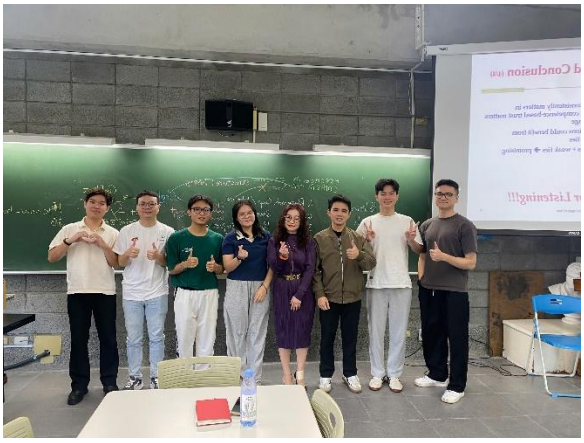
2025 優秀外國青年來臺蹲點計畫 成果報告書

研習主題：次世代高效率馬達的閉迴路調機技術及節能技術的學習與應用

計畫摘要：

(1) 專案簡介：

本梯次共錄取了五位來自越南胡志明工業大學電機工程學系的大四學生。在台期間之研究主題由雙方學校與系所之指導教授討論後共同決定。在國立宜蘭大學機械與機電工程系先進動力與能源實驗室實習的三個月的過程中，實驗室提供多項協助及多元學習，包括學伴的安排、專業技能的訓練、多元文化交流以及專題製作。



TEEP Team 在校期間參加校內全英課程

此專案旨在加強與姊妹校(合作大學)的聯合教學與研究並為兩校學生創造一個合作學習的環境，強化務實交流。這個跨國、跨校、跨系所的團隊由國立宜蘭大學的 8 名學生和 5 名指導老師(含業界師資及跨領域師資)，以及胡志明工業大學的 4 名指導老師和 5 名 TEEP 學生組成。本梯次的見學與實習訓練專注於人才培育、跨域聯合教學與學習，並整合了移地教學及各項研究和技術領域的資源，具體建立務實的雙邊合作關係。並讓所有參與 TEEP 見學與實習的師生，了解台灣社會開放的友善環境，對多元文化的包容及政府對高等教育環境的經營，具體落實 TEEP 計畫的宗旨與目標。

(2) 在台停留時間:

2025/04/07~2025/06/30

(3) 地點:

國立宜蘭大學　機械與機電工程學系

先進動力與能源實驗室**(Advanced Power and Energy Center/APEC)**

(4) 專案執行:

a. **參加 Advanced Power and Energy Center/APEC，內部培訓課程:** 包括專業外語、電機工程概論、伺服馬達調機理論、馬達控制、馬達能效測試以及高階變頻器的原理、設定及多軸運動控制的學理基礎及應用。

b. **專案研究：**根據 TEEP 成員的背景，研究主題在與 APEC 的指導老師討論確定後，學習及研究人內容涉及高階變頻器的學理基礎與應用、伺服馬達調機、運動控制和高階電力計的操作及應用。主題經過精心選擇，旨在作為未來雙邊進一步的合作，以及作為後續參與 TEEP 學員進一步學位研究和未來下個梯次到宜蘭大學學習的 TEEP 成員的基礎。

c. **企業交流：**通過與台灣領先企業的互動，增進 TEEP 成員對台灣教育、產業、經濟及文化的理解。

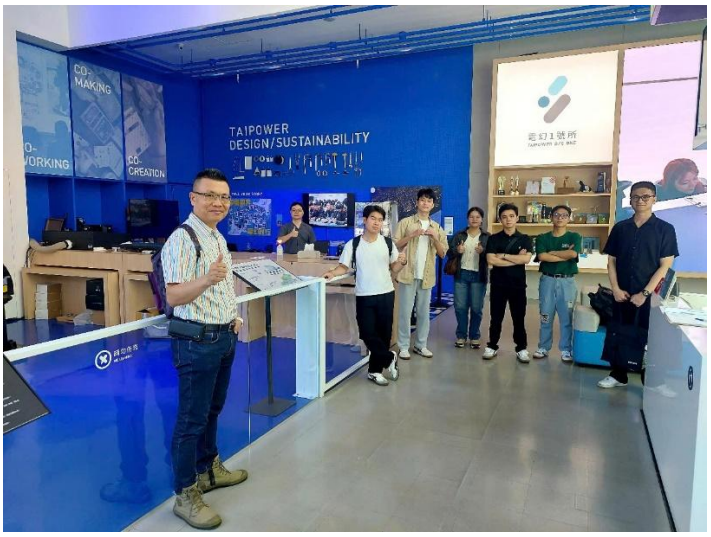
期望台灣成為 TEEP 學員未來在繼續深造或就業發展的首選夥伴。

d. **以英語為主要溝通語言：**在全球化的社會中，英語是一項必備技能，特別是在台灣。由於少子化的影響，台灣致力於招聘優秀外國人才來台攻讀學位與工作。為了培養符合未來需求的人才，本計劃全程使用英語，包括討論、每週學習報告和最終成果展示。

(5) 實習生：

本梯次，我們共錄取了來自越南胡志明市工業大學電機工程學系的五名學生及，分別為 Nguyen Anh Khoa, Nguyen Dai Vi, Nguyen Ngoc Yen Thanh, Nguyen Quoc Viet, Nguyen Tien Truong,，申請學生必需先經過當地學校指導老師的面試及評選，取得原就讀系所主管推薦後才進入指導老師的最後評選。

指導老師與 TEEP 學生的定期學習討論



指導老師帶領 TEEP 學生進行移地教學-台電參訪

(6) 財務報告

TEEP@AsiaPlus Financial Report		
姓名	在台期間	補助
Nguyen Anh Khoa	3 個月 (114 年 04 月 07 日~114 年 06 月 30 日)	42,000
Nguyen Dai Vi	3 個月 (114 年 04 月 07 日~114 年 06 月 30 日)	42,000
Nguyen Ngoc Yen Thanh	3 個月 (114 年 04 月 07 日~114 年 06 月 30 日)	42,000
Nguyen Quoc Viet	3 個月 (114 年 04 月 07 日~114 年 06 月 30 日)	42,000
Nguyen Tien Truong	3 個月 (114 年 04 月 07 日~114 年 06 月 30 日)	42,000
總計		210,000

1. 學習成果

(1) 專案成果影片:

https://www.youtube.com/watch?v=ZG9pWlz-rUQ

(2) 專案成果:

姓名	Nguyen Anh Khoa	**電子郵件**	khoanguyen6633@gmail.com
	Nguyen Dai Vi		nguyendaividt@gmail.com
	Nguyen Ngoc Yen Thanh		Yenthanhnguyen2709@gmail.com
	Nguyen Quoc Viet		vietsutu 1507@gmail.com
	Nguyen Tien Truong		truong112p@gmail.com
指導教授	Cheng-Hu Chen (NIU, TW)		
主題	**次世代高效率馬達的閉迴路調機技術及節能技術的學習與應用**		

研究摘要:

隨著台灣科技產業的持續進步，台灣製造業不僅已經邁入工業 4.0，更進一步向工業 5.0/AI 發展，強化人工智慧技術的導入。由於近年來台灣出生率持續下降，各行各業對於導入自動控制技術及減少人力資源投入的需求日益增加，這已成為台灣各級產業面臨的主要挑戰。在近幾屆的國際自動化展場上，可以清楚看到產業的發展趨勢，自動化技術與智能化整合技術已廣泛應用於生產線的各個階段，無論是前端、中端還是後端，整個製程的每個環節都不例外。

馬達作為各種自動化設備的主要動力來源，其重要性不言而喻。全球工業用電中有 70%是由馬達消耗，而全球用電量有一半消耗在馬達。在全球面臨氣候變遷、減少石化燃料使用以及核能爭議等挑戰的背景下，各國普遍面臨電力供應緊張或電費高漲的問題。因此，提高馬達的效率和功率密度已成為各國政府及電機製造業者透過法律規範與政策推廣的重點。

在此次 TEEP 計畫中，學員們成功建構對各類直流、交流馬達的系統性理解。他們學習辨識不同交流馬達（感應馬達與同步磁阻馬達）、直流馬達在構造、運作原理與應用層面的差異，並針對伺服系統的電流迴路、速度迴路與位置迴路等控制迴路進行實際的實機操作與參數調整。為了強化學員實作經驗，學生們深入學習如何設定伺服控制器的關鍵參數，包括增益調整、加減速時間設定、負載補償與回授裝置設定等。透過不斷的測試與調機，學員們能夠提升系統的響應速度與穩定性，進而實現對運動裝置的精確控制，展現出將理論轉化為實務的高度能力與潛力。

在另一項研究中，學員們針對高效率馬達及變頻器的節能潛力進行了深入探討。實驗過程中，學員利用功率計連接至控制器，並針對控制器輸入端的線電壓、相電壓及相電流進行精確的能源消耗測量與分析。在實驗中，採用同步磁阻馬達與三相感應馬達，分別進行一分鐘的運行測試；此期間，功率計持續監測馬達運動過程中的能量消耗。實驗結束後，學員根據相關數據，並進一步進行能源消耗的計算與評估，以獲取更精確的結果。

通過此次專案，參與的 TEEP 學員不僅在專業技能上得到了顯著提升，還掌握了許多非常實用的技能，依據過去培育的經驗，這些技能將對他們未來的職業發展產生正向的影響。此外，學員們也成功融入了當地學生的學習和生活環境，跨文化的交流與合作使他們在專業成長的同時，也增強了文化理解與全球視野。他們學會了如何在多元文化背景下有效合作與溝通，不同背景的

學生之間能夠開展知識與經驗的分享，進一步促進了跨文化的理解與合作，為未來更深層次的國際合作奠定了堅實的基礎。

成果:

此專案之成果可以分成四個部分:

(1) 不論是宜蘭大學 APEC 和胡志明市工業大學電機工程學系的學生皆能夠辨別不同交流馬達的差異。此外，他們學會了如何透過調整馬達參數、控制器參數以及馬達的各個迴路(電流、速度、位置迴路)來讓伺服馬達達到更快速的響應及更精準地控制。

(2) TEEP 學生不僅學習了馬達測試與調機的理論，還在實踐中應用了這些知識，進一步實現同步磁阻馬達和感應馬達的調機知識與技術。此外他們還學習到了高階電力的原理及操作等相關知識並且將其應用到研究中，成功建立一套運動控制及能源消耗計算之實驗平台。

(3) TEEP 學生們學會了如何使用高階變頻器和運動控制器來控制不同型式的高效率交流工業馬達及伺服馬達。

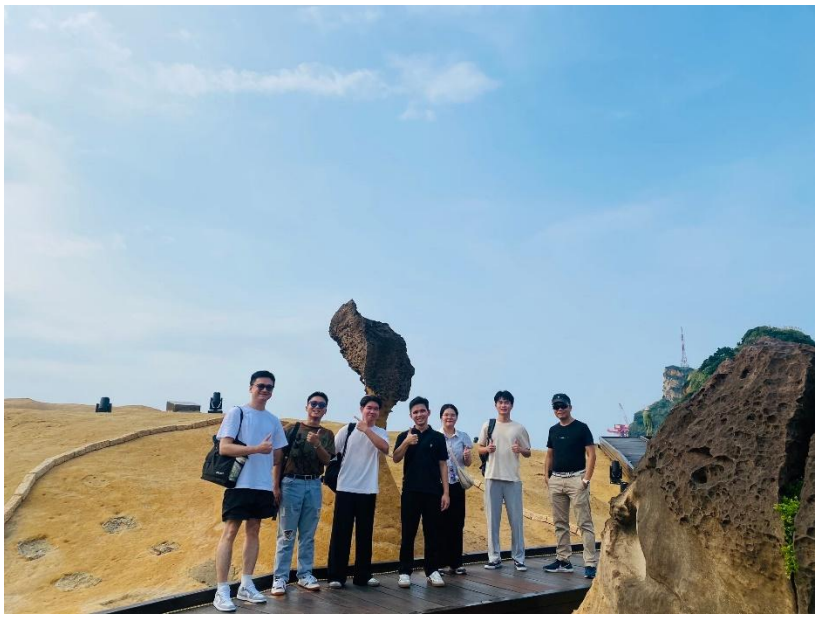
(4) 宜蘭大學 APEC 和胡志明市工業大學電機工程學系的學生獲得了與來自不同文化背景和語言的團隊合作的能力，成功合作並且完成了預期設定的學習目標。

TEEP 學員學習心得:

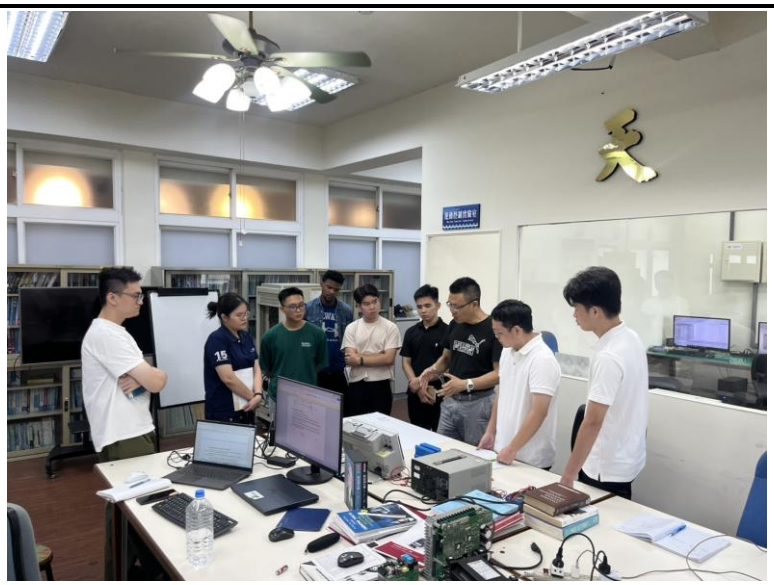
Nguyễn Quốc Việt:

My name is Nguyen Quoc Viet, a student from Industrial University of Ho Chi Minh City (IUH). I have just completed a 3-month internship at National Ilan University (NIU) under the TEEP program, working in the Advanced Power Energy Center (APEC) laboratory. This has truly been a memorable and extremely valuable experience for me. Throughout the internship, I not only learned theoretical knowledge but also had the opportunity to practice, verify what I had learned at IUH, and gain a lot of new practical knowledge at APEC.

In particularly, I have gained a deeper understanding of the three control loops of a servo motor, understood their operating principles, and learned how to control them effectively in APEC's Motion Control laboratory. In addition, I also had the chance to explore and work with power measurement devices, learned how to read technical specifications, operate the device, and collect data through communication systems. Besides that, I have also improved my ability



TEEP Students Visit Yehliu Geopark with Host Professor



Host Professor Teaches Motor Control Knowledge to the Team and Graduate Students

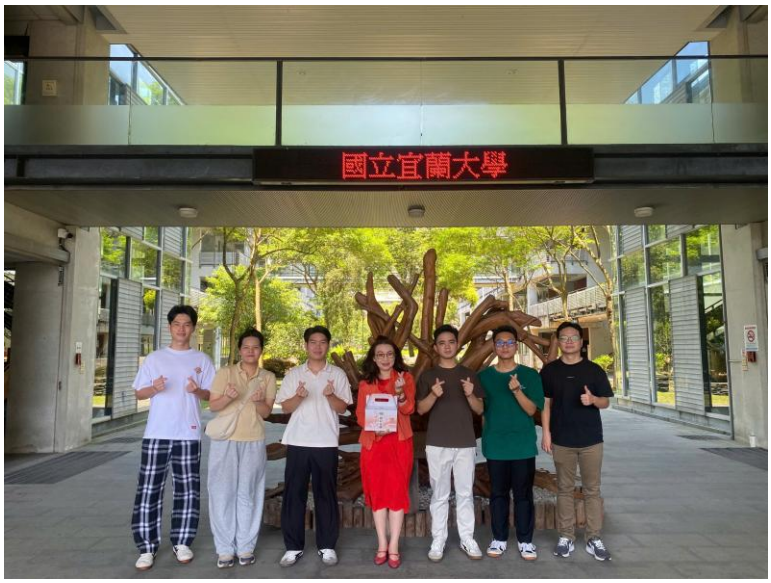
to search for and study technical documents — an essential skill for any engineer. I sincerely thank my host professor for the dedicated support, IUH for giving me this valuable opportunity, and NIU for providing such a practical learning environment.

Nguyễn Tiến Trường:

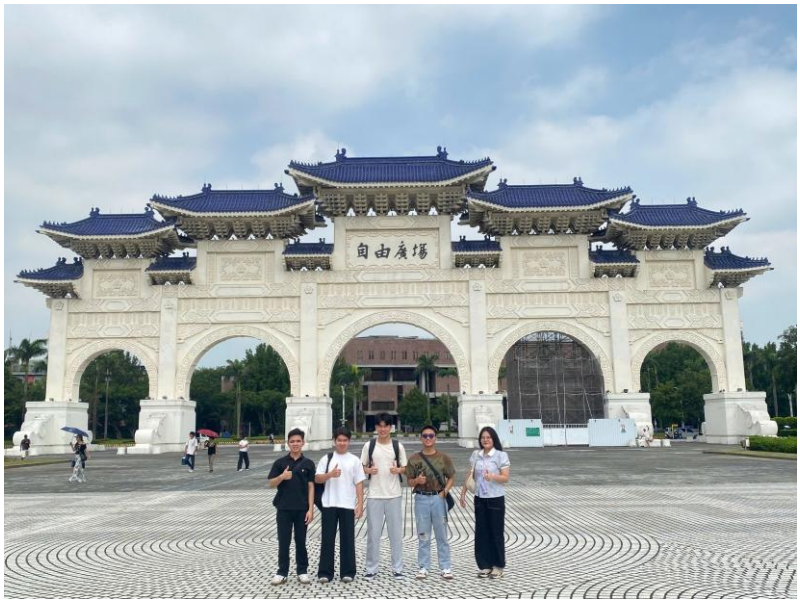
My name is Trường, and I come from the Industrial University of Ho Chi Minh City (IUH), Vietnam. My internship in Taiwan was a truly memorable and meaningful experience. During my time studying and working at National Ilan University, I was not only immersed in a rigorous academic environment but also had the opportunity to engage in a wide range of cultural activities. Under the dedicated guidance of my Host Professor, I attended both major-related and cross-domain classes. I was especially interested in learning about different types of motors and how to optimize their performance. In addition, I participated in basic Mandarin classes with other international students, which helped improve my communication skills and deepened my understanding of the local culture. Beyond the classroom, I took part in field trips, enjoyed traditional cuisine, attended festivals, and explored historical and architectural landmarks. These experiences broadened my perspective, allowed me to build meaningful connections with international friends, and enriched my appreciation of cultural diversity. This journey was not only academically rewarding but also personally transformative.

Nguyễn Ngọc Yến Thanh:

My name is Nguyen Ngoc Yen Thanh, a student from the Industrial University of Ho Chi Minh City, Vietnam. I recently completed a three-month internship at National Ilan University (NIU), specifically at the Advanced Power Energy Center (APEC). This internship provided me with an excellent opportunity to gain both academic and practical experience in the field of electrical engineering. I was involved in evaluating motion control systems, assembling and wiring control cabinets, and conducting motor testing. I also worked with various types of motors, including Induction Motors (IM), and Synchronous Reluctance Motors (SynRM), which



TEEP Team Has a Photo With the NIU Professor

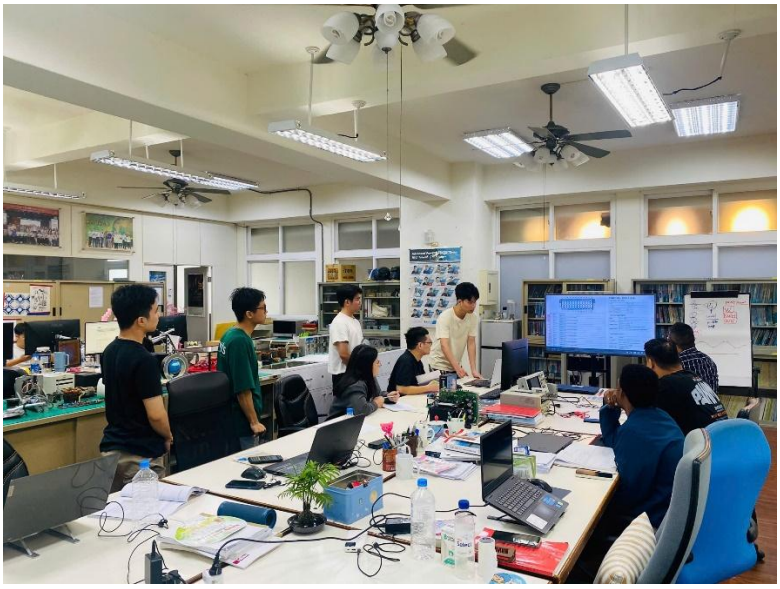


TEEP Team Visits CKS Memorial Hall with the Host Professor

helped me strengthen my technical knowledge. During my time at NIU, I also attended several courses such as Mandarin, Organization Theory, and Introduction to Electrical Engineering. These classes not only expanded my academic background but also improved my communication and teamwork skills. Living and studying in Taiwan gave me the chance to explore a new culture, participate in local festivals, enjoy traditional food, and visit many beautiful places. It was a great way to understand more about Taiwanese society and lifestyle.This internship has helped me grow both professionally and personally. It improved my independence, adaptability, and global outlook. I am truly grateful for this unforgettable experience and proud to have been a part of the NIU community.

Nguyễn Anh Khoa:

I am Nguyễn Anh Khoa, a student at Ho Chi Minh City University of Industry. I had the valuable opportunity to participate in the TEEP internship program in Taiwan for three months. Three months study program in Yilan brought me an incredibly meaningful and profound experience. Throughout the course, I not only gained in-depth knowledge about servo motors but also had the opportunity to practice controlling various types of motors such as induction motors and synchronous reluctance motors. The curriculum was thoughtfully designed, with a strong focus on both theoretical depth and practical application, which helped me reinforce and expand my professional knowledge. I was introduced by my professor to the history and development of the power industry in Taiwan. In addition, I had the chance to improve my professional working skills through group projects and the dedicated guidance of my professor. Beyond academics, life in Yilan also left a strong impression on me. I was able to enjoy many traditional Taiwanese dishes and visit famous places such as the Lin Family Mansion, Taipei City, and even experience the high-speed rail. People here are gentle,



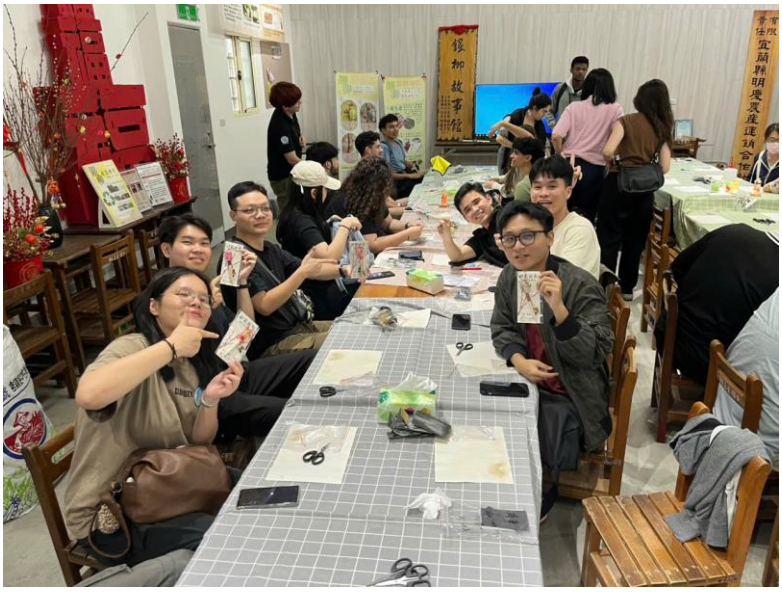
TEEP Team Has a Repot Session with the Host Professor

polite, and always willing to help - even when faced with language barriers. One thing I truly appreciated was the culture of green living, where waste is sorted properly and public cleanliness is maintained with great care and responsibility. These three months in Yilan were an unforgettable journey that helped me grow in knowledge, skills, and cultural understanding. I truly appreciate and feel grateful for this opportunity.

Nguyễn Đại Vĩ:

My name is Nguyễn Đại Vĩ. I come from Ho Chi Minh City University of Industry, Vietnam. During my 3-month internship in Taiwan, I had the chance to experience and learn many valuable things. First of all, I am very thankful to Professor Chen - the person who supported and guided me during the preparation, and also taught me during the internship. Thanks to his help, I was able to study in a modern learning environment and learn how to do research and work in a more scientific way. What impressed me the most is the people in Taiwan - they are very friendly, open, and always willing to help others. Besides that, Taiwan is also famous for its beautiful nature, delicious food, and strong development in science and technology. During the internship, I had the chance to work directly with a motor control system. This helped me learn how to solve problems in a practical way, not just by remembering theory like before.

I also realized the importance of communication and teamwork skills - which I still need to improve. These experiences encouraged me to keep trying, improve my language skills, and continue learning to become better in the future.



TEEP Students Make Their Own Crafts by Using Local DIY Plants