國中科技領域
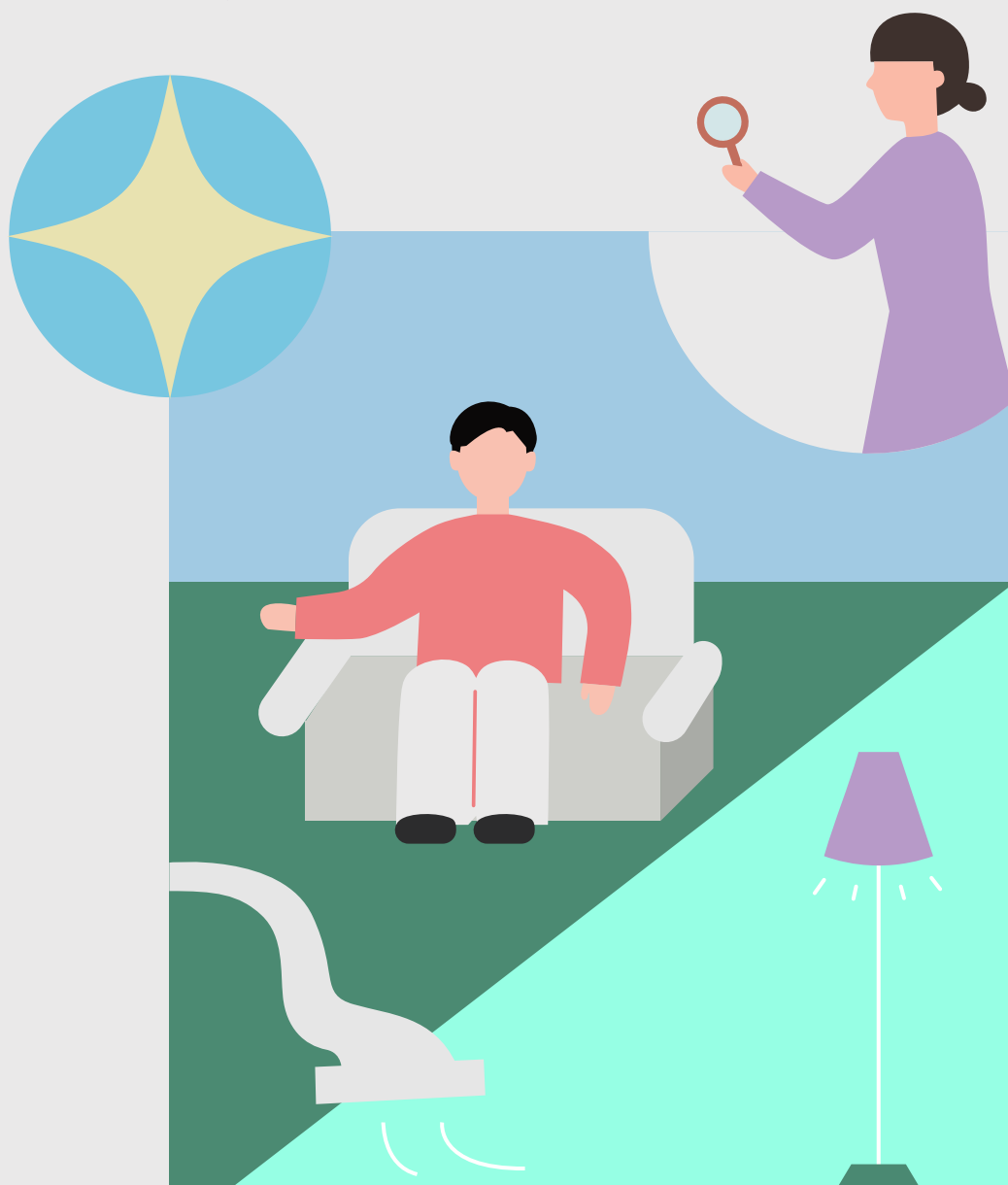
雙語教學資源手冊
生活科技 英語授課用語

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

〔 國中九年級 〕

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單元一　科技與科學的互動關係
The Interaction Between Science and Technology

高師大工業科技教育學系 周家豪

■　前言 Introduction

本單元的教學目標在於引導學生深入探討科技的本質，理解科技與科學之間密不可分的關聯，並思考如何通過跨學科知識的整合來推動科技的進一步發展。單元設計採取多層次的教學方法，展示科技與科學相輔相成的關係，強調學生合理運用科技以提升生活品質的能力。教學目標使學生能理解科學與科技的互動關係，並能舉例說明如何從科學發現中促進科技發展。同時能運用關鍵詞彙與句型來描述科學與科技的相互影響，最終，培養對科技如何解決實際問題的興趣，並提升批判性思維能力，能夠辨析科技進步與科學發現之間的動態互動，並提出科技創新與應用的全新見解。

The objective of this unit is to guide students in gaining a profound understanding of the nature of technology, recognizing the inseparable relationship between technology and science, and reflecting on how interdisciplinary knowledge can drive further technological advancements. The unit adopts a multi-dimensional instructional approach, illustrating the complementary relationship between technology and science, with a focus on empowering students to effectively utilize technology to enhance their quality of life. The teaching objectives aim to enable students to understand the interaction between science and technology and provide examples of how scientific discoveries promote technological development. Additionally, students will be able to use key vocabulary and sentence structures to describe the mutual influence of science and technology. Ultimately, the lesson seeks to cultivate students' interest in how technology solves real-world problems, enhance critical thinking skills, and empower them to analyze the dynamic interaction between technological advancements and scientific discoveries while offering fresh insights into technological innovation and application.

■　　**活動目標 Activity Goals**

活動一，學生能瞭解科學演進對科技發展的影響

Activity one aims to help students comprehend the progression of science and its impact on technological development.

活動二，學生能辨識科學發現如何促進科技發展，並舉例說明

Activity two aims to identify how scientific discoveries promote technological development and provide examples to illustrate.

■　　**詞彙 Vocabulary**

單字	中譯	單字	中譯
science	(n.) 科學	interaction	(n.) 互動
technology	(n.) 科技	development	(n.) 發展
discovery	(n.) 發現	experiment	(n.) 實驗
innovation	(n.) 創新	solution	(n.) 解決方案
principle	(n.) 原理	invention	(n.) 發明
application	(n.) 應用	impact	(n.) 影響

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

❶ **Have you ever had _____ of _____?**

例句：**Have you ever had** the experience **of** discovering something using a telescope?

你有使用望遠鏡發現東西的經驗嗎？

❷ **_____ is/are _____ that _____.**

例句：Microscopes are tools that help scientists study tiny organisms.

顯微鏡是幫助科學家研究微小生物的工具。

❸ **_____ is/are so_____ that _____.**

例句：Wind power is **so** innovative **that** it significantly reduces environmental pollution.

風力發電如此創新，以至於能大幅減少環境污染。

■ 　對話 Dialogues

對話一 Dialogue 1

Teacher: Hello students! Today we are going to introduce you guys to some scientific principles that can be utilized in regularly used technologies. Some phenomena are so inconspicuous that we often neglect the significance and take the results for granted. Without these scientific advancements, technology wouldn't be as prosperous as it is nowadays. We can definitely say that science and technology complement each other.

Student: I am curious about the difference between science and technology. Aren't these two similar?

Teacher: They do share some similarities but they are still different. Science discovers things, and technology uses those discoveries to make things.

Teacher: Science explains principles like gravity, and technology uses these principles to create tools like airplanes. Can you give an example of how science helps technology develop?

Student: Dynamics led to the invention of Wind power?

Teacher: Exactly! Science helps us understand how Dynamics works, and technology turns it into devices like Wind power blades.

Student: I didn't realize I was using all these tech products.

Teacher: Now that we have learnt a lot about science, we can think about solving problems within our lives. Do you guys have any ideas?

Student: How about we make a solar-powered car?

Teacher: If you really want to build a solar-powered car, you'll need to acquire the knowledge about the kinetic transmission system, the circuit system for a solar-powered motor and the structure of a car.

Student: Well, it'll be a complicated project! I'd better draw the design.

Teacher: Good idea! Once you get the design drawn we can discuss further details.

老師： 老同學們大家好！今天，我們將向大家介紹一些可以在我們日常科技中使用的科學原理。有些科學現象是如此不起眼，以至於我們常常忽略其重要性，並認為結果是理所當然的。如果沒有這些科學進步，科技就不會像今天這樣繁榮。可以肯定地說，科學與科技是相輔相成的。

學生： 我很好奇科學與科技之間的差異。這兩樣不是一樣的嗎？

老師： 它們確實有一些相似之處，但仍然有所不同。科學是發現一些東西，而科技用那些發現來做東西。

老師： 科學解釋像重力這樣的原理，而科技把這些原理用來創造工具，比如飛機。你們能舉出一個例子，說明科學如何幫助科技發展嗎？

學生： 力學讓我們有了風力發電？

老師： 完全正確！動力學幫助我們理解力的運作，而科技把它轉化為像風扇這樣的設備。

學生： 我在用這些科技產品時從來沒有意識到。

老師： 現在我們已經學到了很多科學知識，我們可以思考解決生活中的問題。你們有什麼想法嗎？

學生： 不如我們做一台太陽能驅動的車？

老師： 如果你真的想造一輛太陽能車，你需要瞭解動能傳動系統、太陽能馬達的電路系統和汽車的結構。

學生： 嗯，這將是一個複雜的項目！我最好把設計圖畫下來。

老師： 好主意！一旦你得到了設計圖，我們就可以討論更多的細節。

對話二 Dialogue 2

Teacher: Hello everyone, today we're going to discuss emerging technologies and 3D printing. First, do you know how emerging technologies have influenced our lives?

Student: Emerging technologies have had a significant impact on our lives. For example, smartphones and tablets have made it easy for us to access information and stay connected. At the same time, emerging technologies have also played a significant role in the medical field. For instance, surgical robots can perform more precise surgeries, which helps improve the success rate of patient treatments.

Teacher: That's absolutely correct. Now, let's shift our focus to 3D printing. Do you know what 3D printing is?

Student: I'm not so familiar with 3D printing. I've heard that you can create whatever you want with it.

Teacher: 3D printing is a manufacturing technology that uses data to design and create physical objects. Its applications are quite diverse, ranging from medical devices to automotive parts.

Student: So, what potential impacts could 3D printing have on the future?

Teacher: 3D printing can help us manufacture items in a more eco-friendly way by reducing the need for wasteful materials. Additionally, it enables personalized manufacturing, which is particularly useful in certain industries such as healthcare and fashion. It can also be utilized in classrooms for educational purposes.

Student: Teacher, how do we delve deeper into the study of emerging technologies and 3D printing in our classroom?

Teacher: Perhaps we can organize some hands-on 3D printing projects to experience the practical applications of this technology ourselves. At the same time, we can also invite industry experts to share their experiences and insights with us.

Student: Wow! I can't wait for the next lesson to begin!

老師： 大家好，今天我們要來討論新興科技和 3D 列印。首先，我們知道新興科技對我們的生活產生了哪些影響嗎？

學生： 新興科技對我們的生活影響很大。比如，智能手機和平板電腦讓我們可以輕鬆地訪問信息和保持聯繫。同時，新興科技也在醫療領域發揮了巨大作用，例如，手術機器人可以進行更精確的手術，這有助於提高病人的治療成功率。

老師： 那是非常正確的。現在，讓我們將注意力移到 3D 列印。你們知道 3D 列印是什麼嗎？

學生： 我對 3D 列印不太熟悉。我聽說你可以用它創造任何你想要的東西。

老師： 3D 列印是一種製造技術，它可以使用數據設計和創建實體物體。它的應用範圍很廣泛，包括從醫療器械到汽車零件。

學生： 那麼，3D 列印對未來的發展有哪些潛在影響呢？

老師： 3D 列印可以幫助我們更環保地生產物品，因為它減少了浪費材料的需求。同時，它也能夠實現個性化製造，這對一些特定行業如醫療和時尚非常有用。它還可以在教室中用於教育中。

學生： 老師，我們如何在課堂上深入研究新興技術和 3D 列印？

老師： 或許我們可以組織一些 3D 列印的實作項目，親自體驗這項技術的實際應用。同時，我們也可以邀請業界專家與我們分享他們的經驗和見解。

學生： 哇！我等不及下一課開始了！

單元二 產品創新與設計策略
Product Innovation and Design Strategy

高師大工業科技教育學系 周家豪

■ 前言 Introduction

本單元的核心在於培養學生掌握產品設計的六個關鍵步驟。重點強調引導學生從概念發想到產品實現的完整流程，逐步進行構思的調整與聚焦，最終將相關知識運用於具體的產品開發過程。學生需理解，產品設計的核心在於深入洞察使用者需求，通過問題分析，找出可行的解決方案，並最終運用科學知識將構思轉化為實際產品。

本單元設計了四個挑戰，學生可以依照順序逐步完成每一個關卡。雖然各階段的細節繁複，但只要在設計過程中始終保持對消費者的「同理心」，即可順利完成產品的設計與開發。此過程不僅要求學生具備科學知識的應用能力，更需要他們能夠靈活地解決設計中的實際問題，確保最終產品符合市場需求。

The primary focus of this unit is to equip students with the mastery of the six essential steps of product design. Emphasis is placed on guiding students through the entire process, starting from the ideation phase, refining and narrowing down their concepts, and finally applying their knowledge to create tangible products. Students must understand that the key to successful product design lies in identifying user needs, analyzing problems, and finding feasible solutions, ultimately utilizing scientific knowledge to bring their product ideas to fruition.

The unit is divided into four challenges, which students can undertake sequentially. While each stage involves detailed and intricate processes, maintaining a sense of "empathy" towards the consumer throughout the design journey will ensure the successful completion of the product design. This process not only tests the students' ability to apply scientific knowledge but also requires them to solve practical design challenges, ensuring that the final product aligns with market needs.

■　活動目標 Activity Goals

活動一，學生在此單元能熟悉「產品設計流程」的六項順序，並瞭解各階段的任務。

Activity one aims to develop students' familiarity with the six sequential stages of the "Product Design Process" and to instill a nuanced understanding of the tasks associated with each phase.

活動二，學生能瞭解產品設計中「規劃階段」與「概念發展階段」，在於評估使用者的需求並做出市場調查與分析，最終確認產品的定位與目標客群。

Activity two aims to foster students' comprehension of the "Planning Phase" and "Concept Development Phase" in product design, involving the assessment of user needs, conducting market research and market analysis. Finally, confirming the positioning of the product and its target audience.

活動三，學生能夠理解「系統整體設計階段」之意義，透過反覆評估與修正產品的設計，想盡方法降低產品所帶來的負面損害。

Activity three aims to empower students with the ability to comprehend the significance of the "Overall Systematic Design Phase." This entails the iterative assessment and refinement of the product's design, employing various methodologies to mitigate the potential negative ramifications associated with the product.

活動四，學生能夠知道「細部設計」與「測試修正」環節中，可透過簡易的材料進行建模，以此來幫助瞭解產品的組裝步驟、材料尺寸和瞭解後續維護方式。

Activity four aims to cultivate students' awareness of the "Detailed Design Phase" and "Testing and Correction Phase". The utilization of rudimentary materials for modeling facilitates comprehension of product assembly procedures, material dimensions and insight into subsequent maintenance modalities.

■ 詞彙 Vocabulary

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單字	中譯	單字	中譯
revaluation	(n.) 重估	proposal	(n.) 方案
production	(n.) 生產流程	criterion	(n.) 尺度
creativity	(n.) 創意	tolerance	(n.) 公差
survey	(n.) 市調	fuse	(n.) 保險絲
replaceable	(n.) 可替代性	analysis	(n.) 分析
explanation	(n.) 解釋	ramification	(n.) 衍生

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

❶ _____ is/ are used as a tool to _____.

例句：The checklist **is used as a tool to** record progress.

　　　檢查表被用作一個記錄進度的工具。

❷ _____ is/are the _____ who _____.

例句：She **is** the girl **who** thought of this idea.

　　　她是提出這個想法的女孩。

❸ **Have you _____ what _____ you're going to _____?**

例句：**Have you** decided **what** proposal **you're going to** execute after the meeting?

現代科技如此先進以至於我們能夠預測地震活動。在會議之後，你已經決定要執行哪個提案了嗎？

■　**對話 Dialogues**

對話一 Dialogue 1

Teacher: Good morning, class. Today, we're delving into the exciting topic of product design. Can anyone tell me what product designing is?

Student: Is it about making things look good in advertisements or TV shows?

Teacher: That's indeed a part of it! Product designing is not just about aesthetics; it's a comprehensive process that involves creating functional, user-friendly, and visually appealing products. Let's break it down into key stages.

Student: Like planning and sketching?

Teacher: Exactly! The initial stage is the planning phase, where we assess user needs, conduct market research and define our target audience. We then move to the concept development phase, where we sketch and refine ideas. Can you think of products you use every day that went through these stages?

Student: Smartphones, maybe?

Teacher: Precisely! Now, after we have the big picture, we will move to the systematic whole design phase. This involves evaluating how all the different parts of the product work together seamlessly. Any ideas on why this step is crucial?

Student: To make sure everything fits and works well together?

Teacher: That's spot on! The detailed design phase follows, where we specify materials, dimensions, and assembly processes. And what do you think comes next?

Student: Testing, right?

Teacher: Absolutely! Testing and correction. We create prototypes, identify any issues, and refine our designs accordingly. It's a critical step to ensure the product meets quality standards.

Student: So, it's like a step-by-step process?

Teacher: Yes, exactly! Each stage builds on the previous one, leading to a well-thought-out and carefully designed product. Now, let's apply these concepts. Your assignment is to think of a product, go through these stages in your mind, and sketch your ideas. We'll discuss them in the next class. Ready to get creative?

Student: Definitely!

老師： 早安，同學們。今天我們將探索產品設計的精彩世界。有人能告訴我什麼是產品設計嗎？

學生： 是不是與在廣告或電視節目中讓東西看起來好看的方式？

老師： 確實是其中的一部分！產品設計不僅僅關乎美學；它是一個全面的過程，涉及創建功能性、用戶友好且視覺上吸引人的產品。讓我們分解為幾個關鍵階段。

學生： 像是規劃和素描嗎？

老師： 確切！初始階段是規劃階段，我們在這階段評估用戶需求，進行市場研究，並定義我們的目標受眾。然後我們轉向概念發展階段，我們在這裡素描和完善想法。你能想到每天使用的產品可能經歷了這些階段嗎？

學生： 智能手機，也許？

老師： 完全正確！現在，在我們有了整體圖景之後，我們轉向系統整體設計階段。這涉及評估產品的所有不同部分如何無縫地協同工作。你有沒有想過為什麼這一步是至關重要的呢？

學生： 確保一切都能很好地契合和協同工作？

老師： 一針見血！接下來是詳細設計階段，我們在這裡指定材料、尺寸和裝配流程。你認為接下來是什麼？

學生： 測試，對吧？。

老師： 完全正確！測試和修正。我們創建原型，找出任何問題，並根據需要完善我們的設計。這是確保產品符合質量標準的關鍵步驟。

學生： 所以，就像一個逐步的過程？

老師： 是的，正是如此！每個階段都建立在前一個階段的基礎上，引領我們走向一個深思熟慮且精心設計的產品。現在，讓我們應用這些概念。你們的任務是想一個產品，心中經歷這些階段，然後素描你們的想法。我們下節課再來討論。準備好要發揮創意了嗎？

學生： 是的！

對話二 Dialogue 2

Teacher: Hello everyone! Today, let's focus on a crucial aspect of product design – market research. Who can tell me why market research is essential in the product design process?

Student: Is it about understanding what people want so we can design products that meet their needs?

Teacher: That's absolutely correct. Market research helps us gain insights into consumer preferences, needs, and behaviors. Now, in the context of product design, why might this be crucial in the early stages?

Student: To make sure our product will be something people actually want?

Teacher: Exactly! Before we invest time and resources into designing a product, we need to ensure there's a demand for it. Now, in the market research stage, what specific tasks might we undertake?

Student: Surveys and interviews, maybe?

Teacher: Brilliant! Surveys and interviews are fantastic methods. We can collect direct feedback from potential users and learn about their expectations. Additionally, what else might we consider?

Student: Observing competitors?

Teacher: Precisely! Armed with the knowledge from market research, we can design products that not only meet consumer needs but also stand out in the market. Your assignment is to think about a product you like and consider how market research might have influenced its design. We will share our findings in the next class.

Student: Wow! I'm looking forward to it!

老師： 大家好！今天，讓我們聚焦於產品設計中一個至關重要的部分 – 市場研究階段。有人能告訴我為什麼市場研究在產品設計過程中至關重要嗎？

學生： 這是不是為了理解人們的需求，這樣我們就可以設計符合他們需求的產品？

老師： 非常正確。市場研究幫助我們瞭解消費者的喜好、需求和行為。現在，在產品設計的背景下，為什麼這在早期階段可能是至關重要的呢？

學生： 確保我們的產品是人們實際上想要的東西？

老師： 完全正確！在我們投入時間和資源進行產品設計之前，我們需要確保有對它的需求。現在，在市場研究階段，我們可能會進行哪些具體的任務？

學生： 也許是進行調查和訪談？

老師： 太棒了！調查和訪談是很棒的方法。我們可以直接收集潛在用戶的反饋，瞭解他們的期望。此外，我們還可以考慮哪些事情？

學生： 觀察競爭對手？

老師： 確實！憑藉市場研究的知識，我們可以設計既滿足消費者需求又在市場上脫穎而出的產品。你們的作業是思考一下你們喜歡的產品，看看市場研究可能如何影響它的設計。我們下節課分享我們的發現。準備好去探索市場了嗎？

學生： 哇！我等不及下一課開始了！

單元三 電子元件與電能控制技術應用
Applications of Electronic Components and Power Control Technology

高師大工業科技教育學系 周家豪

■ 前言 Introduction

本關卡旨在引導學生從傳統的機械製作與加工技術，逐步進入「電」的領域，讓學生深刻理解電力對現代生活的重大影響。挑戰一中，將通過探討電子科技的發展歷程，以電風扇為案例，介紹生活中常見電子產品的元件及其運行的科技系統。此過程幫助學生認識電子產品的結構與原理。

隨後，挑戰二和挑戰三將深入介紹各種常見的電子元件及製作電子電路的常用工具，為未來進行電路設計與實作活動奠定基礎，滿足教學需求。這些挑戰幫助學生熟悉實際操作所需的工具和材料，使學生能夠獨立完成簡單的電路設計。

最後，在挑戰四中，以專題製作活動為框架，學生將整合前期所學，設計並製作出具有創意的桌上型電動清潔機。這一製作過程包括明確定義問題、主題構思與資料收集、設計草圖繪製、選擇電路與材料並進行製作、最終測試和產品改良。此專題製作旨在提升學生的實作能力與創新思維，讓學生能夠從實際問題出發，運用科學知識解決現實生活中的需求。

This unit aims to guide students from the realm of traditional mechanical works and processing techniques into the domain of "electricity," helping them gain a comprehensive understanding of electricity's profound impact on modern life. In Challenge 1, the development of electronic technology is explored, using the electric fan as an example to introduce the components and technological systems within everyday electronic products. This helps students grasp the structure and principles behind electronic devices.

Following this, Challenges 2 and 3 provide an in-depth introduction to various common electronic components and the tools typically used in electronic circuit design, laying the groundwork for future circuit implementation activities. These challenges familiarize students with the necessary tools and materials for practical applications, enabling them to independently complete basic circuit designs.

Finally, in Challenge 4, a project-based activity framework is used to guide students in integrating previously learned knowledge to design and create a creative desktop electric cleaning machine. The production process involves clearly defining the problem, brainstorming and collecting data, sketching design diagrams, selecting circuits and materials, and performing the final testing and improvement of the product. This project aims to enhance students' hands-on skills and innovative thinking, encouraging them to apply scientific knowledge to solve real-world needs.

■　活動目標 Activity Goals

活動一，以電子科技的發展史引導學生建立對於電子科技的背景知識，再以電風扇為例解說生活中的電子產品所包含的元件及其科技系統。

Activity one aims to establish students' background knowledge of electronic technology by using its history as guidance, then using the electric fan as an example to further explain the components and technological systems included in electronic products in our daily lives.

活動二，學生能瞭解生活中常見的各類電子元件，以及製作電子電路的常用工具。

Activity two, students can learn about various electronic components which are common in life plus common tools for making electronic circuits.

活動三，學生能夠進行三用電表的各項操作，並進行焊接電路「英雄手套」的實作活動。

Activity three, students will be able to perform various operations with a multimeter and participate in the practical activity of soldering circuits for the "Hero's Glove."

活動四，學生能夠整合前面關卡的各項知識，應用於創意清潔機的設計與製作，並以小組的形式，合作完成專題活動。

Activity Four, students will integrate the knowledge acquired from previous stages and apply it to the design and production of a creative cleaning machine. They will work in groups and collaborate to complete the project activity.

■ 詞彙 Vocabulary

單字	中譯	單字	中譯
multimeter	(n.) 萬用電表	breadboard	(n.) 麵包板
circuit board	(n.) 電路板	needle-nose pliers	(n.) 尖嘴鉗
transistor	(n.) 電晶體	stepper motor	(n.) 步進馬達
resistor	(n.) 電阻	capacitor	(n.) 電容
switch	(n.) 開關	component	(n.) 元件
diode	(n.) 二極體	quantum computer	(n.) 量子電腦

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

❶ _____ require(s) _____, doesn't ____?

例句：Soldering **requires** steady hands, **doesn't** it?

　　　銲接需要穩定的手，對吧？

❷ _____ that is _____ used to be_____.

例句：The battery **that is** on the shelf **used to be** connected to the circuit.

　　　在架子上的電池曾經連接到電路上。

❸ The _____ for _____ is either between _____ and _____.

例句：**The** forward voltage [Vf] **or** a typical red LED light bulb **is typically between** 1.8 **and** 2.4 volts.

　　　一般紅色 LED 燈泡的順向電壓通常介於 1.8 到 2.4 伏特之間。

■　對話 Dialogues

對話一 Dialogue 1

Teacher:　Good morning, class. Today, we're delving into the intricacies of multimeters and their practical applications in our everyday routines. First off, has anyone ever used a multimeter?

Student:　I have indeed had the chance to utilize a multimeter during a science project last semester.

Teacher:　Excellent! It's great to have some hands-on experience among us. Could you share with the class how you employed the multimeter and what you learned from the experience?

Student:　Well, we used the multimeter to measure the voltage and current across different components of a simple circuit. It was fascinating to see how the readings varied based on the circuit's configuration.

Teacher: Fascinating indeed! It's remarkable how such a tool can provide valuable insights into the workings of electrical systems. Who else would like to share their experiences or thoughts on using a multimeter?

Student: I once used a multimeter to measure the current of the DC fan in my room when I was bored!

Teacher: That's insightful. Multimeters can also measure currents, but remember, though, multimeters are not toys; they should be handled with care and caution.

Student: I have heard that multimeters can also check faulty circuits.

Teacher: That's absolutely correct! This is probably the main use of multimeters.
By checking the resistance in a circuit, we could pinpoint a faulty connection and fix it.

Student: Are there specific models or features we should consider when selecting one for our projects?

Teacher: Depending on the type of usage, I recommend you buy a digital multimeter since the display value is often clear and these multimeters usually have more built-in functions.

Student: Once we have a multimeter, how do we set it up to get the value we want to measure?

Teacher: Good question! First off, you want to make sure you choose the setting that matches the quantity you wish to measure via the rotary dial or buttons. Second, choose an appropriate range for your expected value. For example, if you expect the voltage to be around 5 volts, choose a voltage range that includes this value.

Student: Then we insert the probes, right? The black probe goes into the COM socket, and the red probe goes into the socket corresponding to the measurement.

Teacher: Exactly! Lastly, the final step is to connect the probes to the device or the circuit you wish to measure. The value will be directly shown on the screen.

Student: Ah! I see! I can't wait to test out the multimeter that I bought yesterday!

老師：　早安，同學們。今天，我們將討論電表的功能以及如何在日常生活中使用它。首先，有人用過萬用電表嗎？

學生：　我確實有機會在上學期的一個科學項目中使用過萬用電表。

老師：　太棒了！我們中間有些人有實地經驗真是太好了。你可以和班上分享一下你是如何使用萬用電表以及你從這次經驗中學到了什麼嗎？

學生：　嗯，我們使用萬用電表來測量一個簡單電路中不同元件的電壓和電流。看到讀數如何根據電路的配置而變化，真是令人著迷。

老師：　確實令人著迷！這樣的工具如何提供對電氣系統運作的寶貴見解，真是令人驚嘆。還有誰想分享他們使用多用電表的經驗或想法呢？

學生：　我曾經在無聊的時候使用它來測量我房間風扇的電流！

老師：　這真是一個有見的觀察。多用電表也可以測量電流，但請記住，萬用電表不是玩具；它們應該被小心謹慎地使用。

學生：　我聽說萬用電表還可以檢查故障電路。

老師：　這是絕對正確的！這可是萬用電表的主要用途。通過檢查電路中的電阻，我們可以找出故障的接點並加以修復。

學生：　選擇萬用電表時，我們應該考慮特定的型號或功能嗎？

老師：　根據使用情況不同，我建議你購買數字萬用電表，因為其值通常更準確，並且通常內置了更多功能。

學生：　使用萬用電表時，我們如何進行設置以獲得我們想要測量的值呢？

老師：　好問題！首先，您要確保通過旋轉撥盤或按鈕選擇與您希望測量的數量相匹配的設置。其次，選擇適合您期望值的範圍。例如，如果您期望電壓在 5 伏特左右，請選擇一個包括此值的電壓範圍。

學生：　是的，接下來我們插入探針，對吧？黑色探針插入 COM 插座，紅色探針插入與所測量的數值相對應的插座。

老師：　正確！最後，最後一個步驟是將探針連接到您希望測量的設備或電路上。數值將直接顯示在屏幕上。

學生：　啊！我明白了！我迫不及待要測試昨天買的萬用電表了！

對話二 Dialogue 2

Teacher: Good morning, class. Today's lesson centers around the diverse array of batteries and their applications in our everyday routines. Can anyone provide an illustration?

Student: I often hear about the lithium-ion battery.

Teacher: Yes! It's commonly employed in smartphones and portable electronic devices due to its high energy density and rechargeable nature.

Student: I think we've learned there's a lead-acid battery in natural science class, frequently utilized in automotive applications for starting engines and providing auxiliary power.

Teacher: Seems like you've paid a lot of attention in class! Lead-acid batteries indeed play a vital role in the automotive industry, facilitating the smooth operation of vehicles.

Student: What about the batteries we put in remote controls? What are those?

Teacher: These are called alkaline batteries, which are widely used in household items such as toys, and flashlights due to their long shelf life and affordability.

Student: Can we recharge alkaline batteries when they run out of energy? Throwing them away seems like a waste of money and not good for our earth's sustainability.

Teacher: Unfortunately, we can't recharge them due to their natural chemical composition. We should lessen reliance on such batteries, as they are not beneficial to the earth's sustainability.

對話二 Dialogue 2

老師：　早安，同學們。今天的課程圍繞著各種不同類型的電池及其在我們日常生活中的應用展開。有人能舉例嗎？

學生：　我經常聽說鋰離子電池。

老師：　是的！由於其高能量密度和可充電的特性，鋰離子電池常被用於智能手機和便攜式電子設備中。

學生：　我記得我們在自然科學課上學過有關鉛酸電池的知識，這種電池經常用於汽車應用中，用於啟動引擎和提供輔助動力。

老師：　看來你在課堂上確實很用心！鉛酸電池確實在汽車工業中扮演著重要角色，有助於車輛的平穩運行。

學生：　那些在遙控器中放置的電池是什麼？

老師：　既然你提到了，那些被稱為鹼性電池，因其長久的保質期和價格親民，被廣泛用於家用物品如玩具和手電筒中。

學生：　當鹼性電池用完能量後，我們能夠將它們充電嗎？把它們丟掉似乎是浪費金錢且不利於地球的永續經營。

老師：　不幸的是，由於它們的天然化學組成，我們無法將它們充電。我們應該減少對這類電池的依賴，因為它們對地球的永續性沒有好處。

單元四 控制系統與邏輯運作原理
Control Systems and Logic Operation Principles

高師大工業科技教育學系 周家豪

■ 前言 Introduction

本單元的重點在於讓學生學習控制系統的基本原理與實際應用，並深入理解微控制器的結構與功能。在第一個挑戰中，將探討控制系統的運作模式，並以物聯網（IoT）作為範例，介紹日常生活中常見的控制裝置。透過這項挑戰，學生將掌握控制系統的基本概念及其在現代技術中的應用。

在第二個挑戰中，將引導學生瞭解兩款主要的微控制器：Micro: bit 和 Arduino，並進行詳細比較，探討功能特點、適用場景與技術優勢。此過程有助於學生在不同的應用場合下選擇合適的控制器，進一步提升他們的技術判斷能力。

最後，將帶領學生綜合運用所學的知識與技能，設計並製作一個具創意的選擇機。這個專案不僅讓學生實際操作微控制器的設計與編程，還能激發學生的創造力與問題解決能力，從而加深對控制系統及微控制器的實際應用的理解。

This unit emphasizes teaching students the fundamental principles and practical applications of control systems, as well as the structure and functionality of microcontrollers. In the first challenge, we will explore how control systems function, using the Internet of Things (IoT) as an example to introduce common control devices found in daily life. Through this challenge, students will acquire a foundational understanding of control systems and their applications in modern technology.

In the second challenge, students will be introduced to two key microcontrollers: Micro:bit and Arduino. A detailed comparison will be made, focusing on their features, use cases, and technical advantages. This will help students enhance their ability to select appropriate controllers for different applications, sharpening their technical decision-making skills.

Finally, students will be guided to apply the knowledge and skills they have learned to design and create a creative selecting machine. This project not only involves hands-on experience with microcontroller design and programming but also fosters creativity and problem-solving skills, deepening students' understanding of the practical applications of control systems and microcontrollers.

■　活動目標 Activity Goals

活動一，學生在此單元能認識控制邏輯系統，並學會區分電子電路與程式控制的差異。最後，學生可以熟悉物聯網的概念與生活中的應用。

Activity one allows students to understand control logic systems in this unit and learn to distinguish between electronic circuits and programming controls. Finally, students will become familiar with the concept of the Internet of Things (IoT) and its applications in daily life.

活動二，學生能認識常見的微控制器與配件，並比較使用不同微控制器能達到的效果與他們的功能。

Activity 2 enables students to familiarize themselves with common microcontrollers and accessories and compare the effects and functionalities achieved with different microcontrollers.

■　詞彙 Vocabulary

單字	中譯	單字	中譯
Internet of Things (IoT)	(n.) 物聯網	programmable	(adj.) 可編程的
microcontroller	(n.) 微處理器	photoresistor	(n.) 光敏電阻
transistor	(n.)電晶體	module	(n.) 模組
Programmable Logic Controller (PLC)	(n.)可控式控制器	Liquid Crystal Display (LCD)	(n.) 液晶螢幕
automation	(v.)自動化	latency	(n.) 延遲
antenna	(n.)天線	adaptive	(adj.) 自適應

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

❶ **All/Some of the _____ will be _____.**

例句：**All of the** data collected by this sensor **will be** stored in an online database.

這個感測器收集的所有數據將存儲在一個在線數據庫中。

❷ **The _____ was _____ by _____.**

例句：**The** robotic arm **was** controlled **by** a microcontroller.

這個機械手臂由一個微控制器控制。

❸ _____ are the _____ which _____.

例句：The radars within this car **are the** crucial components **which** make this car unique.

這輛汽車內部的雷達是使這輛汽車獨特的關鍵組件。

■　對話 Dialogues

對話一 Dialogue 1

Teacher:　Hello, everyone. Today, we're going to briefly talk about the Internet of Things (IoT). How much do you guys know about this technology?

Student:　I've heard of IoT before, but I'm not entirely sure how it works.

Teacher:　That's alright, it's still a fairly new technology. IoT involves connecting everyday objects to the internet to gather and share data.

Student:　So, for example, can a smart water bottle connect to the internet?

Teacher:　Absolutely, IoT indeed revolves around connecting various devices and objects to the internet, allowing them to communicate and exchange data. A Smart water bottle sounds like a decent IoT product.

Student:　Isn't security a major concern with IoT devices, considering they collect and transmit data?

Teacher:　Cyber security is in fact a major concern of IoT. To be honest, we can't fully prevent personal information from leaking out, so it's best to not share personal or sensitive information within the platform or service.

Student:　I've heard about IoT being used for environmental monitoring and conservation efforts. Is that true?

Teacher:　Yes! IoT plays a significant role in environmental monitoring by enabling the collection of real-time data in relation to factors like air quality, soil moisture, and wildlife activity. This data helps scientists and conservationists make informed decisions to protect our environment.

Student:　How do we collect those figures?

Teacher:　Well, by using the right sensors and the right program, we can utilize the data for further use! Next class, we will be going through programming our Micro:Bit microcontroller!

Student:　I can't wait for the next class!

老師：　大家好。今天，我們將簡要談論物聯網（IoT）。你們對這個科技瞭解多少呢？

學生：　我以前聽過物聯網，但我不完全確定它是如何運作。

老師：　沒問題，因為這仍然是一項相對較新的技術。物聯網涉及將日常物品連接到互聯網，以收集和分享數據。

學生：　所以，例如，智能水瓶可以連接到互聯網嗎？

老師：　確實，物聯網的核心在於將各種設備和物品連接到互聯網，使它們能夠通信和交換數據。智能水瓶聽起來像是一個不錯的物聯網產品。

學生：　考慮到物聯網設備收集和傳輸數據，安全是否是一個主要關注的問題？

老師：　事實上，網絡安全確實是物聯網的一個主要關注點。老實說，我們無法完全防止個人信息泄露，所以最好不要將個人敏感信息分享給平台或服務。

學生：　我聽說物聯網被用於環境監測和保護工作。這是真的嗎？

老師：　是的！物聯網在環境監測方面發揮了重要作用，它可以收集有關空氣質量、土壤濕度和野生動物活動等因素的實時數據。這些數據有助於科學家和保育人員做出明智的決策，以保護我們的環境。

學生：　我們如何收集這些數據呢？

老師：　通過使用合適的感測器和合適的程序，我們可以利用這些數據進行進一步的應用！下一堂課，我們將學習編程我們的 Micro:Bit 微控制器！

學生：　我等不及下一堂課了！

對話二 Dialogue 2

Teacher:　Hello class, today we are going to talk about microcontrollers and will go through a bit of programming. First off, what do we know about microcontrollers?

Student:　Guessing by the name, they probably are small computing devices that can be programmed to control various electronic systems.

Teacher:　Yes, that's exactly what they are. You can find several different kinds of microcontrollers, we are going to talk about how to program Micro:Bit and Arduino via an integrated development environment (IDE) later on.

Student:　What are these little blocks on my Micro:Bit board?

Teacher:　That's probably the main processor, the core of the board. All the data that is picked up by the sensor and will be processed over there.

Student:　What's the difference between a microcontroller and a computer?

Teacher:　That's a great question! Microcontrollers are indeed different from regular computers in several ways. Unlike regular computers, which are general-purpose devices capable of running various software applications, microcontrollers are specialized computing devices designed for specific tasks.

　　　　　They are typically embedded within electronic systems and operate with limited resources. E.g. memory and processing power.

Student:　So, in what places do we often see microcontrollers being used?

Teacher:　There are countless projects you can create with microcontrollers, ranging from basic LED blinking exercises to advanced robotics and automation projects. For instance, you can build a weather station that collects and displays real-time weather data using sensors and a microcontroller, or you can create a home automation system that controls lights, appliances, and security devices.

Student:　I can't wait to start using them in my own project!

老師：　同學們，大家好。今天我們要討論微控制器並進行一些程式編寫。首先，關於微控制器，大家知道些什麼呢？

學生：　從名稱來猜測，它們可能是可以編程來控制各種電子系統的小型計算設備。

老師：　是的，這正是它們的功能。你可以找到幾種不同類型的微控制器，我們稍後將討論如何通過集成開發環境（IDE）來編程 Micro:Bit 和 Arduino。

學生：　這些小方塊是我 Micro:Bit 板上的什麼東西呢？

老師： 那可能是主要的處理器，是板子的核心。所有由感測器收集的數據將在那裡進行處理。

學生： 微控制器和電腦之間有什麼區別呢？

老師： 這是個很好的問題！微控制器確實與普通電腦在幾個方面有所不同。與普通電腦不同，普通電腦是通用設備，能夠運行各種軟件應用程序，微控制器是專用計算設備，專門設計用於特定任務。它們通常嵌入在電子系統中，並使用有限的資源，如內存和處理能力。

學生： 那麼，我們通常在哪些地方看到微控制器被使用呢？

老師： 使用微控制器，你可以建立無數的項目，從基本的 LED 閃爍練習到進階機器人和自動化項目。例如，你可以建立一個天氣站，使用感測器和微控制器收集並顯示實時天氣數據，或者你可以創建一個家庭自動化系統，控制燈光、家電和安全設備。

學生： 我迫不及待地想開始在我的項目中使用它們！

單元五　創意機器人清潔設備的設計製作
Design and Creation of Creative Robotic Cleaning Devices

高師大工業科技教育學系 周家豪

■　前言 Introduction

本課程設計旨在通過一系列有系統的關卡，指導學生在製作清掃機器人的過程中，將過去所學的知識與技能進行整合，並運用於實際的創造性實踐活動中。課程從一開始便專注於培養學生的基礎知識與技術能力，涵蓋從機器人結構認識到基本電路原理的各個方面，幫助學生建立堅實的學習基礎。

隨著課程的推進，學生將被逐步引導進入更為高階的主題，如感應器應用、馬達控制等，培養他們靈活運用這些專業知識的能力，並將其應用於機器人設計與製作的各個階段。課程設計強調教學的連貫性與系統性，目的是讓學生能夠更加透徹地理解知識之間的相互關聯，並通過實際操作將這些分散的概念有機結合，最終形成一個完整的學習體系。

This curriculum is designed to guide students through a structured series of stages, where they integrate previously acquired knowledge and skills into the hands-on, creative process of building a cleaning robot. From the beginning, the course emphasizes the development of students' foundational understanding and technical abilities, covering areas such as robot structure recognition and basic circuit principles, enabling students to establish a solid foundation.

As the course progresses, students will be gradually introduced to more advanced topics, such as sensor applications and motor control, fostering their ability to apply these specialized concepts flexibly throughout the various phases of robot design and fabrication. The curriculum is designed with a strong focus on coherence and systematic instruction, aiming for students to gain a deeper understanding of the interconnections between different areas of knowledge. Through practical application, they will be able to integrate these concepts into a comprehensive learning framework.

■　　活動目標 Activity Goals

活動一，學生在此單元能回顧產品設計的流程，檢視之前所到的重點知識與技能。

Activity One: Students will review the product design process in this unit, examining key knowledge and skills acquired previously.

活動二，學生能運用創意思考、製圖技巧、結構與機構、能源與動力和電與控制等相關知識，設計創意清掃機器人。

Activity Two: Students will employ creative thinking, drafting skills, structures and mechanisms, energy and power, as well as electrical and control-related knowledge to design some innovative cleaning robots.

活動三，學生能夠運用電路控制邏輯知識，針對特殊需求設計程式進行控制。

Activity Three: Students will apply their understanding of circuit control logic to design programs for specialized requirements.

活動四，學生能夠運用製圖技巧，繪製完整的工作圖並進行尺度標註。

Activity Four: Students will utilize drafting skills to create comprehensive working drawings and perform scale annotations.

■　　詞彙 Vocabulary

單字	中譯	單字	中譯
hex-key wrench	(n.) 內六角板手	receiver	(n.) 接收器
tin-lead solder	(n.) 銲錫	hot melt adhesive	(n.) 熱熔膠
suction cleaner	(n.) 吸塵器	mind map	(n.) 心智圖

potential difference	(n.) 電位差	diagonal cutting nipper	(n.) 斜口鉗
touch panel	(n.) 觸控面板	laser cutting machine	(n.) 雷切機
power supply	(n.) 電源供應	direct current motor	(n.) 直流馬達

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

❶ **While he/she _____, he/she _____.**

例句：**While he** was laser cutting the components for the cleaning robot, **he** heard a strange noise.

當他正在使用雷射切割機切割清潔機器人的零件時，他聽到了一聲奇怪的聲音。

❷ **_____ is a type of _____ that can be _____.**

例句：Tin-lead solder **is a type of** metal alloy **that can be** used to connect two wires.

銲錫是一種金屬合金，可用於連接兩根電線。

❸ **Many _____ at _____.**

例句：**Many** technologies are advancing **at** an exponential velocity.

許多科技以指數速度進步。

■　**對話 Dialogues**

對話一 Dialogue 1

Teacher: Alright, class, today we're diving into the final phase of our cleaning robot project. We've covered a lot of ground so far, from understanding the basics of robot structures to delving into advanced topics like sensor technology and motor control. Now, it's time to bring it all together and design the complete system.

Student: Sounds exciting! So, what exactly are we going to be working on today?

Teacher: We're going to focus on designing the overall system, which includes the power supply, control components like microswitches and main switches, actuators such as motors and fans and considering the aesthetics with the casing/outer shell.

Student: Got it. So, we need to think about how all these components fit together and function as a cohesive unit, right?

Teacher: Exactly. We want to ensure that every part serves its purpose effectively and that the entire system operates smoothly. This is where all the knowledge and skills you've gained throughout the course will come into play.

Student: I see. So, for the power supply, are we using batteries or some other source?

Teacher: Good question. We'll explore different power options and discuss their pros and cons, considering factors like voltage requirements and battery life.

Student: And what about the control elements? How do we integrate the microswitches and main switches into our design?

Teacher: We'll discuss placement and wiring, making sure they're easily accessible for operation while ensuring safety and efficiency.

Student: And for the actuators, like motors and fans, how do we determine the specifications and configurations?

Teacher: We'll evaluate the requirements based on the tasks our robot needs to perform and select appropriate components accordingly. It's all about finding the right balance between power, speed, and functionality.

Student: Lastly, what about the outer shell? How do we make it both practical and visually appealing?

Teacher: We'll explore different design options, considering factors like durability, weight and aesthetics to create a casing that not only protects the internal components but also enhances the overall look of our robot.

Student: Sounds like we've got our work cut out for us, but I'm excited to get started!

老師： 好，同學們，今天我們要進入清潔機器人專案的最後階段。到目前為止，我們已經涵蓋了很多內容，從理解機器人結構的基礎知識到深入探討感測器技術和馬達控制等進階主題。現在，是時候把所有的東西結合起來，設計出完整的系統了。

學生： 聽起來很令人興奮！那我們今天具體要做些什麼呢？

老師： 我們要著重於設計整體系統，包括電源供應、控制元件（如微動開關和主開關）、執行元件（如馬達和風扇），並且考慮外觀，比如外殼。

學生： 明白了。所以，我們需要考慮所有這些元件如何結合在一起，並作為一個有機的整體運作，對吧？

老師： 正是如此。我們希望確保每個部分都有效地發揮作用，並且整個系統運行順暢。這就是你在整個課程中獲得的所有知識和技能發揮作用的時候了。

學生： 我明白了。那麼，關於電源供應，我們是使用電池還是其他來源呢？

老師： 好問題。我們將探討不同的電源選擇，並討論它們的優缺點，考慮諸如電壓要求和電池壽命等因素。

學生： 那麼控制元件呢？我們如何將微動開關和主開關集成到我們的設計中？

老師： 我們將討論它們的放置和連線，確保它們易於操作，同時確保安全和效率。

學生： 至於執行元件，比如馬達和風扇，我們如何確定規格和配置呢？

老師： 我們將根據機器人需要執行的任務來評估要求，並相應地選擇適當的元件。這一切都是為了在功率、速度和功能之間找到合適的平衡。

學生： 最後，外殼呢？我們如何使它既實用又外觀吸引人？

老師： 我們將探索不同的設計選擇，考慮耐用性、重量和美觀等因素，以創造出一個不僅保護內部元件而且還能提升整體機器人外觀的外殼。

學生： 聽起來我們有很多工作要做，但我很期待開始！

對話二 Dialogue 2

Teacher:	Good morning, class! Today, we're going to delve into programming the Micro: Bit to control our cleaning robot. But first, let's understand the various modules we'll be working with.
Student:	Sounds interesting! What modules are we using?
Teacher:	We'll be introducing the light sensor module, the infrared sensor module, and the ultrasonic sensor module. Each of these modules has unique functions that will help our robot navigate and perform its cleaning tasks effectively.
Student:	How does the light sensor module work?
Teacher:	The light sensor module detects the intensity of light in its surroundings. We can use it to make our robot react to changes in light, such as moving towards brighter areas for cleaning.
Student:	And what about the infrared sensor module?
Teacher:	The infrared sensor module can detect obstacles in front of the robot by emitting infrared light and measuring the reflection. We'll use it to help our robot avoid collisions while navigating.
Student:	Wait...there's still one more sensor, the ultra…?
Teacher:	The ultrasonic sensor! This sensor measures distance by emitting ultrasonic waves and calculating the time it takes for the waves to bounce back. With this module, our robot can detect obstacles in its path and adjust its movements accordingly.
Student:	I see. So, how do we control these modules using the Micro: Bit?
Teacher:	We'll use programming blocks to command the Micro: Bit to interact with each module. For example, we can use "if" statements to instruct the robot to move forward if the light sensor detects low light levels, or to stop if the infrared sensor detects an obstacle.
Student:	That makes sense! I'm excited to start coding our robot.

老師：	早安，同學們！今天我們要深入研究如何使用程式積木控制我們的清掃機器人。但首先，讓我們瞭解一下我們將要使用的各種模組。
學生：	聽起來很有趣！我們要使用哪些模組？
老師：	我們將介紹光敏模組、紅外線模組和超聲波模組。每個模組都有獨特的功能，將幫助我們的機器人有效地導航和執行清掃任務。
學生：	光敏模組是如何工作的？

老師： 光敏模組可以檢測周圍光線的強度。我們可以使用它來使我們的機器人對光線的變化做出反應，例如移動到光線更亮的區域進行清掃。

學生： 那紅外線模組呢？

老師： 紅外線模組可以通過發射紅外線光線並測量反射來檢測機器人前方的障礙物。我們將使用它來幫助我們的機器人在導航時避免碰撞。

學生： 等等…還有一個模組，叫超…甚麼的？

老師： 它叫超聲波模組!這模組通過發射超聲波並計算波反彈的時間來測量距離。有了這個模組，我們的機器人可以檢測到路徑上的障礙物並相應地調整移動。

學生： 我明白了。那麼，我們如何使用 Micro: Bit 控制這些模組呢？

老師： 我們將使用程式積木來命令 Micro: Bit 與每個模組進行交互。例如，我們可以使用「如果」語句指示機器人在光敏模組檢測到低光水平時向前移動，或者在紅外線模組檢測到障礙物時停止。

學生： 這有道理！我很期待開始替我們的機器人撰寫程式。

單元六　電子技術產業的演進與未來趨勢
Evolution and Future Trends of the Electronics Technology Industry

高師大工業科技教育學系 周家豪

■　前言 Introduction

本單元旨在引導學生深入探討電子技術產業的演進與未來趨勢，電子技術產業多年來發生了巨大的變化。過去，這個產業專注於工具製造和設備出口；如今，它在資訊產業中扮演著關鍵角色，希望學生能夠認識電子技術產業緣起與改變，在享受科技的同時，能夠瞭解電子技術的演進如何改變我們的生活與工作方式，從中培養學生對產業創新及未來趨勢的興趣，並建立對電子技術發展在日常生活中影響的認識。

教學目標學生能夠理解電子技術產業的歷史演變，從工具器具製造出口逐步轉型為以資訊產業為核心的形態，並能解釋這種轉變的意義，搭配關鍵詞彙和句型，學生能夠運用學到來描述產業趨勢，並用英文表達自己的觀點。有助於提升學生的社會參與感，更促使學生可持續的未來作出貢獻。

The objective of this unit is to guide students in exploring the evolution and future trends of the electronics technology industry. Over the years, this industry has undergone significant changes. In the past, it focused on manufacturing tools and exporting equipment; now, it plays a critical role in the information industry. The goal is for students to understand the origins and transformations of the electronics technology industry. While enjoying the benefits of technology, they will learn how the evolution of electronics has reshaped our ways of living and working. Through this process, students will develop an interest in industrial innovation and future trends and build awareness of the impact of electronics technology development on daily life.

Our instructional goal is students will understand the historical evolution of the electronics technology industry, transitioning from manufacturing and exporting tools to becoming information industry-centered, and explain the significance of this transformation. By incorporating key vocabulary and sentence structures, students will be able to describe industry trends and express their opinions in English. This will enhance students' sense of social engagement and encourage them to contribute to a sustainable future.

■　**活動目標 Activity Goals**

活動一，瞭解電子技術產業的歷史演進過程。

Understand the historical evolution of the electronics technology industry.

活動二，認識半導體從製造工具轉變到資訊產業中的角色。

Know the role of semiconductors in transitioning from manufacturing tools to the information industry.

■　**詞彙 Vocabulary**

單字	中譯	單字	中譯
semiconductor	(n.) 半導體	evolution	(n.)演進
manufacturing	(n.) 製造	trend	(n.) 趨勢
export	(n.) 出口 (貿易)	tool	(n.) 工具
technology	(n.) 科技	information	(n.) 資訊
innovation	(n.) 創新	adaptation	(n.) 適應
industry	(n.) 產業	globalization	(n.) 全球化

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

❶ I don't know how _____.

例句：**I don't know how** the semiconductor industry works.

　　　我不知道半導體產業是如何運作的。

❷ _____ are the most _____ right now.

例句：Semiconductors **are the most** popular industry **right now.**

　　　半導體是目前最流行的產業。

❸ _____ was/were_____ while _____.

例句：The company **was** expanding globally, **while** developing innovative products locally.
公司在全球擴展的同時，也在本地開發創新產品。

■　對話 Dialogues

對話一 Dialogue 1

Teacher: Alright class, today we're diving into a new unit focusing on the development of the electronics technology industry. It's crucial to understand how the development of the electronics technology industry from their evolution affects the world around us. Do you know what this industry focused on in the past?

Student: Was it about making machines or tools?

Teacher: That's right! In the past, the electronics industry primarily focused on manufacturing tools and mechanical equipment, which were exported to other countries. But over time, it shifted to focus on the information industry, producing products like smartphones, computers, and servers. Why do you think this change happened?

Student: Maybe because people now rely a lot on technology?

Teacher: Exactly! As technology advanced, the electronics industry began to meet the growing demand for information products. What about the future? Where do you think this industry is headed?

Student: Maybe smarter technology, like artificial intelligence?

Teacher: That's correct! Future trends will certainly move toward more efficient and intelligent products. The key technology behind this evolution, and what we're discussing today, is semiconductors. Semiconductors are not only the core of electronic products but also the driving force behind the progress of the information industry.

Teacher: Before discussing semiconductors, let's first explore the development of the electronics technology industry.

老師： 好了，同學們，今天我們要深入探討一個新的單元，重點是電子技術產業的發展。你們知道以前這個產業的重點是什麼嗎？瞭解電子技術產業的發展，對我們周圍的世界造成的影響是至關重要的。

學生： 是不是跟做一些機械或工具有關？

老師： 沒錯！在過去，電子技術產業主要專注於製造工具和機械設備，然後出口到其他國家。不過，隨著時間的推移，它逐漸轉變成以資訊產業為主，比如智慧型手機、電腦和伺服器等產品。你們覺得，為什麼會有這樣的改變？

學生： 因為現在大家都依賴科技吧？

老師： 說得很好！隨著科技的快速發展，電子產業開始滿足我們對資訊產品的需求。未來呢？你們認為這個產業會往什麼方向發展？

學生： 可能是更聰明的科技產品，比如人工智慧？

老師： 沒錯，未來的趨勢一定會朝向更高效、更智慧的產品發展。而其中的關鍵技術，就是我們今天要討論的半導體。半導體不僅是電子產品的核心技術，還推動了整個資訊產業的進步 。

老師： 討論半導體前先帶大家瞭解電子技術產業的發展。

對話二 Dialogue 2

Teacher: Alright, class, today we're going to delve into the semiconductor. As part of our unit on electronic products. We'll explore how the semiconductor industry works. Does anyone know what a semiconductor is?

Student: Is it used to make chips?

Teacher: That's right! A semiconductor is a special material that can control the flow of electricity. It's the foundation for making chips. Can you name some devices that use chips?

Student: iPhone, PS5, etc.…

Student: Computers and gaming consoles!

Teacher: Correct! Chips are like the brains of these electronic devices. Now, do you know what material semiconductors are made from?

Student: Is it silicon?

Teacher: Exactly! Silicon is a material extracted from sand. We process silicon into wafers, design circuits on them, and turn them into chips. Once the chips are made, they are tested to ensure they work properly. This is how the semiconductor industry operates.

Student: It sounds complicated but also fascinating!

Teacher: Then let's begin our journey from silicon to chips!

老師： 好了，同學們。今天我們要深入探討半導體，作為我們電子產品單元的一部分。我們將探討它如何生產運作，有人知道半導體是什麼嗎？。

學生： 是用來做晶片的嗎？

老師： 沒錯！半導體是一種特殊的材料，能夠控制電流的流動，它是製造晶片的基礎材料。那麼，你們知道晶片在哪些設備中被使用嗎？

學生： iPhone, PS5, etc…

學生： Computers and gaming consoles!

老師： 答對了！晶片可以說是這些電子設備的大腦。那麼，你們知道半導體是從什麼材料製造出來的嗎？

學生： 是矽嗎？

老師：　完全正確！矽是一種從沙子中提煉出來的材料。我們將矽加工成矽晶圓，然
　　　　後在上面設計電路，把它變成晶片。製造完成後，晶片還需要進行測試，確
　　　　保它們能正常運作。這就是半導體產業的運作方式之一。

學生：　聽起來很複雜，但也很有趣！

老師：　那我們現在就開始，從矽到晶片的旅程吧！

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	

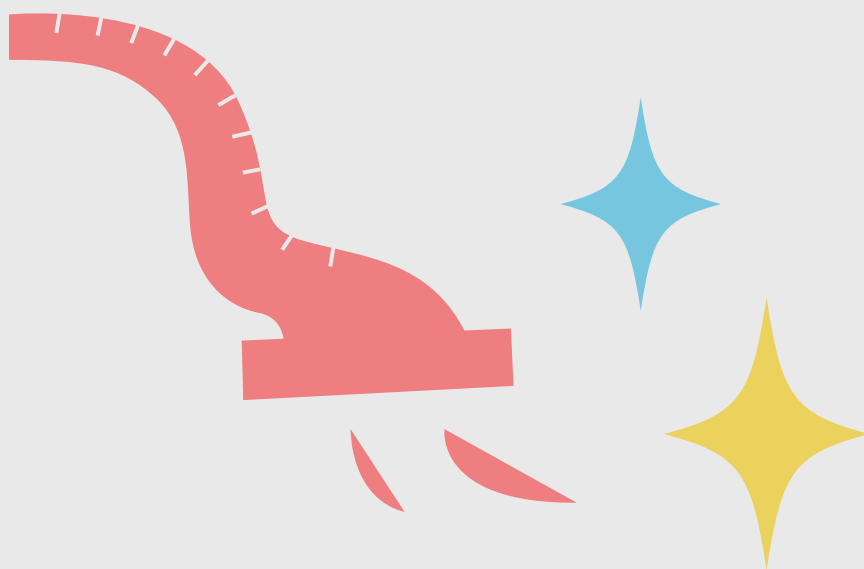國中科技領域雙語教學資源手冊：生活科技科英語授課用語

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
[九年級]
A Reference Handbook for Junior High School Bilingual Teachers in the Domain of Technology (Living Technology): Instructional Language in English
[9th grade]