered vehicle. Can anyone tell me what electronic components we will need?

Student: I know! We'll need a solar panel for generating solar power, and we'll also need a motor for the electric vehicle.

Teacher: Excellent! Unlike regular engine-powered cars, our solar-powered car can convert solar energy into electrical energy, and use a motor as our power source. It's important to note that the motor we use must be equipped with gears to form a "gear reduction system" in order to increase torque.

Student: But we don't have gears. What should we do?

Teacher: Don't worry, students. "TT motor" already has a gear reduction system within it. Let's open it up and take a look.

Student: Wow! There are some small gears driving larger gears inside.

Teacher: Additionally, since solar panels are not large, it's important to reduce the weight of the vehicle, so that it can move forward.

Student: What materials can we use to make the vehicle?

Teacher: In addition to wooden boards, you can use plastic sheets or foam boards to make the vehicle lighter. However, be careful. If the vehicle is too light, it may not have enough friction to move forward.

Student: Okay. Let's give it a try!

老師： 今天，我們要製作以太陽能為動力的車子。有人告訴我，我們將用到哪些電子元件呢？

學生： 我知道！我們需要太陽能板，才能啟動太陽能。而且，我們也要馬達來製作電動車。

老師： 非常好！有別於普通引擎車，我們製作的太陽能車，可以將太陽能轉為電能，而且利用馬達作為動力來源。特別重要注意的是，我們使用的馬達，必須加上齒輪，組成「齒輪減速系統」，以利增加扭轉力。

學生： 但是我們沒有齒輪，怎麼辦呢？

老師： 同學不用擔心，老師發的「TT 馬達」裡面就有減速齒輪組了，我們可以打開看看。

學生： 哇！裡面有小齒輪帶動大齒輪。

老師： 此外，由於太陽能板沒有很大，能減輕重量讓車前進是重要的。

學生： 我們要用什麼材料製作車子呢？

老師： 除了木板外，你們可以用塑膠板或珍珠板製作，使車子變輕，但是，你們也要注意，如果車子過輕，摩擦力可能不夠，導致無法前進。

學生： 好的。我們就試試吧！

單元五 製作電動液壓動力機械手臂
Electric Hydraulic-powered Robotic Arms

桃園市立中壢國民中學 陳儀璟老師

■ 前言 Introduction

本單元的目標，是讓學生學習動力在生活中的應用，他們同時也認識各種動力的運作方式。學生練習用電動和液壓系統，製作機械手臂。透過分組討論和搜集資料，學生可選擇適合的材料與設計，最後，他們也測試和修正，來完成任務。

In this unit, students learn the application of power in daily life. They also understand different power sources. Students create robotic arms by using electric and hydraulic systems. Through group discussion and data collection, students select suitable materials and designs. They also test and make modifications to complete the task.

■ 活動目標 Activity Goals

活動一，學生複習機械並了解如何設計動力傳輸系統。他們學習電動和液壓系統的基本原理和運作方式，專注在這些系統如何能傳輸動力。

In activity 1, students review mechanisms, and understand how to design power transmission systems. They learn the basic principles and operation of electric and hydraulic systems, focusing on how these systems transmit power.

活動二，學生製作基本機械，如滑桿和交差連桿。他們在組內討論並設計電動液壓動力機械手臂。

In activity 2, students make basic mechanisms, such as sliders and cross-linkages. They discuss and design their own electric-hydraulic powered robotic arms in groups.

活動三，學生利用馬達和針筒等材料，製作一個簡單的機械手臂模型。

In activity 3, students use materials, such as an electric motor and syringes to make a simple model of a robotic arm.

活動四，學生測試和調整機械手臂，並練習操控它們。

In activity 4, students test and adjust their robotic arms, as well as practice operating them.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
robot	(n.) 機器人	factory	(n.) 工廠
robotic	(adj.) 機械人的；自動的	operate	(v.) 運作
arm	(n.) 手臂	produce	(v.) 生產
machine	(n.) 機器	rotate	(v.) 旋轉
linkage	(n.) 連桿	grasp	(v.) 抓取
hydraulic system	(n.) 液壓系統	lifting	(v.)升；舉

■ 教學句型與實用句子 Sentence Frames and Useful Sentences

❶ _____ can start V-ing _____.

例句：You **can start** draw**ing the design for the robotic arm.**

你可以開始繪製機械手臂的設計圖。

❷ _____, so that _____.

例句：I will tell you where I am, **so that** you can find me.

我將告訴你，我在哪裡，以便你能找到我。

❸ **_____ before _____.**

例句：We need to complete the structure **before** we make the arm move.

讓手臂移動之前，我們需要先完成結構的部分。

■ 對話 Dialogues

對話一 Dialogue 1

Teacher:	Good morning, everyone. Today, we are going to learn about robotic arms and how they work. Can anyone give me an example of where we can find robotic arms in our daily lives?
Student:	Robotic arms are used in factories to produce cars and other products.
Teacher:	Very good! Robotic arms are widely used in manufacturing industries for automation and precision tasks. Now, can anyone explain how a robotic arm works?
Student:	A robotic arm is controlled by a computer. It uses electric motors and mechanical linkages to move and grab objects.
Teacher:	That's right. Our mission is to create a manipulable robotic arm that we can control. We will be able to use the arm to grasp objects and accomplish our tasks.
Student:	Wow! Is it like a claw machine?
Teacher:	It's similar. But we can control it better because we are building the arm. In addition to rotating angles, we can adjust the gripping distance of this robotic arm. It's more like a claw crane rather than a typical claw machine.
Student:	Do we use wooden boards to make the linkages? Will the joints be able to support the weight?
Teacher:	We need to use syringes to push the linkages. Now, students can start drawing the design of the robotic arms.
Student:	That's great! I can design a durable robotic arm, so that I can handle things more easily.

老師： 大家早。今天，我們要學習機械手臂及其運作方式。有人能舉一個例子給我，在我們的日常生活中，哪裡可以找到機械手臂呢？

學生： 機械手臂在工廠中被用來組裝汽車和其他產品。

老師： 非常好！機械手臂在製造業中被廣泛應用於自動化和精密任務。現在，有人能解釋機械手臂是如何運作的嗎？

學生： 機械手臂由電腦控制。它使用電動馬達和機械連桿來移動和抓取物體。

老師： 沒錯。我們的任務是要做出一個可操控的機械手臂。如此，我們能透過手臂來抓取物品，以便達成任務。

學生： 哇！它像抓娃娃機嗎？

老師： 有點類似。不過，我們可以操控得較精確，因為我們會製作手臂。除了旋轉角度外，我們能調整機械手臂的抓取距離。比起傳統的抓娃娃機，它更像是怪手。

學生： 我們用木板製作連桿嗎？關節部分能支撐重量嗎？

老師： 我們需要用針筒來推動連桿。現在，同學們可以開始繪製機械手臂的設計圖。

學生： 太好了！我能設計出耐用的機械手臂，所以我就能較輕鬆地處理事情。

對話二 Dialogue 2

Teacher: Making the mechanical arm requires several steps. First, before the arm can move, we need to complete the structural part. The arm needs to be fixed to a flat surface.

Student: All right. Our group could use screws to secure the arm to the wooden board.

Teacher: OK! Please remember to attach a syringe to each segment of the linkages. Then, let’s move on to the power system. Can anyone recall which electronic components we’ve been using?

Student: I do. Motors, remote controllers, and batteries.

Teacher: Teacher: Excellent! We use two toggle switches whose specification is 6-pin 2 position to make the remote control. Please connect one switch to each end of the motor, so that you can control the motor’s forward and reverse rotation.

Student: All right. It looks like the controller that we made last time.

Teacher: Exactly. This time we’re primarily focusing on creating power for the linkages. We use switch components to make the remote control.

Student: It seems that our biggest challenge is going to be designing the links and transmission among the linkages, syringes, and motors.

Teacher: That's right. Once your group has a well-designed plan, you can proceed with the construction and test.

Student: OK. I believe our group can be the first.

老師： 製作機械手臂需要幾個步驟，首先，讓手臂移動之前，我們需要完成結構的部分。手臂須被固定在平面上。

學生： 好的。我們這組可用螺絲釘將手臂鎖在木板上。

老師： 可以！請記得每段連桿都要裝一支針筒。接著，我們來談動力的部分，請問有人記得我們用過哪些電子元件嗎？

學生： 我知道。馬達、遙控器和電池。

老師： 正確。我們用兩個 6p 開關來製作遙控器。請同學將一個開關分別連接馬達兩端，以便控制馬達正反轉。

學生： 好的。它看起來很像我們上次做的遙控器。

老師： 沒錯。這次我們主要專注在製作連桿的動力。我們利用開關元件製作遙控器。

學生： 似乎我們最大的挑戰就是連桿、針筒和馬達間的連接傳動設計。

老師： 是的。一旦你們設計好的組別，便可以繼續進行製作與測試。

學生： 好的。我相信我們這組可以拿第一。

單元六 運輸科技對社會與環境的影響
The Impact of Transportation Technology on Society and the Environment

桃園市立中壢國民中學 陳儀璟老師

■ 前言 Introduction

本單元的目標，是讓學生藉由搜尋報告資料，知道運輸科技對社會與環境的影響，並了解運輸科技的發展。它既為社會帶來便利和經濟發展，同時也關注環境影響。為了永續發展，我們轉向使用更多綠色、低碳的運輸系統，取代高污染的傳統運輸系統。除此之外，學生也認識運輸系統中，各階段對應的工作與內容，讓學生增加對職業的了解，有助於生涯的規劃。

In this unit, students are expected to know the impact of transportation technology on society and the environment through researching a special report. The development of transportation technology brings convenience and economic development to society, while we also need to consider its environmental impact. In order to achieve sustainable development, we use more green and low-carbon transportation systems to replace high-pollution traditional transportation systems. Besides, students realize the workings and contents of each stage in the transportation systems too so that they can increase their understanding of careers and help career planning.

■ 活動目標 Activity Goals

活動一，學生從日常生活觀察運輸科技對社會帶來的好處與壞處，並且深入探討平時看不到的運輸過程中有哪些地方需要改善。

In activity 1, students learn the benefits and drawbacks of transportation technology in society through daily life examples. They also explore areas for improvement in the commonly unseen processes of transportation.

活動二，學生分組搜集不同運輸方式對社會與環境的影響，並提出現今的措施與未來可以減少污染、永續發展的方案。

In activity 2, students are divided into groups to gather information on the impact of different transportation modes on society and the environment. They propose current measures for future solutions to reduce pollution and promote sustainable development.

活動三，學生認識運輸系統中各階段對應的工作與內容，此可增加學生對職業的了解。最後，他們完成學習單。

In activity 3, students realize the various stages and corresponding workings and contents in the transportation systems. This increases their understanding of different professions. At the end, they complete learning worksheets.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
transportation	(n.) 運輸	carbon emission	(n.) 碳排放
mode	(n.) 方式	pollution	(n.) 污染
choose	(v.) 選擇	traffic jam	(n.) 塞車
convenient	(adj.) 方便	environmental friendliness	(n.) 環境友好
comfortable	(adj.) 舒服	society	(n.) 社會
pros	(n.) 優點	environment	(n.) 環境
cons	(n.) 缺點	suit	(v.) 符合

■ 教學句型與實用句子 Sentence Frames and Useful Sentences

❶ Which _____: _____, _____, or _____?

例句：**Which** of these modes of transportation do you think is the best: car, bus, **or** bicycle?

你覺得哪種運輸方式最好？車子、公車、還是腳踏車？

❷ Every _____ has _____.

例句：**Every** transportation **has** its pros and cons.

每個運輸系統都有它的優缺點。

❸ If _____ choose to _____, ___ can _____.

例句：**If** you **choose to** take public transportation, it **can** reduce traffic jams and pollution.

如果你選擇搭大眾運輸工具，可以減少交通阻塞和污染。

■ 對話 Dialogues

對話一 Dialogue 1

Teacher: Which of these modes of transportation do you think is the best: car, subway, or bicycle?

Student: I think cars are the best because they are convenient to go everywhere.

Teacher: Indeed, cars offer high mobility, a comfortable ride, and can easily transport goods. Can anyone tell us the cons related to cars in terms of impact on society or the environment?

Student: The carbon emissions from driving cars cause air pollution. If more people choose to take public transportation like buses, it can reduce traffic jams and pollution. However, taking public transportation offers less freedom than driving cars. Nevertheless, I am willing to walk a little farther to take the bus for the benefit of society.

Teacher: Very good. Every transportation has its pros and cons, and we must strike a balance between the convenience and ease we provide to society and the impact on the environment. Does anyone else want to share their experiences?

Student: I consider that bicycles are the best because they don't consume non-renewable energy or generate pollution.

Teacher: Great. You have analyzed transportation systems from the perspective of sustainable environment. In Taiwan's urban areas, we also have friendly bicycle-sharing systems. Through system analysis and management, bicycles can be transported to different locations at different times for optimal usage, enhancing overall efficiency.

Student: Apart from the transportation vehicles, the overall transportation system operation and management are also important.

Teacher: That's right. Now, students are divided into groups and gather information about pros and cons of transportation systems, as well as their impact on society and the environment. Finally, students discuss and propose solutions that can improve the overall transportation system.

Student: OK. Let's start grouping!

老師： 你覺得哪種運輸方式最好？車子、捷運、還是腳踏車？

學生： 我覺得車子最好，因為開車去哪裡都方便。

老師： 確實，車子的機動性好，乘坐舒適，而且載貨便利。有沒有人告訴我們車子對社會或環境的缺點呢？

學生： 開車產生的碳排放會造成空氣污染。若是多人選擇搭公車等大眾運輸工具，可以減少交通阻塞和污染。然而，搭乘公車等大眾運輸工具，沒有開車那麼自由。儘管如此，為了社會的利益，我願意走遠一點去搭公車。

老師： 非常好。每一種運輸都有優缺點，我們必須在給社會便利和輕鬆及對環境的影響中取得平衡。有人要分享經驗嗎？

學生： 我認為腳踏車是最好的運輸工具，因為它不會消耗非再生能源，而且不會產生污染。

老師： 很好。你有從永續環境的角度分析運輸工具。在台灣都市中，我們也有友善的腳踏車共享系統。透過系統分析與管理，腳踏車可以在不同時間段，被運送到不同的地點，做最大的使用，提昇整體的效益。

學生： 除了運輸工具外，整體系統的運作與管理也重要。

老師： 是的。現在，學生分組搜集運輸系統優缺點的資料，及它們對社會與環境的影響。最後，學生討論及提出可讓整體運輸系統改進的方案。

學生： 好的。讓我們開始分組吧！

對話二 Dialogue 2

Teacher: Last time, we talked about each mode of transportation. You can find that there are not only drivers involved in the transportation industry. Please think about what other professions are related to transportation.

Student: Engineers are a crucial part of the system. They have to write programs to monitor the transportation of goods and make adjustments based on actual operations.

Teacher: Very good. What else?

Student: There are also personnel in logistics management. What else? I can't think of anything else.

Teacher: Then, please search online for jobs related to transportation, and choose one that suits your qualities to best introduce it to other students.

Student: Okay!

Teacher: Please come to the front, share the job that impresses you the most with your classmates, and write it down on your worksheet.

(Students take turns sharing.)

Teacher: After mutual sharing, I believe everyone has a better understanding of the entire transportation system. You will have more career choices in the future.

老師： 上次，我們有討論各種運輸系統。你們會發現，不只司機涉入運輸行業。請想看看，還有哪些職業與運輸相關呢？

學生： 工程師是重要的部份。他們必須寫程式監控貨物運輸，並根據實際運作調整狀況。

老師： 非常好。還有呢？

學生： 也有物流管理的人員。還有什麼呢？我想不到其他的了。

老師： 那麼，請上網搜尋跟運輸有關的職業，再選一個最適合你的特質的工作，介紹給其他同學。

學生： 好的！

老師： 請上台向同學分享工作，並在你的學習單上寫下你印象最深刻的工作。

（同學上台分享）

老師： 老師：經過相互分享後，我相信每個人對整體運輸系統有較佳的了解。你們未來將有更多職涯的選擇。

國內外參考資源 More to Explore

自造教育及科技輔導中心 這個網站以創新教育為主題，提供高級中等以下學校的教育資源，並透過系列課程、競賽專區及線上微課程等功能，推動教育界探索未來教學的新視野與可能性。 https://tech.k12ea.gov.tw/	
能源教育資源總中心 國中機構結構與能源相關教學活動的分享內容，包含木工製作、機械結構與動力實驗等範例。 https://learnenergy.tw/index.php?inter=digital&caid=1&id=295	
高雄市教育局國民教育輔導團-高雄國民教育各學科領域專頁 匯集高雄國民教育各學科領域的專頁資訊，提供多元學科資源及社群連結，方便教師和學習者快速找到相關支持與交流平台。 https://reurl.cc/M6yNan	

國中科技領域雙語教學資源手冊: 生活科技科英語授課用語

[八年級]

A Reference Handbook for Junior High School Bilingual Teachers in the Domain of Technology (Living Technology): Instructional Language in English

[8th grade]

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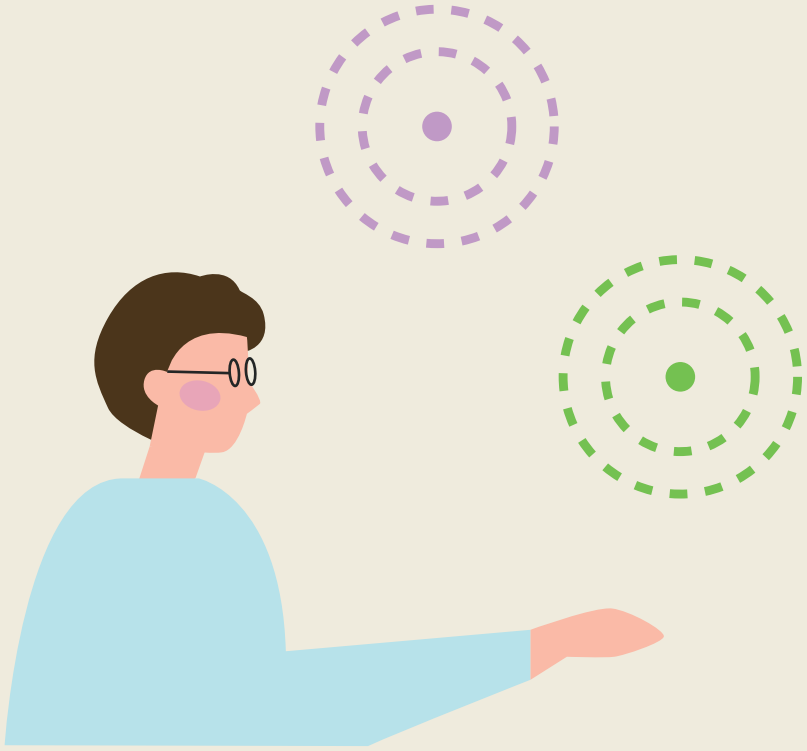

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