

APAIE 2024



PERTH, AUSTRALIA 4-8 MARCH 2024

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Collaborating for sustainable impact: partnerships across the Asia Pacific

APAIE Perth 4 - 8 March 2024



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Session 2D: Tues 5th March, 10:30 – 11:15

**Partnering for Change-Transnational Education to
Support a Sustainable Net-Zero Future**

Cheng Tung Chong
Shanghai Jiao Tong University, China

Liang Guo
Shanghai Jiao Tong University, China

Chair

Cheng Tung Chong
Shanghai Jiao Tong University, China

APAIE 2024



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Partnering for Change- Transnational Education to Support a Sustainable Net-Zero Future

March 5th, 2024

**Ms. Liang Guo
Dr. Cheng Tung Chong
Shanghai Jiao Tong University**

Presenters



Dr. Cheng Tung Chong is an Associate Professor at the China-UK Low Carbon College, Shanghai Jiao Tong University. He holds a PhD (Engineering) from University of Cambridge, UK. He is passionate about teaching and has been actively involved in international teaching such as the SJTU SDG July Camp program and APRU collaborative learning program (global virtual classroom).



Ms Liang Guo serves as the Deputy Director of the International Affairs Office at Shanghai Jiao Tong University. Her role includes developing strategic institutional partnerships with overseas universities, designing, and implementing pilot international engagement projects such as the SDG July Camp, professional training dialogues and workshops, and more.

Top Universities in China





Total Students – 54,759

PG Students

66%

UG Students

34%

International Students – 2,096

PG Students

63%

UG Students

37%

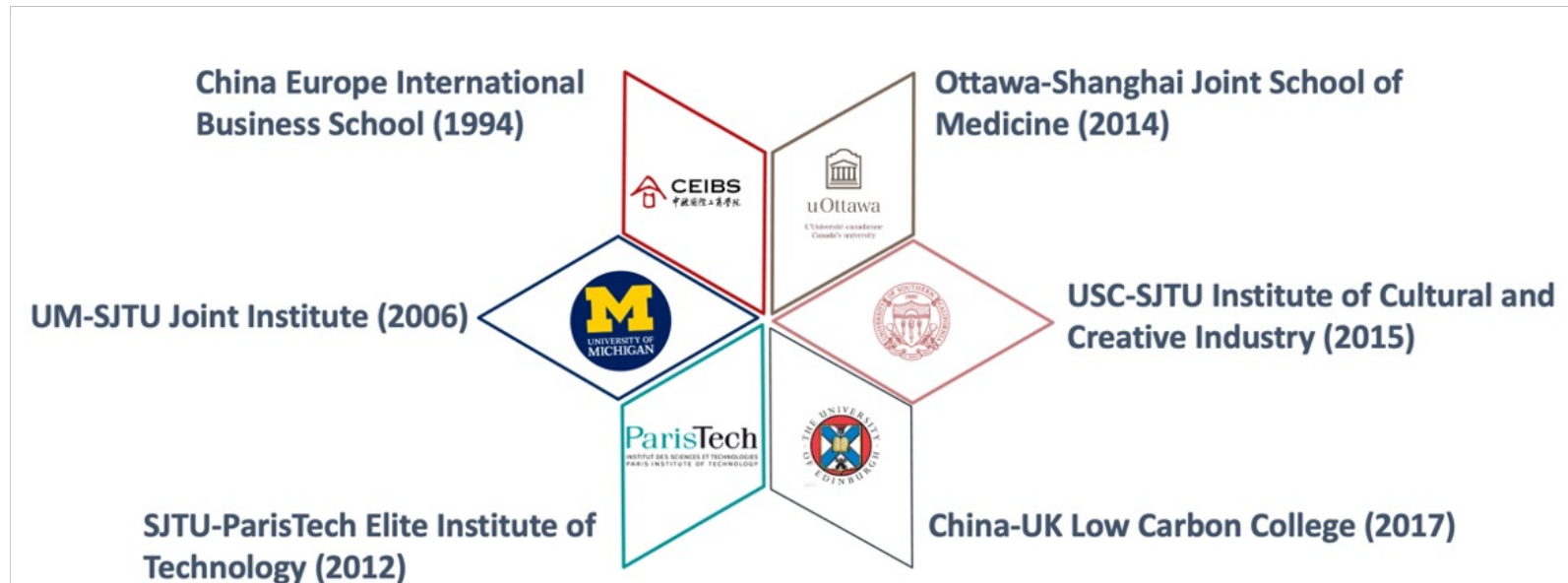
Total Faculty Staff – 10,587

Domestic

10,320

International

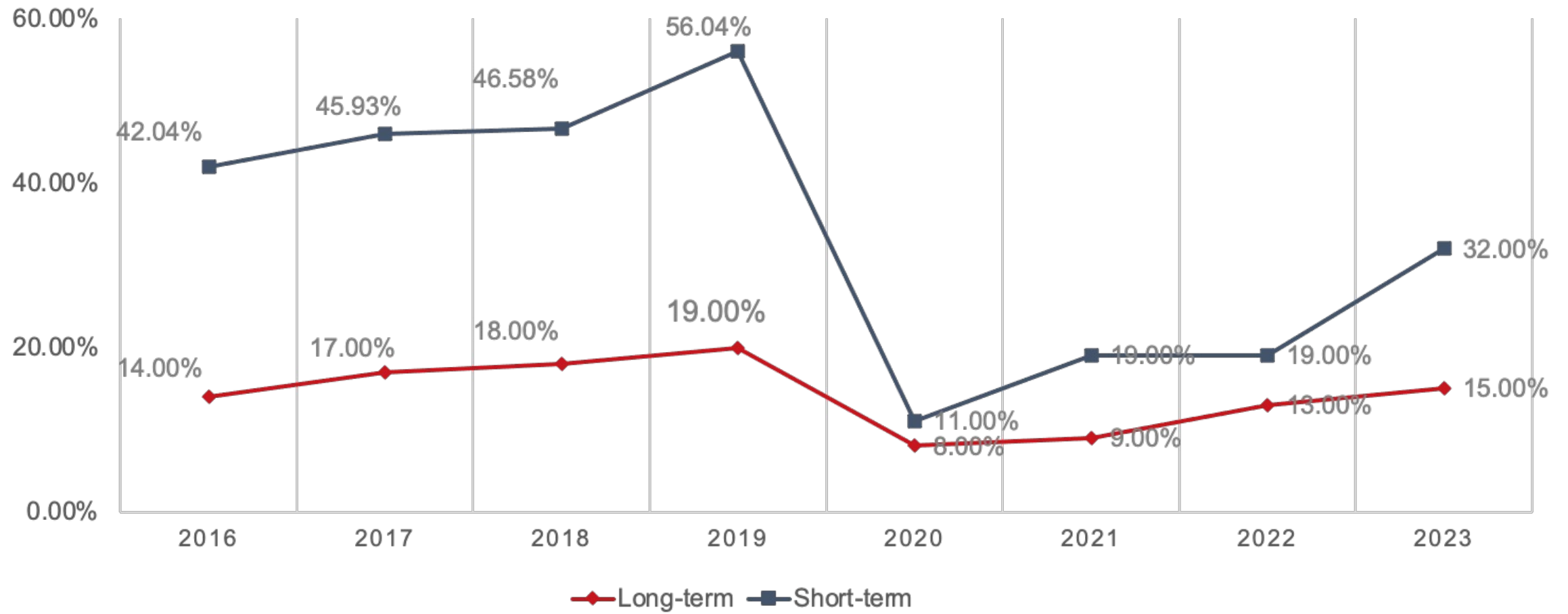
267



Challenges: Joint Institutes can cover upto 10% of the entire student body.
Huge financial input.

SJTU Student Mobility Growth before Covid

Outbound



Global Competence and SDGs



Global Opportunities for ALL

Course Collaboration:

- Global Virtual Classroom Program
 - shared courses
 - co-built courses
- SDG July Camp Program
- COIL(Collaborative Online International Learning)

Multilateral Collaboration:

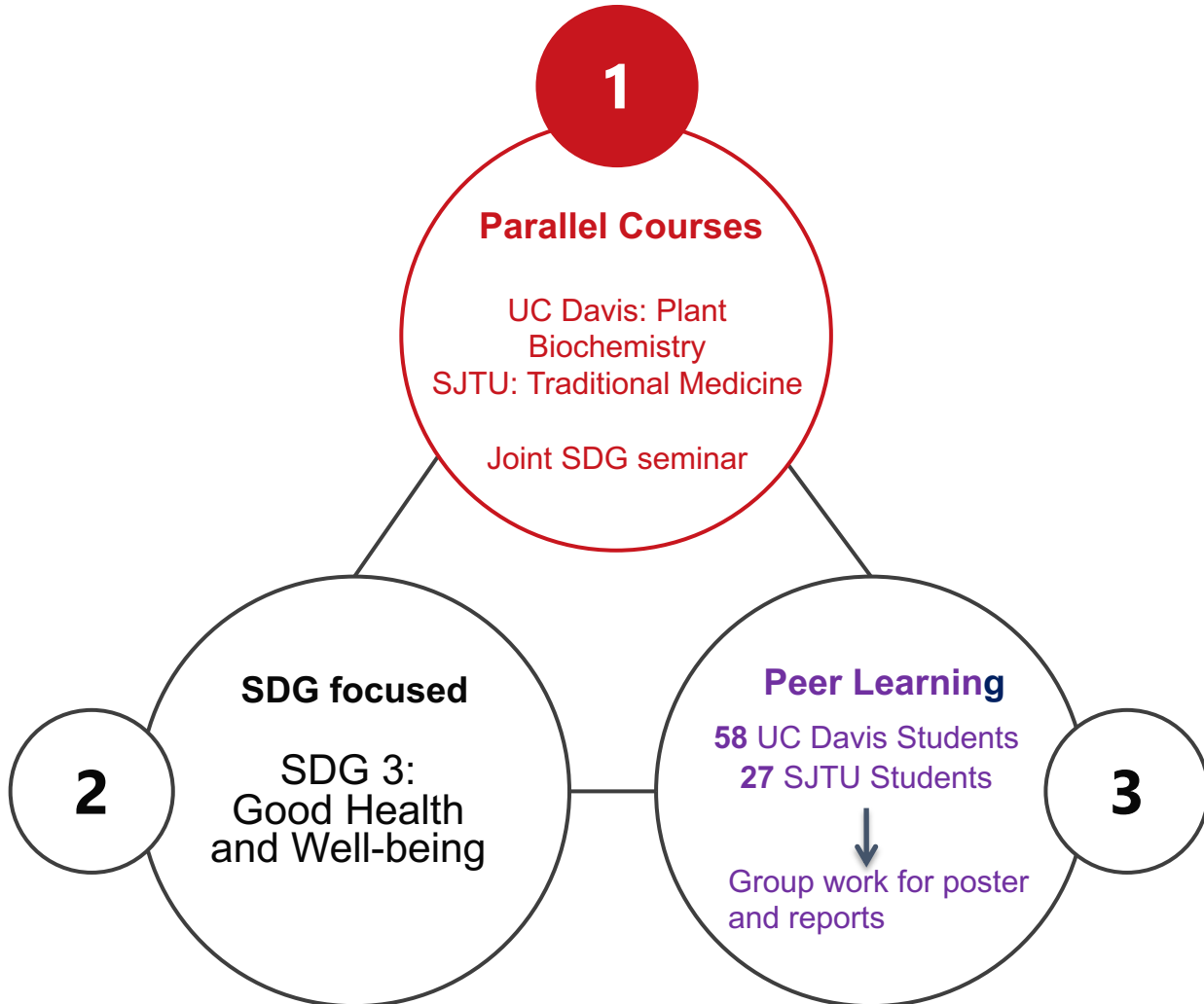
- APRU SDG for Global Citizenship Program
- Warwick-SJTU-HKU-Cornell-U Toronto Internship Program



A 2021 Pilot: U21 Education Innovation Project

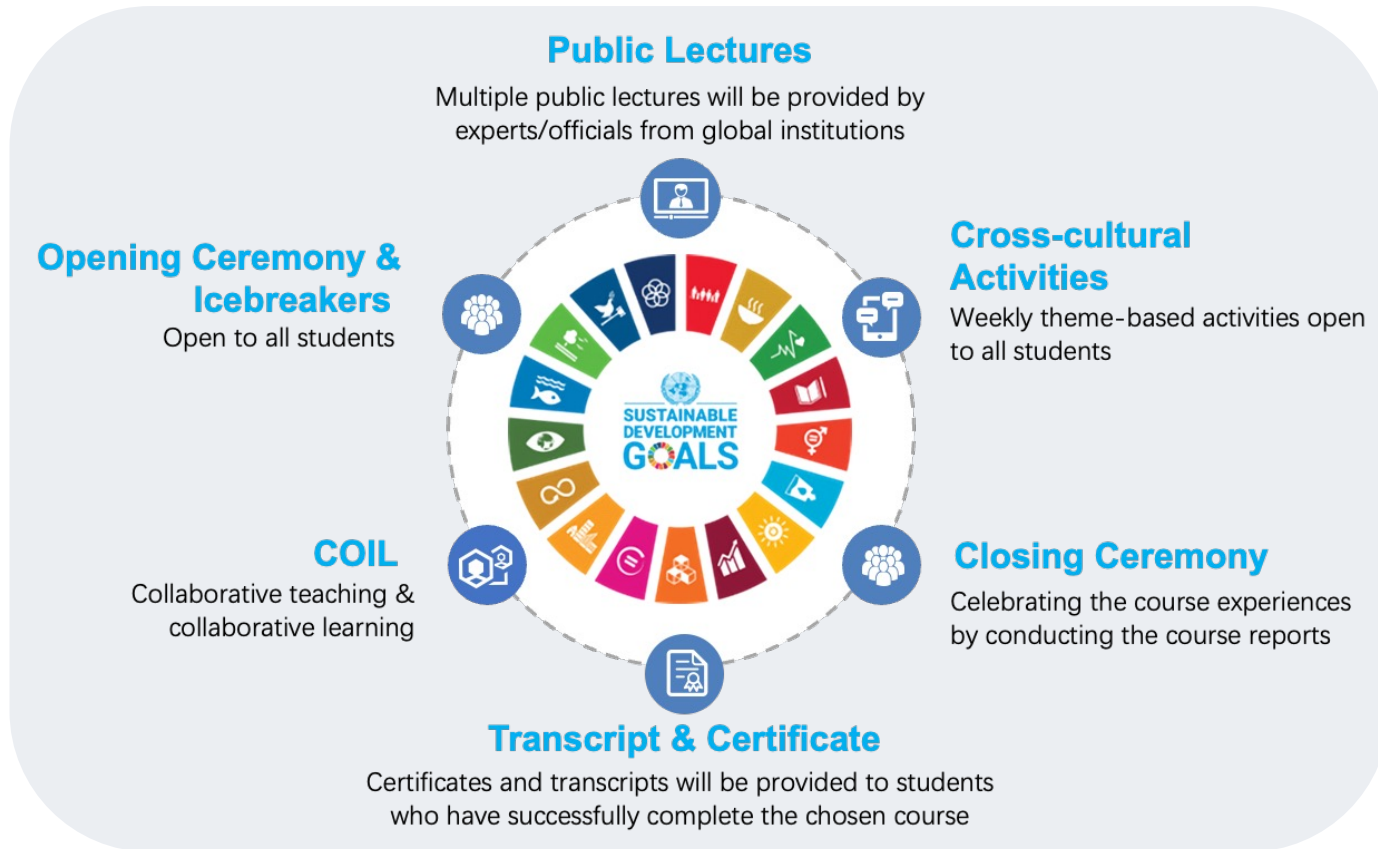


上海交通大学
SHANGHAI JIAO TONG UNIVERSITY



Highlight: virtual intercultural group ... group work on SDGs

- Peer Learning:
 1. How plantation of “basil” relates to combating poverty in China?
 2. How American students view the economic value of “traditional medicine”?
- Toolkit for other partner universities to develop SDG related collaborative courses or programs



What to Expect

- Project-based learning (PBL) & group-based learning (GBL)
- Engage in discussions with peers from different cultures and disciplines in your group
- Take advantage of free lecture series on top of the coursework
- Meet experts from global universities

Core Competencies

- Intercultural competence
- Transferable skills
- Active learning
- Critical thinking and problem-solving
- Teamwork and leadership

- 11 courses
- 12 instructors from SJTU
- 19 instructors from 14 partner universities
- 428 students from 22 countries
- 92% of participants rated the program better than four stars on a five-star scale in feedback survey

- 12 courses
- 21 instructors from SJTU
- 44 instructors from 31 partner universities
- 503 students from 39 countries
- 96% of participants rated the program better than four stars on a five-star scale in feedback survey



1. Net Zero-Carbon Fuels
2. The Urban Management for Port Cities in the 19th and 20th Centuries
3. Malaria Control -- the Millennium Struggle between Human Beings and Infectious Diseases
4. Philanthropy Development
5. Poverty and Mental Health
6. Traditional Medicine and UN sustainable Development Goals
7. Towards Sustainable and Resilient Cities
8. Economy, Development and Security in the Belt and Road Initiative: Between Relational and Rules-based Governance
9. Internet Law and Ethics
10. War and Peace



1. Ecosystem restoration and sustainable development
2. Green shipping and marine renewable energy
3. LOW-CARBON BUILDINGS AND CITIES
4. Net Zero-Carbon Fuels
5. Sustainable Ocean Intelligent Autonomous Monitoring
6. Gender in Development and Education
7. ESG in Business Law and Economic Growth
8. Green Sustainable Transportation
9. Electrochemical Energy Storage
10. The Urban Management for Port Cities in the 19th and 20th centuries
11. Traditional Medicine & UN Sustainable Development Goals
12. Poverty & Mental Health

Course – Net Zero-Carbon Fuels



SHANGHAI JIAO TONG UNIVERSITY | Net Zero Carbon Fuels

Home Course Description Syllabus Research News 搜索.....

Net Zero-Carbon Fuels

The webpage features a green background with a large image of the Earth. The title 'Net Zero-Carbon Fuels' is prominently displayed in a white box on the left side.



SJTU SDG July Camp

The 2023 Shanghai Jiao Tong University SDG July Camp

Module

Week 1 (19-22 Jun)	Low Carbon Fuels (Biofuels + Sustainability)
Week 2 (26-29 Jun)	Zero Carbon Fuels (Ammonia + Hydrogen)
Week 3 (3-6 Jul)	Advanced Fuels (Solar fuels + Metal fuels + Electrification)

Net Zero-Carbon Fuels

Open to all undergraduate and postgraduate students, FREE of charge

Course instructors

 Dr. Agustin Valera-Medina Professor Cardiff University	Course overview Course Title: Net Zero-Carbon Fuels Date: 19 Jun 2023 – 6 July 2023 Mon – Thu (3 weeks): 16:00 Shanghai time Teaching mode: Online Credit(s): 2 credits (32 hours)
 Dr. Jo-Han Ng Head of Research University of Southampton Malaysia	
 Dr. Cheng Tung Chong Associate Professor Shanghai Jiao Tong University	

Course webpage

<https://global.sjtu.edu.cn/en/page/sub/346>

To apply, access the link or scan the QR code

<https://global.sjtu.edu.cn/en/studyatSJTU/SDG>



Course Implementation – Net Zero-Carbon Fuels

SDG July Camp Program



Established online
T&L platform

The Team

- 

Dr. Jo-Han Ng
Head of Research, University of Southampton Malaysia
南安普敦大学马来西亚分校科研主管
- 

Dr. Cheng Tung Chong 张振东
Associate Professor, Shanghai Jiao Tong University
上海交通大学副教授
- 

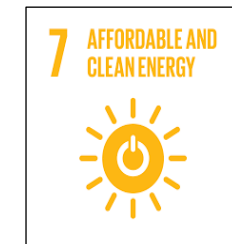
Dr. Agustin Valera-Medina
Professor, Cardiff University
英国卡迪夫大学教授
- 

Haoyu Zhang 张颢玉
Teaching assistant, Shanghai Jiao Tong University
中英国际低碳学院, 硕士生

3 instructors + 1 Tutor

The course

Net Zero-Carbon Fuels



SDG-oriented course

Undergraduates (International: Local 3: 1); Transnational course

Course Overview – Net Zero-Carbon Fuels

Net Zero-Carbon Fuels (PJ 187)				
Week : Date	Topic	Credit hours	Teaching mode	Lecturer-in-charge
1: 19/6	L1: Introduction to SDG with emphasis on SDG 7	3	Lecture + discussion	CCT
1: 20/6	L2: Advancements of biofuels	3	Lecture + discussion	NJH
1: 21/6	L3: Biofuels sustainability: EWF + SDG perspectives	3	Lecture + discussion	NJH
1: 22/6	T1: Topical review 1 (Poster workshop)	2	Workshop + discussion	NJH
2: 26/6	L4: Sustainable aviation propulsion	3	Lecture + discussion	CCT
2: 27/6	L5: Green hydrogen as energy carrier	3	Lecture + discussion	AVM
2: 28/6	L6: Emerging zero-carbon fuels	2	Lecture + discussion	NJH
2: 29/6	L7: Green ammonia as energy carrier	3	Lecture + discussion	AVM
3: 3/7	T2: Topical review 2 + Guest lecture (Prof Alasdair Cairns)	2	Guest lecture	AVM
3: 4/7	L8: Power-to-X, Electrification	3	Lecture + discussion	CCT
3: 5/7	T3: Topical review 3 + Guest lecture (Prof Gus Nathan)	2	Guest lecture	CCT
3: 6/7	Group project presentations	3	Group presentation	CCT/NJH/AVM
Total		32		

Net Zero-Carbon Fuels



Dr Agustin Valera-Medina
Associate Professor
Cardiff University


CARDIFF
WALES, UK

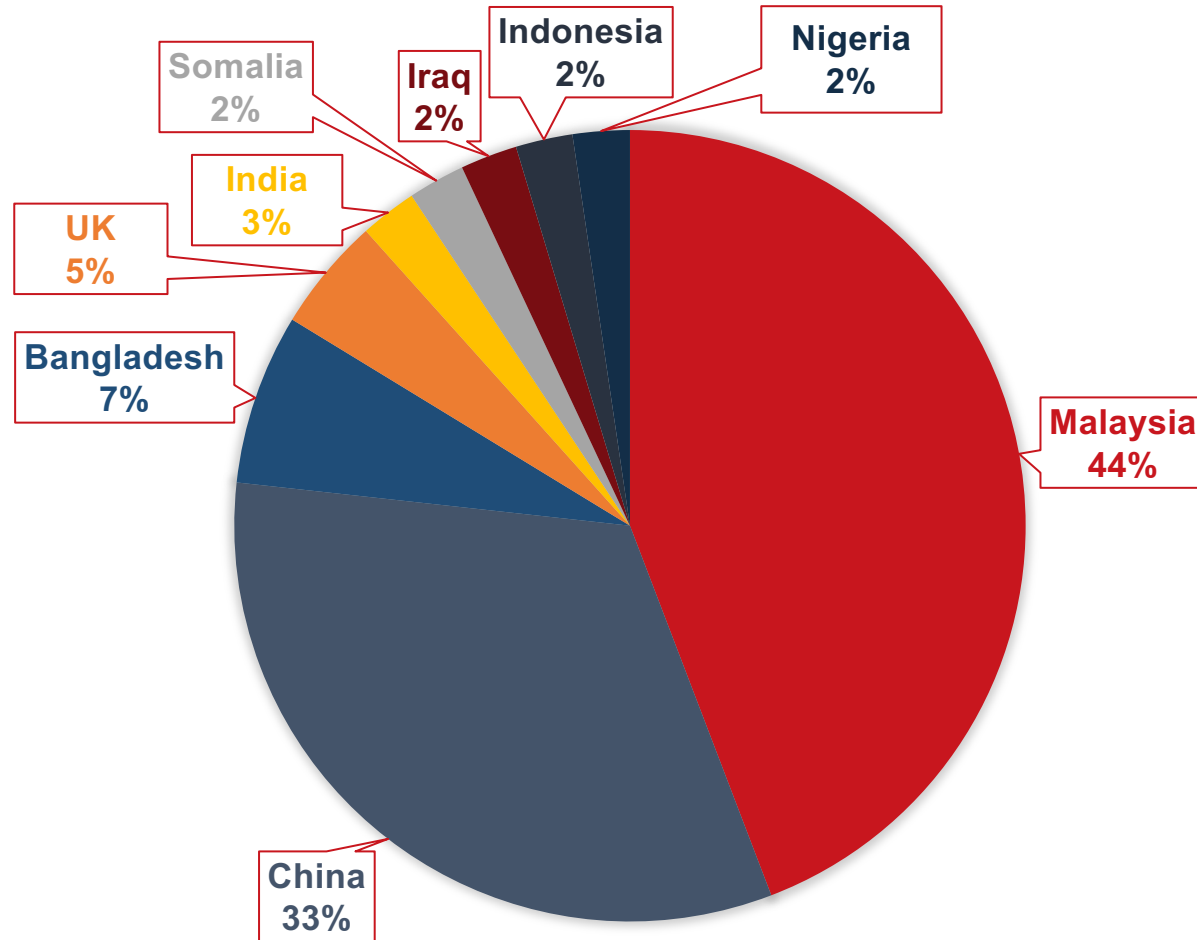


Dr Cheng Tung Chong
Associate Professor
Shanghai Jiao Tong University




Dr Jo-Han Ng
Associate Professor, Head of Research
University of Southampton Malaysia

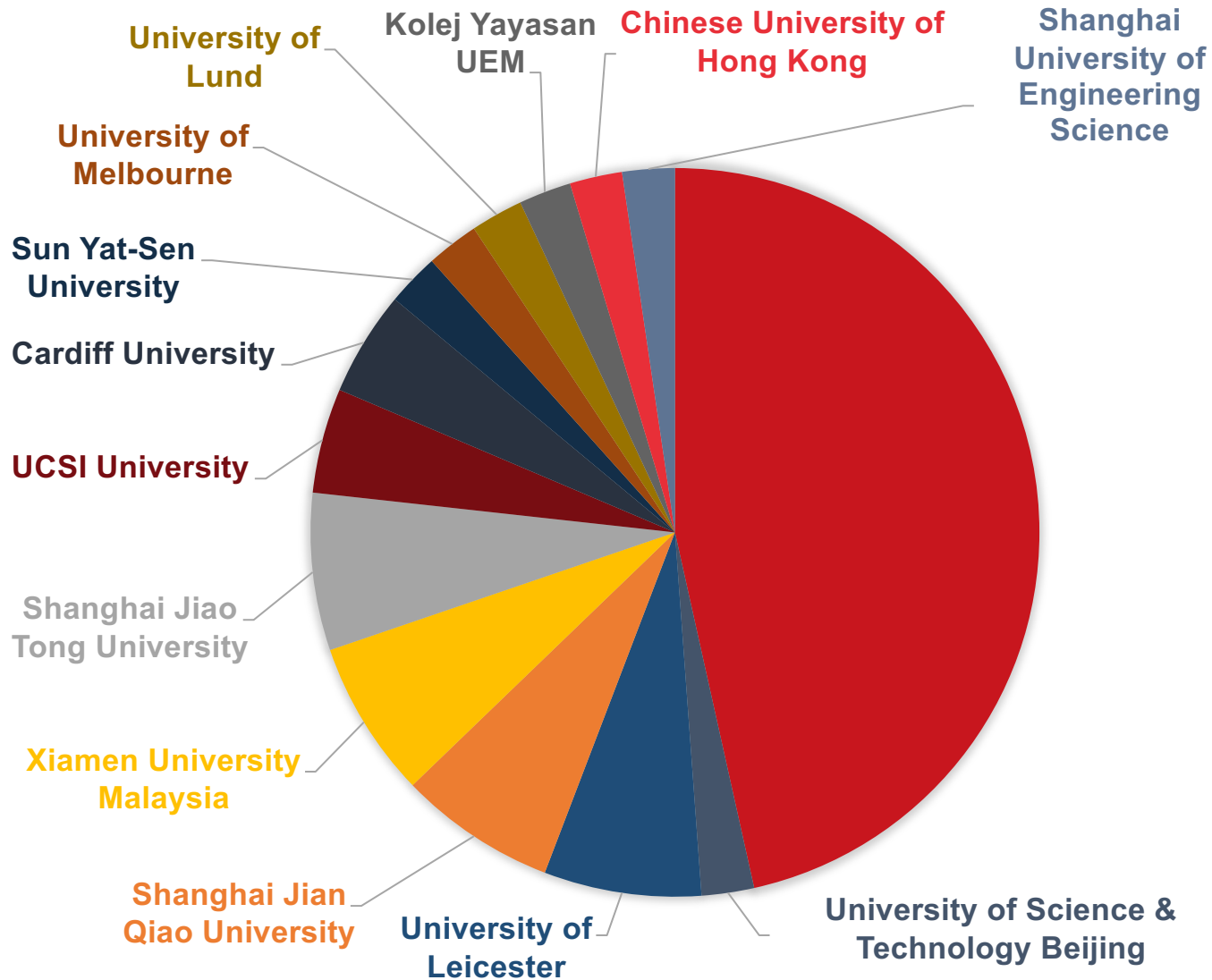

Course registration (by nationality)



No. of students - 43 Nationalities - 9

Malaysia	19
China	14
Bangladesh	3
UK	2
India	1
Somalia	1
Iraq	1
Indonesia	1
Nigeria	1

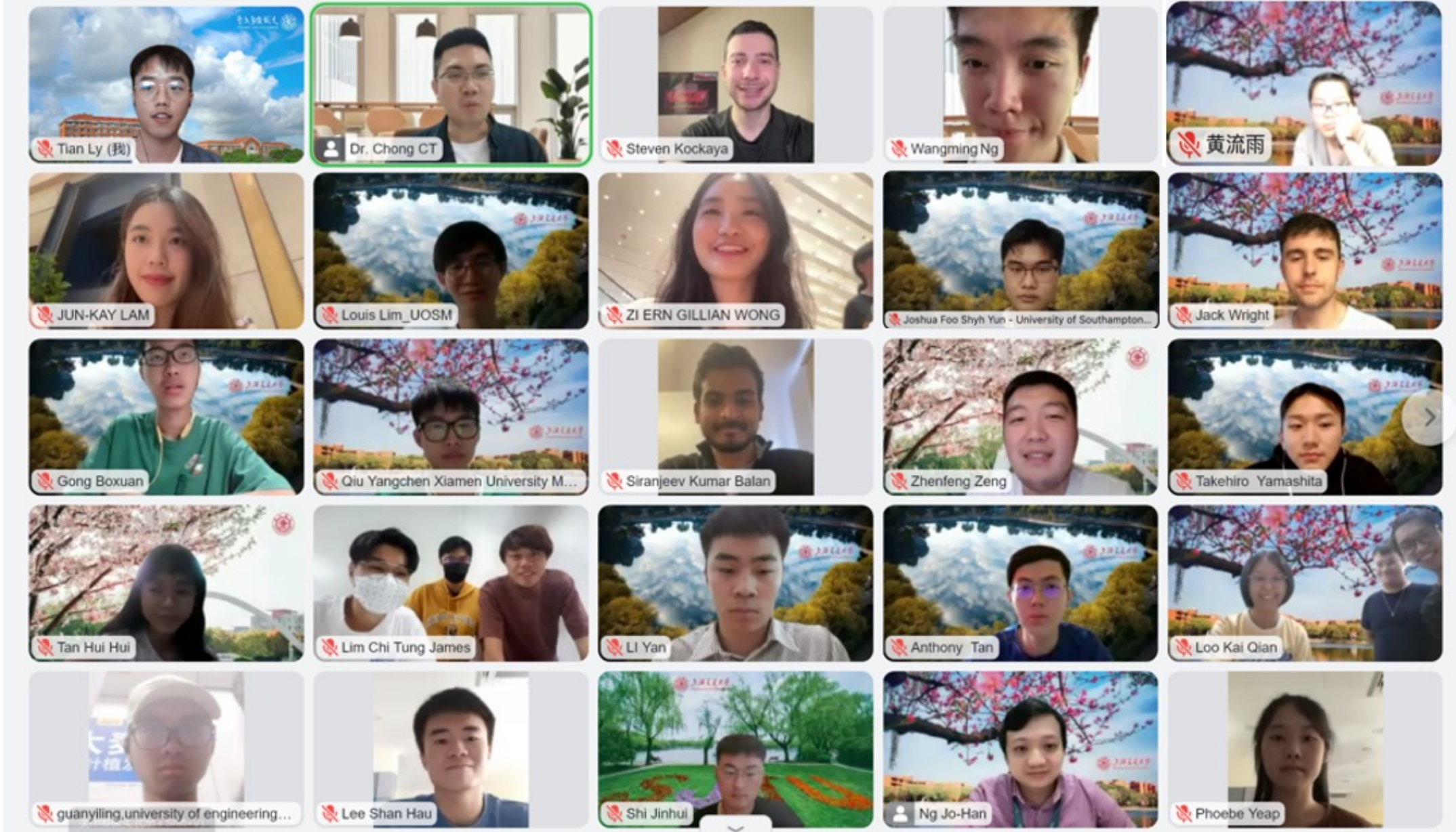
Course registration (by university)



No. of Student - 43 Universities - 14

University of Southampton Malaysia	20
University of Science & Technology Beijing	1
University of Leicester	3
Shanghai Jian Qiao University	3
Xiamen University Malaysia	3
Shanghai Jiao Tong University	3
UCSI University	2
Cardiff University	2
Sun Yat-Sen University	1
University of Melbourne	1
University of Lund	1
Kolej Yayasan UEM	1
Chinese University of Hong Kong	1
Shanghai University of Engineering Science	1

3...2...1... Time for Lecture @ LARK Platform



Group task + presentation

Group task

Ice-breaking session 2

You will be assigned to a Breakout room

Each participant is required to answer this questions:

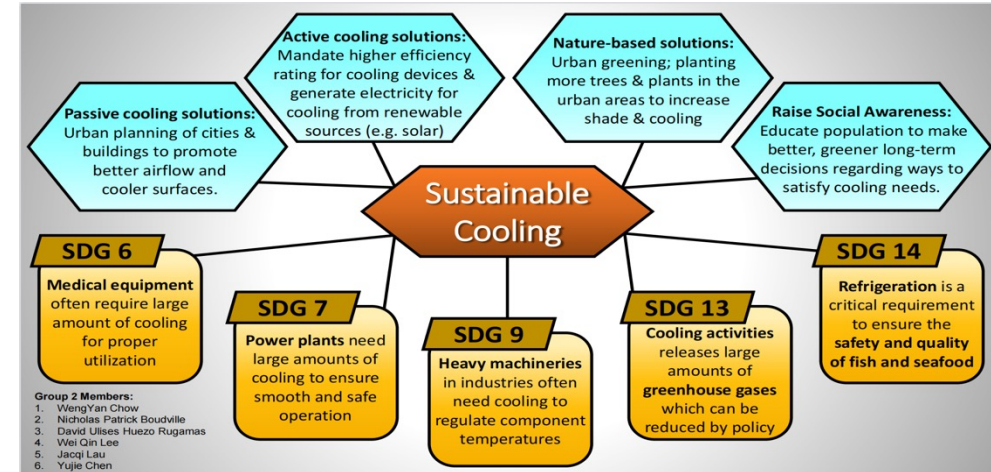
1. Illustrate an example of sustainable energy development (SDG 7- Energy) in your country that leads to the spillover effect to society or environment (link to 2 or more SDGs, give examples).

(Note: Cannot be the same project for 1 country)

- Please turn on your camera, mute your microphone (when you are not speaking)
- 30 seconds to think, then each participant strictly keep the time to **1 minute 30 secs.**



Presentation



TASK 1: HISTORY OF BIOFUELS

UNIVERSITY OF
SOUTHAMPTON
MALAYSIA

Task 1: Discussion – Alternate universe (10 minutes)

Predict what would have happened if James Young did not discover petroleum?

- a) The world would have been a better place using biofuels, and there would have been no fossil fuel-driven climate change
- b) Other chemists would have found petroleum, and the effects we are facing today would just be delayed by a few years
- c) Other forms of renewable energy would have dominated, and solar/wind/hydroelectric could have been the dominant energy source.
- d) Other forms of fossil fuels such as coal would have dominated even more, leading to an even worse environment conditions.

Discuss and vote as a group, then let us know why you predicted that way.




A total of 9 random group tasks were assigned throughout the course

Guest Lecture 1 – Prof Alasdair Cairns (University of Nottingham)

2023 SDG July Camp
Guest Lecture

2023
3 July

Ammonia ICE engines for future heavy transport applications



Prof. Alasdair Cairns
 Director of the Powertrain Research Centre
 University of Nottingham

🕒 16:00 Shanghai; 09:00 UK; 17:30 Adelaide
 📍 ZOOM: 84120449072 Password: 763526

Abstract

Professor Al Cairns is the Director of the Powertrain Research Centre at University of Nottingham and has over 23 years' experience in light and heavy-duty engines, decarbonised fuels and electric hybrid propulsion systems. His early career involved 10 years with engineering consultancy Cosworth/MAHLE Powertrain, managing large collaborative R&D programmes. He has since successfully led over 25 EPSRC, Innovate UK, Advanced Propulsion Centre and directly funded projects in his field with global industry partners. He is currently Programme Director for the MariNH3 which is investigating the potential of green ammonia to fuel and decarbonise commercial shipping.

This presentation will provide a summary of the current state of the art in ammonia end use in internal combustion engines for heavy transport applications (marine, off-road machinery, freight rail) and stationary power. The presentation will include an update of recent experimental results obtained at the University of Nottingham, UK, for both retrofitted and dedicated ammonia IC engines, highlighting key challenges and opportunities for future research in ammonia engine combustion, performance, fuel consumption and emissions.

University of Nottingham
 UK | CHINA | MALAYSIA

Ammonia Fuelled IC Engines for Future Heavy Transport

Prof. Al. Cairns
 July 2023



Powertrain Research Centre

- **Main focus is decarbonised heavy duty IC engines and fuels**
 - Advanced retrofit engine technologies (e.g. dual fuel)
 - **Clean + high thermal efficiency** combustion modes (e.g. jet ignition)
 - Live related funding portfolio of ~£12M
 - 3 academics, 2 technicians, 15 researchers

Jet Ignition Thermodynamic Single Cylinder Dual Fuel Multi Cylinder Optical Single Cylinder (SI & Jet Ignition)




Guest Lecture 2 – Prof Gus Nathan (University of Adelaide)

2023 SJTU SDG July Camp
Guest Lecture

2023
5 July

Low-carbon fuels: a vital component of the net-zero economy

Prof. G.J. 'Gus' Nathan
 Director, Centre for Energy Technology
 University of Adelaide

Wednesday, 5 July, 2023
 16:00 Shanghai; 09:00 London; 17:30 Adelaide
 ZOOM: 82907839697 Password: 670072

Abstract

Gus Nathan is a Professor in Mechanical Engineering at the University of Adelaide, the inaugural Energy Professional of the Year from the Australian Institute of Energy, SA, a Fellow of the Combustion Institute, a recipient of a Discovery Outstanding Researcher Award from the Australian Research Council and an ATSE KH Sutherland medallist. He was the bid leader for, and is now the Research Director of, the national \$215m Heavy Industry Low-carbon Transition Cooperative Research Centre, the HILT CRC. This builds on his leadership of an ARENA-funded program to develop technology with strong potential to provide energy to the Bayer alumina process with concentrated solar thermal heat in partnership with Alcoa and Hatch, together with his co-leadership of program to develop innovative hydrogen production technologies within the Future Fuels Cooperative Research Centre. Overall, he has led the development of six technology platforms, three of which are in ongoing commercial use and include the flame for Sydney Olympic Relay Torch, while three are currently being upscaled to decarbonise heavy industry. He has published some 800 papers in international journals, 250 in peer reviewed conferences, 50 commissioned reports and 13 patents.

Low-carbon fuels will play an important role in the emerging economy that will need to meet growing commitments to progressive targets to reach net-zero CO2 emissions. Most commonly, these fuels are expected to be derived from biomass or refuse, or processed from hydrogen and captured CO2, so that any release of CO2 into the atmosphere is offset by capture of CO2 used in the source of the fuel. Alternative fuels are expected to have a role that complements direct electrification and direct use of sustainable heat, due to their competitive advantage in applications such as high-temperature industrial processes used to produce materials such as steel, cement and aluminium, air transport and heavy freight, together with peaking power. A wide range of processing pathways are therefore emerging to accommodate both the diverse range of feedstock type and the wide range of potential applications. The lecture will address these drivers and pathways, together with some of the emerging technology pathways for their production, storage and use – with a focus on the industrial sector.

THE UNIVERSITY OF ADELAIDE

Net-zero Fuels: A vital component of the net-zero economy

G.J. 'Gus' Nathan, Woei Saw, Leok Lee, Zhao Tian, Zhiwei Sun, Alfonso Chinnici, Mehdi Jafarian, Peter Ashman

Centre for Energy Technology, University of Adelaide
 and
 Heavy Industry, Low-carbon Transition Cooperative Research Centre

Guest lecture for Shanghai Jiao Tong University

adelaide.edu.au

THE UNIVERSITY OF ADELAIDE | HILTCRC

Potential roles for hydrogen in Net-zero High Temp Industrial Processes

COMMON CHALLENGES

- Hydrogen
- Electrification
- Process heat
- Social License
- Infrastructure
- Market and policy context

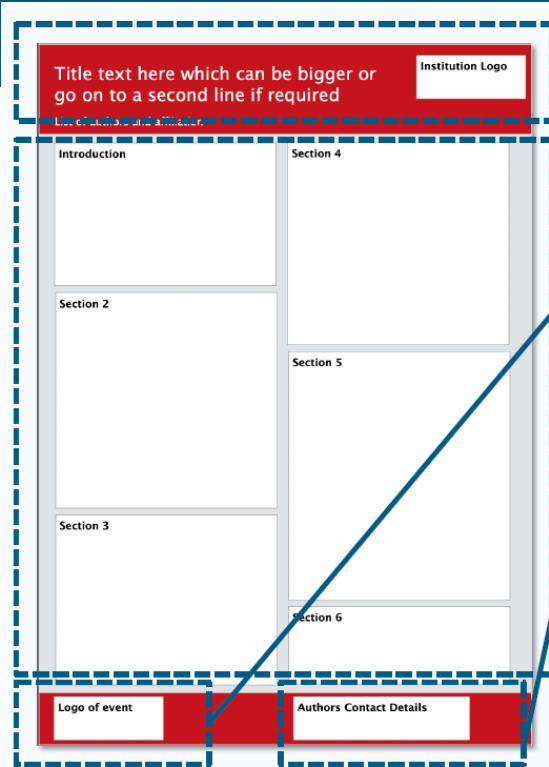
Heat	Chemical	Circular economy
Reduction (iron, lead, etc)	Reductant (H ₂ , CO, etc)	CCU (H ₂ + CO ₂ → jet fuel)
Calcination (cement, alumina)	Atmosphere (H ₂ O, CO ₂ , etc)	Mineral carbonation (gangue)
Pre-treatment (comminution)	Atmosphere (H ₂ O, CO ₂ , etc)	

Centre for Energy Technology



02 RESEARCH POSTER

How the Create a Research Poster



Technical posters consist of:

- Header information
- Body text
- Event details (PJ187)
- Contact information/others

Body text should ideally contain sections such as:

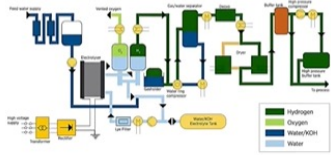
- Introduction
- Methodology/Set Up
- Concept/Framework
- Results & Discussion
- Conclusions
- References

Some posters will not contain all sections

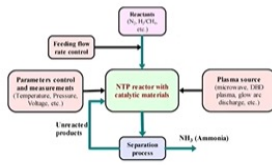
ZERO CARBON FUEL: AMMONIA

Green ammonia Production

Hydrogen Production Commercial alkaline electrolyser



Ammonia Synthesis Nonthermal Plasma (NTP)



[5] M. El-Shafie and S. Kambara, "Recent advances in ammonia synthesis technologies: Toward future zero carbon emissions," International Journal of Hydrogen Energy, vol. 48, no. 30, pp. 11237-11273, 2023/04. <https://doi.org/10.1016/j.ijhydene.2023.09.284>

Currently commercial alkaline electrolyzer has an energy efficiency of 51 to 60% but research and development has improve energy efficiency to 81%

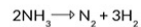


Group 1: Ammonia Coal co-firing for a steam furnace



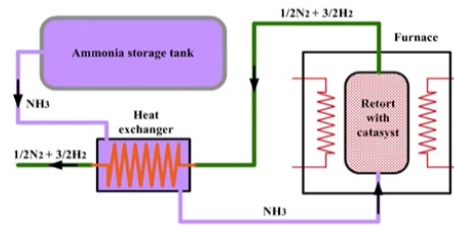
Group 2: Hydrogen in gas turbines

Cracking of Ammonia (for Hydrogen Production)



Catalyst

- Nickel
 - > 850 °C
- Ruthenium
 - < 500 °C
 - Rare and expensive
- Sodium/lithium imide
 - 400 °C to 550 °C
 - Inexpensive

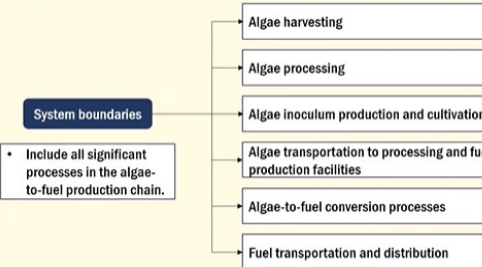


Then moving on we have the cracking of ammonia to produce hydrogen gases.



Group 3: Ammonia - hydrogen in ships

LCA value and its impacts



Within the system boundaries, key process examined include algae in Oklam production, cultivation, harvesting, processing, transportation and conversion to biofuel.



Group 4: Biojet fuel application in aircraft

Green Ammonia:

- Ammonia produced using renewable energy sources
- Minimizes or eliminates greenhouse gas emissions
- Alternative to conventional ammonia production with fossil fuels
- Environmentally friendly and sustainable

Power-to-X Technology (P2X/PtX):

- Uses renewable electricity to convert and store energy in various chemical compounds or fuels
- X represents different end products like ammonia, hydrogen, methane, etc.
- Enables energy storage and addresses renewable energy intermittency
- Maximizes resource utilization and energy system efficiency

The x actually represents a different kind of m products such as ammonia, methane, hydrogen and lots of lots and more.

Group 5: Power-to-X technology

ELEMENTS

Lithium Ion BATTERY vs Hydrogen FUEL CELL

Electric Vehicles

Onboard charger: Converts AC electricity from power outlets into DC power.

Fuel tank: Hydrogen gas is stored in a high-pressure tank. Liquid hydrogen can't be used because it requires cryogenic temperatures.

Exhaust: The only waste product of an FCEV is water.

Now we'll move on to comparing between two technologies we have today for Evs

Group 6: Electrification

BIOETHANOL

Scaling Up Third-Generation Algal Biomass Feedstock

Presented By
Siranjeev Kumar,
Wang TianZuo,
Adrian Chong Ian Xiang,
Lim Wen Wei Louis.

Group 8: Bioethanol - Scaling Up 3rd Gen Algal Biomass Feedstock

CO₂

Group 9

Biogas - Manure as Energy Source

Group 9: Manure as Energy Source

Poster presentation

Ammonia - Coal co-firing for a steam furnace

Loo Kai Qiam, Joshua Foo Shyh Yuen, Gong Boxuan*, Tan Hui Hui, Akinwumi Joseph*
 *Faculty of Engineering of Physical Sciences, University of Southampton, Malaysia Campus, Iskandar Puteri, Malaysia
 *School of Physics and Astronomy, Shanghai Jiao Tong University, Shanghai, China
 *School of Mechanical Engineering, Tsinghua University, Beijing, China
 *School of Engineering, University of Leicester, Leicester, United Kingdom

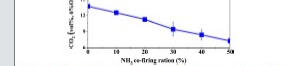
Introduction

Coal is the largest contributor to CO₂ emissions globally.

Ammonia - Coal co-firing for a steam furnace is an alternative to reduce emissions.

Zero carbon fuel: Ammonia

Why ammonia?
 ✓ Carbon-free
 ✓ Easy to liquefy & High energy density
 ✓ Higher volumetric hydrogen content



Potential Carbon-free Ammonia Production

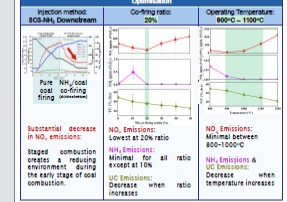
Green Ammonia Production

- Hydrogen Production
 - Water Electrolysis
 - Replace CH₄ and fossil fuel feedstock
 - Ammonia synthesis
 - Nonthermal plasma (MTP)
 - Fossil fuels elimination

Optimisation: Reducing Environmental Impact

Pollutants of Concern: Nitrogen Oxides (NO_x), Ammonia (NH₃), Unburned hydrocarbons (UC) Smog ~ Respiratory diseases

Environmental Impact: Acid rain ~ Disrupt ecosystem



SHANGHAI JIAO TONG UNIVERSITY Net Zero Carbon Fuels PJ187

Loo Kai Qiam, Joshua Foo Shyh Yuen, Gong Boxuan, Tan Hui Hui, Akinwumi Joseph

Group 2 SJTU NZCF 2023 Project: Hydrogen in Gas Turbines

Authors: Peter Kanchan, Cardiff University; Jun-Kay Lam; Shanghai Jiao Tong University; Phoebe Year; University of Southampton Malaysia; Yao Jing; University of Southampton Malaysia; Tamer Ahmed; University of Science & Technology Beijing



Challenges

The main challenges associated with hydrogen gas turbine are physical properties of hydrogen, hydrogen production, efficient gas compression and storage capacity.

Learnar, flame speed, flammability, high reactivity, the flame speed of hydrogen (1.7 m/s) in combustion zone is relatively higher than natural gas which can cause severe flame flashback.

Production Method: The method used to produce hydrogen for combustion in gas turbine is electrolysis. Due to lower production cost in comparison to thermochemical process, the use of electrolyser unit must be significantly lowered to be competitive with common methods like natural gas reforming (NG).

Gas Turbines and Hydrogen Fuel

A gas turbine engine is a type of engine that converts the energy from the combustion of a fuel, typically natural gas, into mechanical energy. Gas turbines are used for various applications, including power generation, aircraft propulsion, and marine propulsion.

Gas turbines are commonly used in power plants to generate electricity, where they can be used in combined cycle power plants for improved efficiency.

In the aviation industry, gas turbines are widely used in jet engines to provide thrust for aircraft propulsion. They offer high power output, reliability, and the ability to operate at high altitudes.

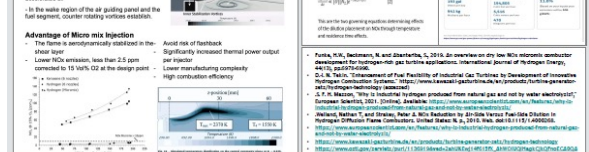
Micro Mix Injection

Fuel is distributed through the fuel supply segments & injected through small nozzles into a crossflow of air jet-in-crossflow mixing of a jet into a crossflow of air.

In the water region of the air guiding panel and the fuel injection, counter rotating vortices exist.

Advantage of Micro Mix Injection: The flame is aerodynamically stabilized in the "air jet" region.

- Lower NO_x emissions, less than 2.5 ppm
- Lower manufacturing complexity
- High combustion efficiency



SHANGHAI JIAO TONG UNIVERSITY Net Zero Carbon Fuels PJ187

Shawn Ho, Braydon Lee, Vanessa Rudd, Mubhammad, Lesley

Ammonia-Hydrogen In Ships

Braydon Lee UOSM, Vanessa Rudd UOSM, Shawn Ho UOSM, Lesley Huang SJQU, Omar UCSI

Introduction and Problem statement

- CO₂ emissions from shipping industry accounts for 2.5% of the global emissions.
- Ammonia is the best alternative net zero carbon fuel but has its disadvantages too.
- This study introduces an Ammonia-Hydrogen blend as a modification to using pure ammonia

Green Ammonia Production

H₂ Water Electrolysis
N₂ Air Separation
NH₃ Sustainable Haber Process

3rd Generation Ammonia production

Photochemical
Electrochemical Methods

- Low temperature
- Molten-salt synthesis
- Solid-state synthesis
- Lithium metal cycling
- Non-thermal plasma synthesis

Ammonia - Hydrogen Engines

Micro Mix Injection
Pre-combustion of the ammonia or reduce
Spray combustion of ammonia
Expansion stroke

Ammonia premixed ICE engine

Cracking of Ammonia (Hydrogen production)
 NH₃ + Heat → H₂ + N₂

Catalyst: Nickel at > 850 °C, Ruthenium ~ 500 °C, Sodium/lithium imide at 400 °C to 550 °C

SHANGHAI JIAO TONG UNIVERSITY Net Zero Carbon Fuels PJ187

Shawn Ho, Braydon Lee, Vanessa Rudd, Mubhammad, Lesley

Algae-to-jet fuel:

A promising, sustainable and scalable technology

Lee Ya Wen*, Raya Puruhas*, Kong Xiao Yan*, Takehiro Yamashita*, Al Jabber Khan*, Wu Hong Ming*
 *Faculty of Engineering of Physical Sciences, University of Southampton Malaysia Campus, Iskandar Puteri, Johor, Malaysia
 *Lund University
 *Shanghai Jiao Tong University

Introduction

Aviation CO₂ emissions have dramatically increased in recent years, prompting organizations to promote the use of Sustainable Aviation Fuels (SAF).

Feasibility of ASTM-D7655 Annex 7

ASTM-D7655 Annex 7 is the newest addition to the ASTM-approved SAF technology. It can be scaled up to produce 10 000 tonnes of the biojet fuel HC-HEFA-SPK annually.

Hydrocarbon instead of lipid
 Hydrocarbon content: *Butyrococcus braunii* produces the main feedstock, crude oil which mainly consists of hydrocarbon.

"Drop-in" fuel

Modifications of existing engines are not required.

"Fast-track" review process

Fast Track Annex (1-2 years) vs Conventional testing protocols (8-10 years)

Sustainability

Life Cycle Assessment (LCA) estimates the carbon intensity of HC-HEFA-SPK.

Total net GHG emissions: COESA UCO SAF, COESA Rebased SAF, Algae-based SAF

References

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2. Wang, Y., et al. (2021). Chapter 4 - SAF production and distribution. *SAF: Sustainable Aviation Fuels*. Elsevier, 18-24.

3. Wang, Y., et al. (2021). Chapter 5 - SAF production and distribution. *SAF: Sustainable Aviation Fuels*. Elsevier, 25-31.

4. Wang, Y., et al. (2021). Chapter 6 - SAF production and distribution. *SAF: Sustainable Aviation Fuels*. Elsevier, 32-38.

5. Wang, Y., et al. (2021). Chapter 7 - SAF production and distribution. *SAF: Sustainable Aviation Fuels*. Elsevier, 39-45.

SHANGHAI JIAO TONG UNIVERSITY Net Zero Carbon Fuels PJ187

Lee Ya Wen, Raya Puruhas, Kong Xiao Yan, Takehiro Yamashita, Al Jabber Khan, Wu Hong Ming

- Poster – Summarise the project
- Enable other teams to read and reflect the work

Poster presentation

Power-to-X technology (green ammonia)

Anthony Tan, Li Heng Chin, Wei Jia Wee, Li Yan

Introduction

Global environmental problems from carbon emissions intensify, prompting the adoption of clean energy as one of 17 Sustainable Development Goals (SDGs). Large-scale solar and wind power deployment is expected, but intermittent energy supply and curtailment hinder their efficiency and effectiveness.

1. Current state

Global ammonia production, export, import, consumers and trade flows

The main technology/ammonia cracking, Haber-Bosch process is currently TRRL 6.8, and decarbonized Haber-Bosch production is still in R&D 1.4.

Ammonia from electrolysis and Haber-Bosch, used with a solid oxide fuel cell to produce electricity can achieve 28.5% overall efficiency.

2. Risk associated

- Need time to scale up the production, else is not sufficient to supply the world
- Safety condition need to be strict as ammonia is toxic and flammable properties, so handling, storage, and transport of ammonia is important.
- High Capital cost risk in green ammonia production due to infrastructure setup, including renewable energy systems and ammonia synthesis plants.

3. Solutions to the risks

Integrate green ammonia production with existing ammonia production facilities is one of the solution for the risk associated with green ammonia production, optimizing electricity costs with renewable energy.

- Cost and Efficiency
- Leverage existing infrastructure for reduced capital investment in green ammonia production, optimizing electricity costs with renewable energy.
- Market access
- Green ammonia production integrates with existing facilities for market access, reduced risk, and gradual transition.
- Environmental impact
- Green ammonia offers potential as a carbon-free fuel, energy carrier, and fertilizer feedstock, making it easily transportable and storable, contributing to decarbonization in various sectors.

4. Green ammonia vs Methanol

Ammonia

- Chemical composed of hydrogen and nitrogen
- Zero carbon fuel
- Does not require carbon source
- Nitrogen easily captured from air
- More efficient in the long run
- 780,000ppm = 780g/liter

Methanol

- Methanol is a hydrocarbon
- Net zero carbon fuel
- Requires carbon source
- Carbon dioxide obtained from burning fossil fuels or biomass, or direct air capture
- Direct air capture is energy intensive and expensive
- Only short-term advantages
- 450ppm = 0.45g/liter

Which is better?

It is not a multiple-choice question

In its current state, the development of one technology can improve the other. For instance, a hydrogen source will stimulate innovations in fuel cell technologies which will complement an electricity society, enhancing battery capabilities.

IC Engines: Should it be Banned?

IC engines generate mechanical energy by burning fossil fuels such as petrol or diesel, which is then converted into useful work. IC engines have been the main source of power for transport and many industrial applications for over a century. This heavy reliance is the source of most global GHG emissions. However, due to its importance and sufficiency to the whole industry, it shouldn't be banned at present. It will continue to evolve as awareness of environmental issues increases and new technologies become available.

Conclusion

Green ammonia production offers superior energy density, carbon neutrality, infrastructure, market potential, and environmental impact compared to methanol, positioning the company for a sustainable future and ensure long-term success.

Citation

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 4. Li Yan—Astralleed416@gmail.com

Electrification Decarbonising Ground Mobility

Wei Yitong, Chen Huihui, Qiu Tingting, Wang Zhenfeng, Lin Chi, Tian Jiamen
 KJIME (Ji Cao) College, Shanghai Jiao Tong University, Minhang Campus
 No. 800 Dongchuan Road, Minhang District, Shanghai

Introduction

Since the adoption of The Paris Agreement, countries worldwide began increasing efforts to mitigate greenhouse gas emissions, hoping to achieve the 1.5°C annual temperature rise target. Among these, decarbonising road transport holds a high priority.

With the progress of global technological development and the emergence of sustainable development concepts, the global battery-powered market has shown explosive growth in recent years, with sales exceeding 50 million vehicles in 2022. Similarly, the development of other forms of zero-carbon vehicles follows this trend.

The report highlights the benefits of decarbonization, a comparison between battery-powered and fuel-cell electric vehicles, what's next for IC engines and policies to help achieve road transport electrification.

How to Decarbonize Road Transport

Draft Policy

Regulations

- For Consumers: Introduce preferential parking and toll fee discounts for EVs and FCVs to incentivize their adoption.
- For Producers: Implement stricter emissions standards for vehicle manufacturers, incentivizing the production of low or zero-emission vehicles.

Battery-Powered VS Fuel Cell Vehicles

Common

- Advantages: High efficiency, long driving operation, no noise, better energy density
- Disadvantages: High initial cost, technology not fully matured, lack of facilities, safety concern

Advantages of Battery

- Diverse storage electricity
- Cheaper to recharge
- Centralized processing of batteries can control pollution

Advantages of Fuel Cell

- Larger range
- Shorter refuel
- Wide range of energy sources

Benefits of Decarbonisation

- Control global temperature rise
- Mitigate climate change
- Reduce air pollution
- Protect our land
- Conserve the ocean's ecosystem
- Prevent the loss of marine biodiversity
- Improve Living Conditions
- Raise life expectancy
- Reduce mortality rates
- Increase labour productivity
- Improve energy and resource efficiency
- Higher quantity and quality of production leading to higher GDP and economic growth

Conclusion

Battery-powered and fuel-cell electric vehicles both have their pros and cons. To choose, a single all renewable source is not the perfect option yet. Due to the importance and sufficiency of IC engines, currently, we can't and shouldn't ban them completely. To decarbonize the transportation sector, draft policies and regulations can be used to achieve the goals. Finally, decarbonization can bring us so many benefits, we should keep going and focus on that.

Bioethanol - Scaling Up Third-Generation Algal Biomass Feedstock

Srinivas Kumar Bala, University of Leicester
 Lin Wei Wei Lim, University of Southampton Malaysia
 Adam Cheng Jui Xiang, University of Southampton Malaysia
 Timmo Wang, Sun Yat-sen University

Introduction

The demand for biofuels, particularly bioethanol, has been a global concern and societies strive to reduce the greenhouse gas emissions and achieve energy sustainability. Concerns about food security and the scarcity of arable land have been highlighted by the predominance of first-generation feedstocks derived from edible food crops. Consequently, efforts have been made to transition towards third-generation feedstocks derived from algal biomass, but these alternatives present their own challenges.

3rd generation biomass

2nd generation biomass

1st generation biomass

Pros and Cons of Algal Biomass

Adopting algal biomass as a feedstock offers several potential benefits. It provides significant environmental advantages through carbon sequestration, reduced land and water requirements, and waste utilization. Algal cultivation requires less land than traditional crops and can thrive in diverse aquatic environments, making it a land and water-efficient option. Additionally, algal biomass can utilize organic waste streams, reducing waste and improving resource efficiency. However, there are risks, including technological challenges, market viability concerns, and regulatory factors. Overcoming these challenges is essential to unlock the full potential of algal biomass for sustainable and eco-friendly solutions in various industries.

BENEFIT RISK

Proposed Production Solution

FEEDSTOCK / CULTURE: Algae in PBR
PRETREATMENT: Thermal
HYDROLYSIS: Enzymatic
FERMENTATION: SSB
PURIFICATION: Distillation
RECOVERY: Bioethanol

Current State-of-the-Art for Algal Biomass Bioethanol

1 Pretreatment: Destroy cell wall to expose intracellular components
2 Hydrolysis: Convert complex carbohydrates to simple monomers
3 Fermentation: Use microorganisms to convert the sugars obtained by hydrolysis into ethanol
4 Purification: Improve the purity and separate waste and other useful substances

Conclusion

- Feed stock Availability and Cost - Shifting to 3rd generation biomass feedstock, such as non-food crops or municipal solid waste, involve higher costs and complexities.
- Established Infrastructure - Switching to 3rd generation biomass feedstock would require modifications and additional investments in infrastructure, equipment, and research and development.
- Market Demand and Stability - Switching to 3rd generation feedstock would require anticipating a relatively a new market, with uncertain demand and potential challenges in market. Staying with 1st generation feedstock allows us to maintain market stability and capitalize on our existing customer base.

Biogas – Manure as an Energy Source

Net-Zero Carbon Fuels 2023, Shanghai Jiaoqiao University
 Jack Wright, ZhenFeng Zeng, Guan Yiling, Zi Ern, Gillian Wong, Md Mehedi Hasan Rumman

Introduction - The Abundance of Manure, easy of processing and energy density make it the ideal source for affordable and clean energy generation; Target 7 of the UN sustainable development goals.

Manure Feedstock availability and supply chain

- China has produced 209.3 million tons of pig manure annually
- The United States produces 41.5 million MT of ready-to-eat meat (chicken, pork and beef)

The Ecological problem of Manure

Environmental hazards of Manure:

- Groundwater pollution
- Eutrophication of surface waters
- Accumulation of nutrients in soil
- Dispersion of pathogens
- Toxic compound accumulation
- Ammonia Acidification
- Greenhouse gas emissions
- Odour, dust, noise

Biogas from Manure Production

Animal Manure may be exploited toward the biogas production in an anaerobic digester. Anaerobic digestion is the microbial fermentation of substrate in the absence of oxygen. High energy content makes it ideal as a natural gas substitute.

Pre-digestion: Done to increase gas production and digestate quality either by enzymes or chemicals or any physical or biological methods. These include Milling, Extrusion, Microwave and Acid treatment.

Anaerobic digestions: AD commonly takes place in a fixed dome digester at an industrial scale.

Renewable Energy Source: Manure is derived from abundant and continuously generate organic waste materials.

Nutrient Recycling: Anaerobic digestion produces nutrient-rich digestate from manure.

Business opportunities for Manure based Biogas

- Renewable Energy Generation
- Waste Management services
- Reduce Green House Effect
- Energy Revenue
- Fertiliser revenue

Upgrading Technologies: CO₂ represents 30-50% (Muñoz et al. 2015) of the biogas content, it is the main objective to be eliminated in order to recover and purify the biogas.

Conclusion

The use of manure is beneficial from both an environmental and business perspective. Manure offers a number of revenue opportunities and is proven and simple to process. Not utilizing Manure would create an ecological disaster.

Our recommendation to Investors:

A Large Industrial fixed dome anaerobic digester facility with acid pre-treatment and High pressure water scrubbing upgrading located in the central agricultural areas of USA and China.

Authors Contact Details

Group leader: Contact Details: Jackw@sjtu.edu.cn

Jack Wright, ZhenFeng Zeng, Guan Yiling, Zi Ern, Gillian Wong, Hasan Rumman, Md Mehedi



- Students learnt the skills of making poster
- Collaborative learning – enhance teamwork

Best presentation award



Best Group Presentation Award Distinction

Loo Kai Qian, Gong Bo Xuan, Joshua I
Tan Hui Hui, Joseph Akinwu

SJTU SDG July Camp 2023: Net Zero-Car
Shanghai, China: 19 June – 6 July 2

Assoc Prof Chong Cheng Tung
Shanghai Jiao Tong University
Course leader

Prof Agustin Valera-Medina
Cardiff University
Course instructor



Best Group Presentation Award Outstanding

Anthony Tan Yen Kun, Wee Wei Jia, Chin Li Heng, L

SJTU SDG July Camp 2023: Net Zero-Carbon Fuels
Shanghai, China: 19 June – 6 July 2023 (Onlin

Assoc Prof Chong Cheng Tung
Shanghai Jiao Tong University
Course leader

Prof Agustin Valera-Medina
Cardiff University
Course instructor



Best Group Presentation Award Merit

Siranjeev Kumar, Wang TianZuo, Adrian Chong Ian Xiang
Lim Wen Wei Louis

SJTU SDG July Camp 2023: Net Zero-Carbon Fuels (PJ187)
Shanghai, China: 19 June – 6 July 2023 (Online)

Assoc Prof Chong Cheng Tung
Shanghai Jiao Tong University
Course leader

Prof Agustin Valera-Medina
Cardiff University
Course instructor

Assoc Prof Ng Jo-Han
University of Southampton Malaysia
Course instructor

Distinction Award: 1, 4

Outstanding Award: 5, 6, 9

Merit Award: 2, 3, 8

Course reflection

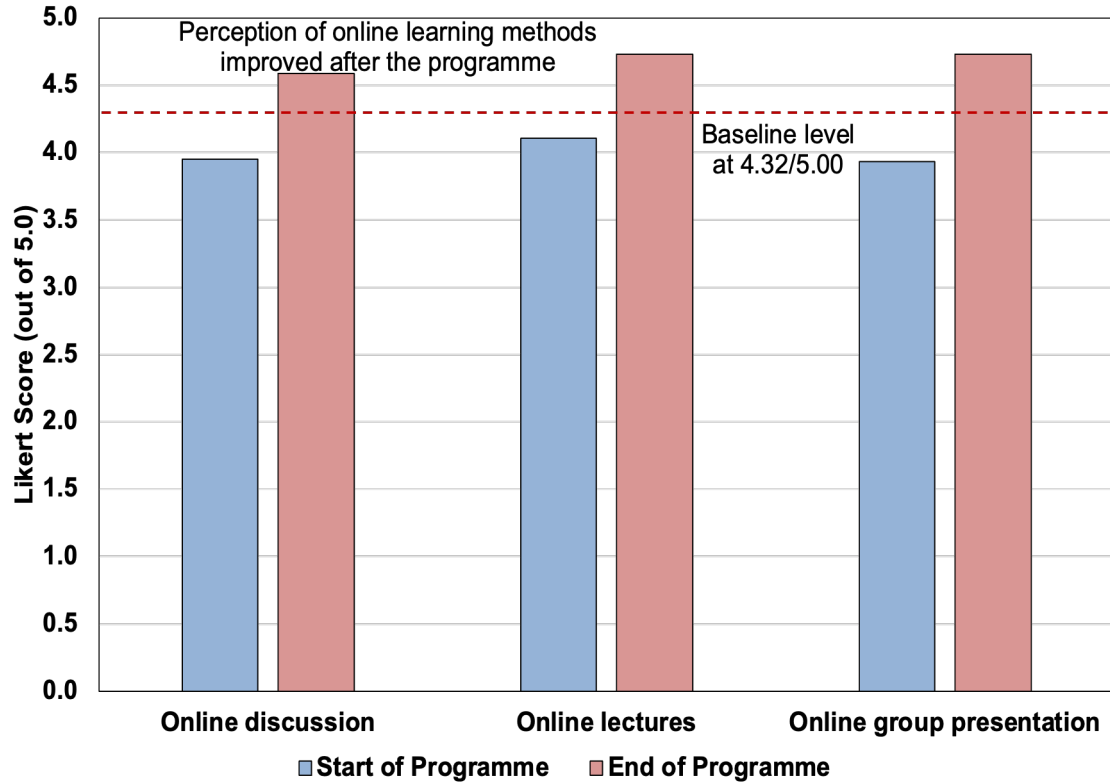
Questions	2023	2022
	Score (/5)	Score (/5)
I think that the programme has been useful to help me to understand the Sustainable Development Goals .	4.95	4.8
I think that the programme has been useful to help me to understand the Net Zero-Carbon Fuels .	4.97	4.8
I think that the programme has increased my interest in learning about Sustainable Development Goals .	4.86	4.7
I think that the programme has increased my interest in learning about Net Zero-Carbon Fuels .	4.89	4.7
I feel that the overall method of learning in the programme is effective .	4.76	4.5
I find live online lectures in this programme to be effective for learning.	4.73	4.5
I find online group presentations in this programme to be effective for learning.	4.73	4.5

Course passing rate : 91%

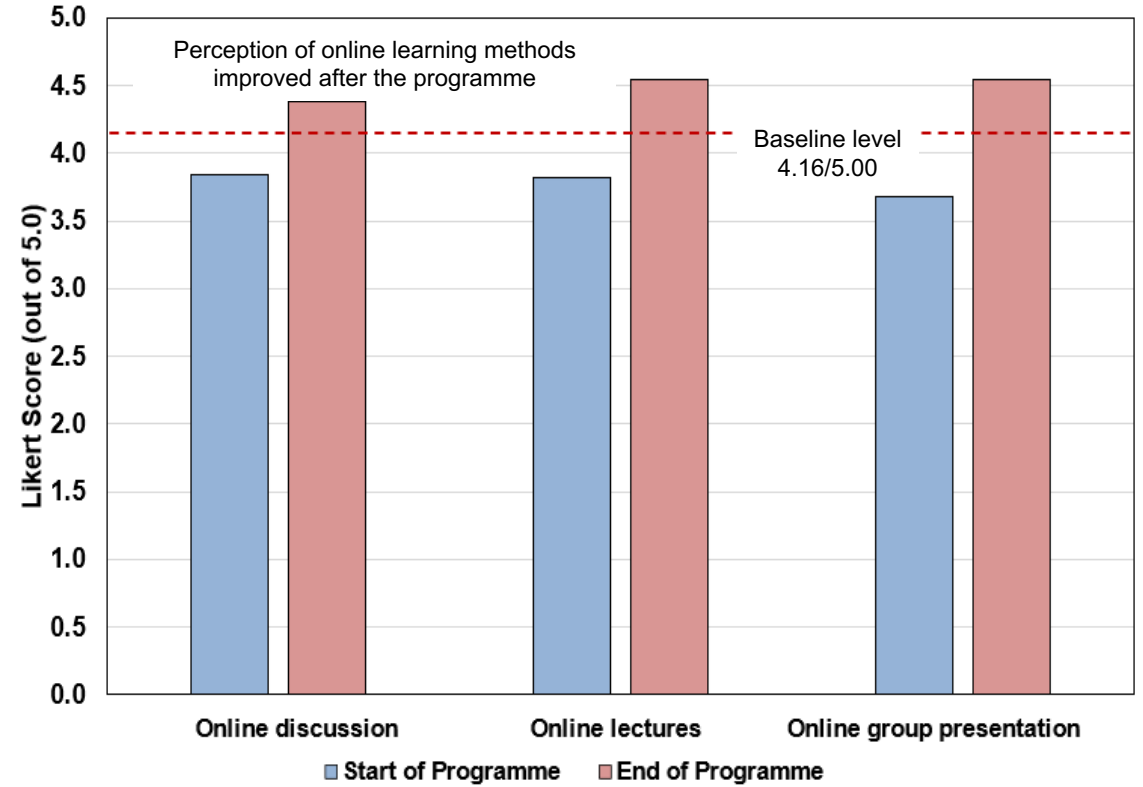
88 %



Perception on online learning methods before and after the programme



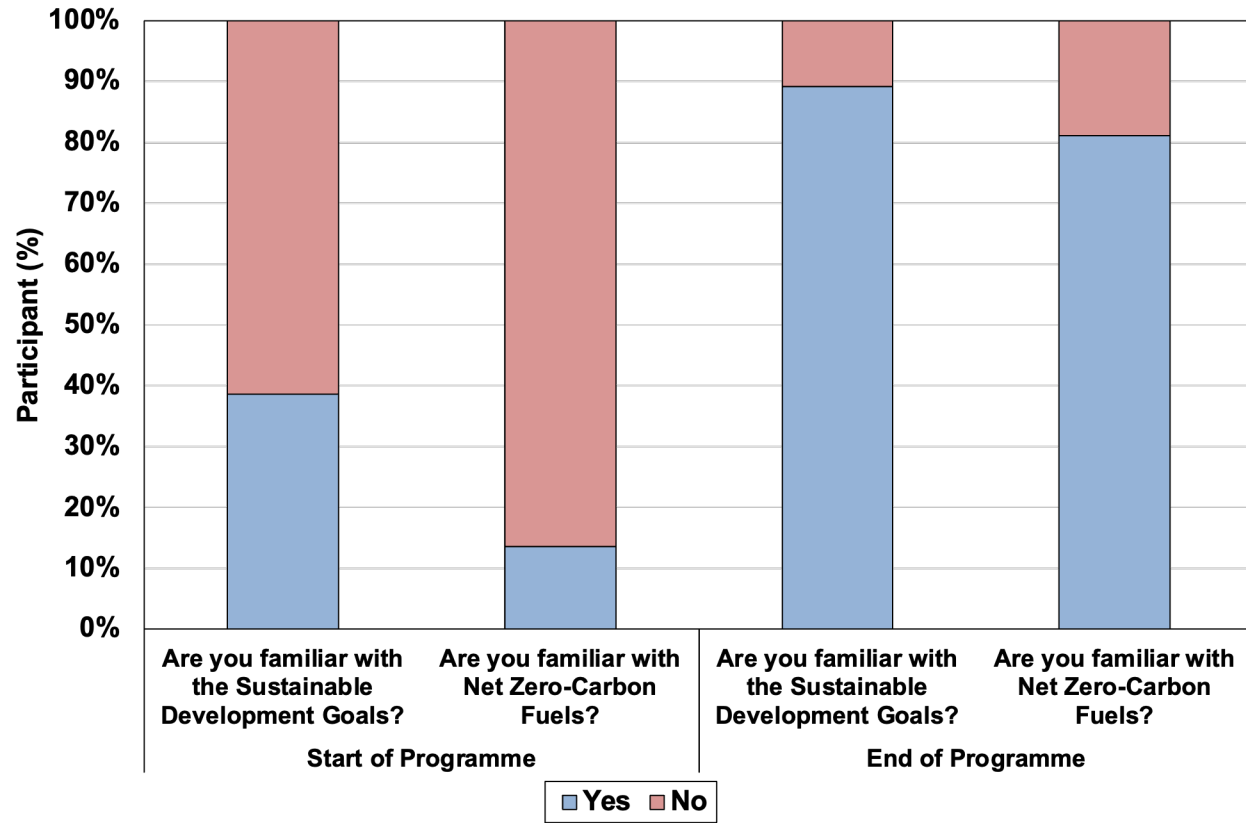
2023



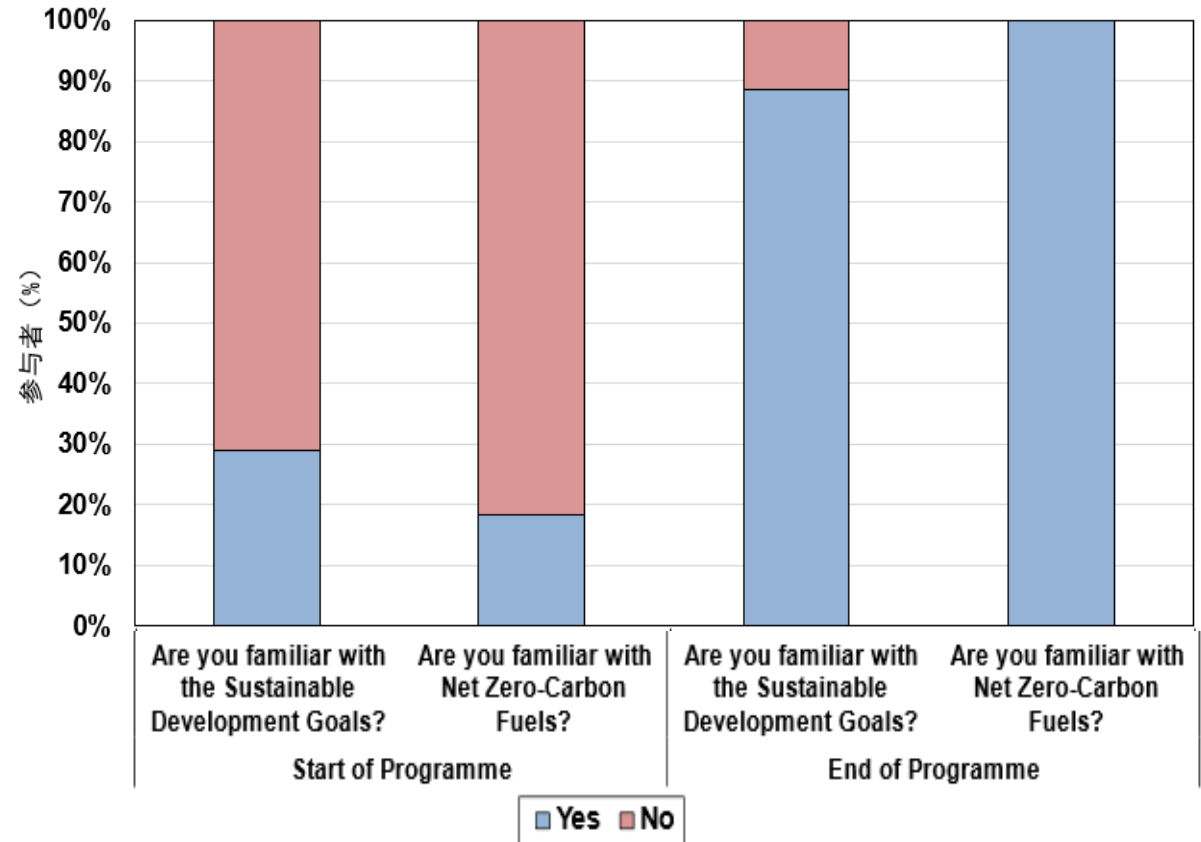
2022



Perception on the familiarity of the SDG and course content



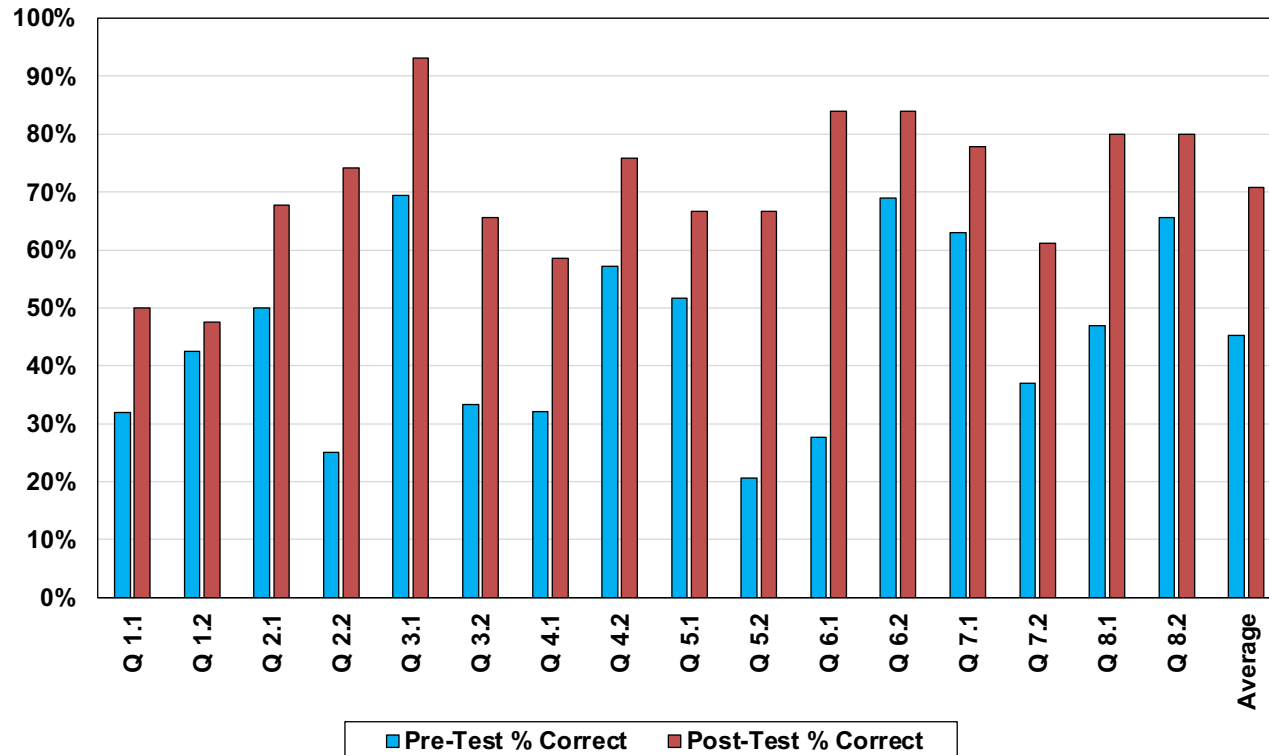
2023



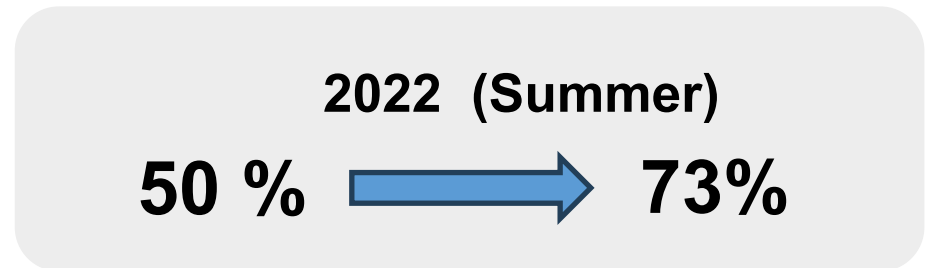
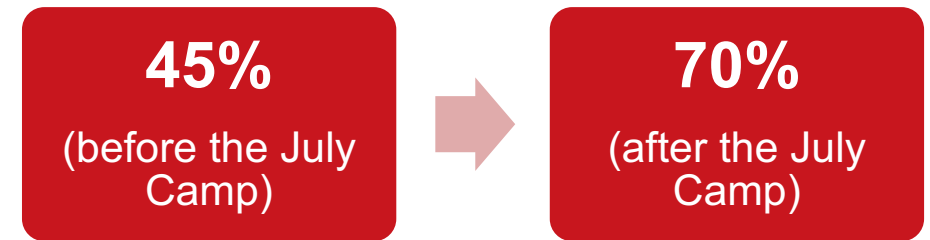
2022

Course efficacy test

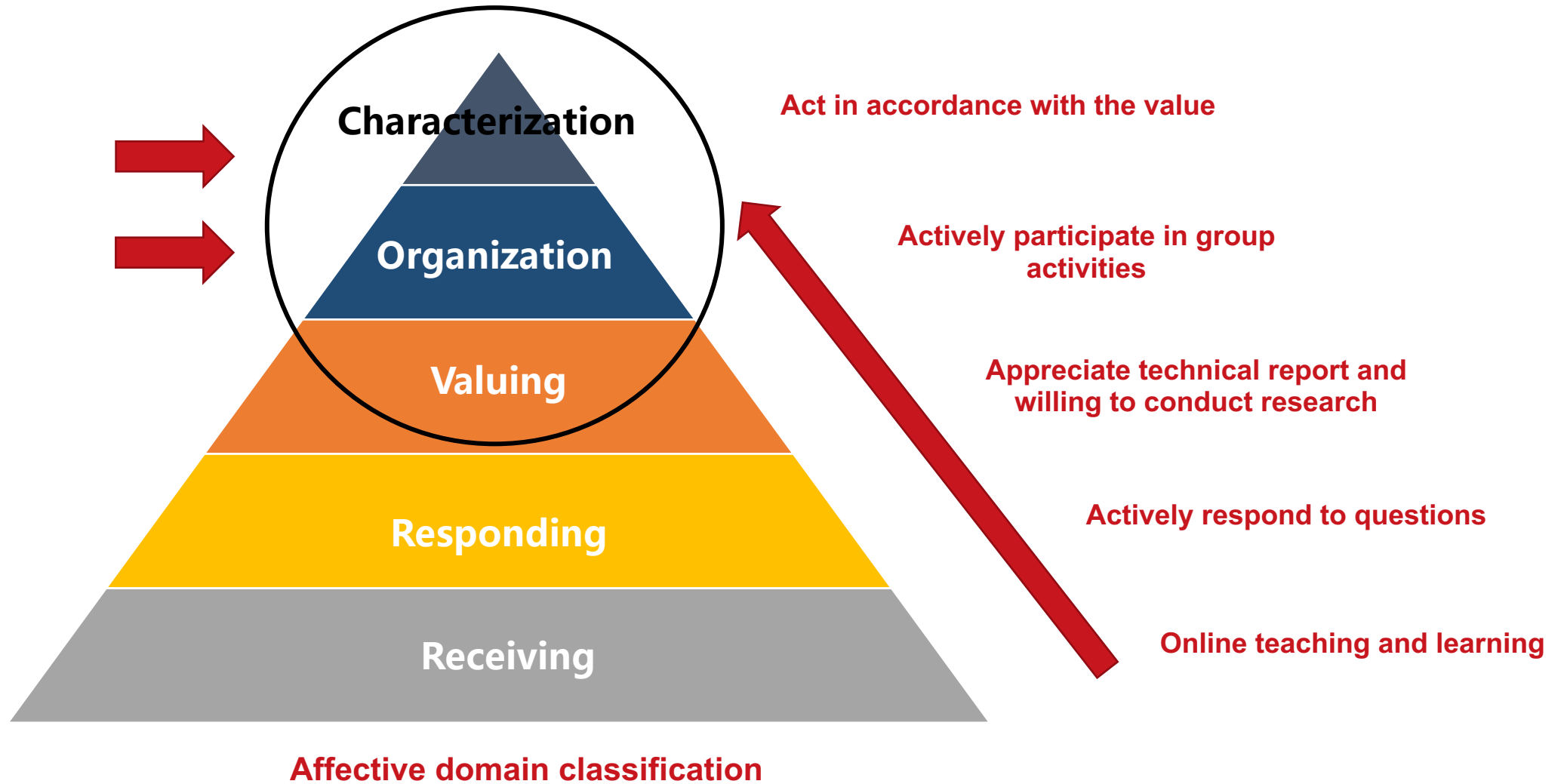
Improvement in Knowledge of SDG and Net-Zero Carbon Fuels Before and After the Course



Participants' (2023) understanding of SDG and Net Zero-Carbon Fuels improved from:



Bloom's taxonomy – Affective Domain



Did the course increase the affectiveness in students towards the SDG and Net Zero-Carbon Fuels knowledge?

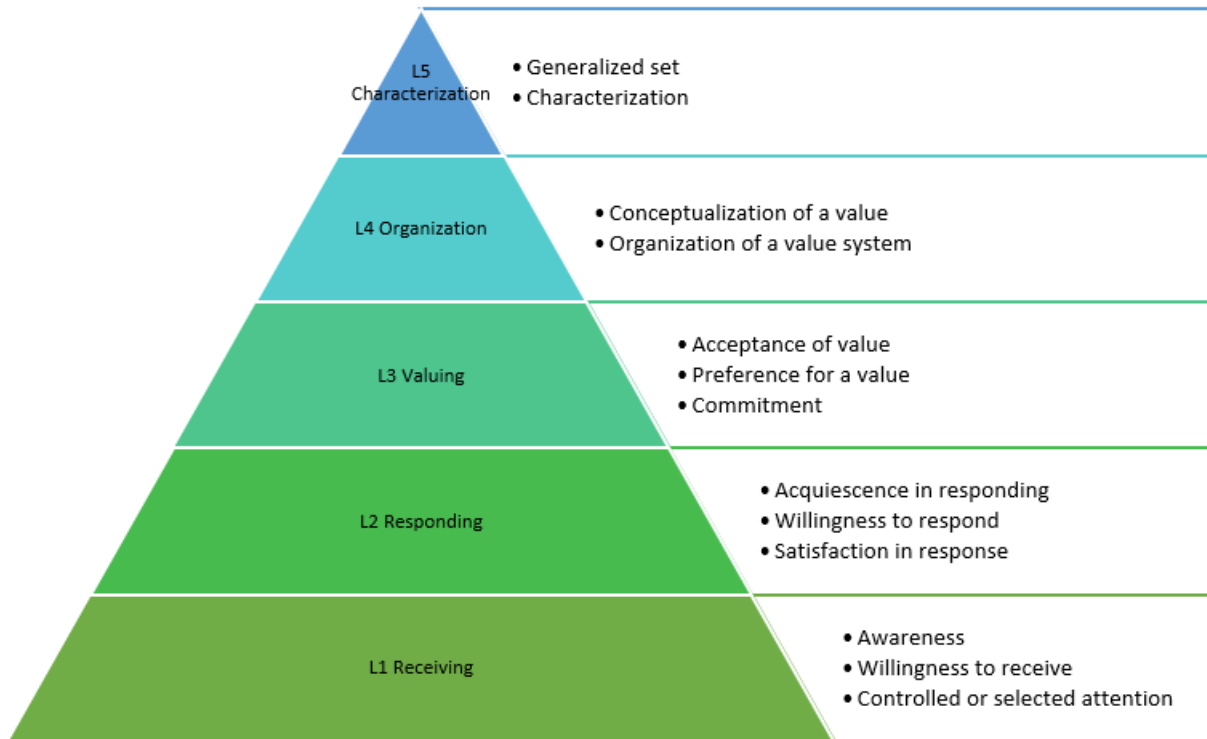


Figure 1: Affective Domain based on Krathwohl, Bloom and Masia (1964).

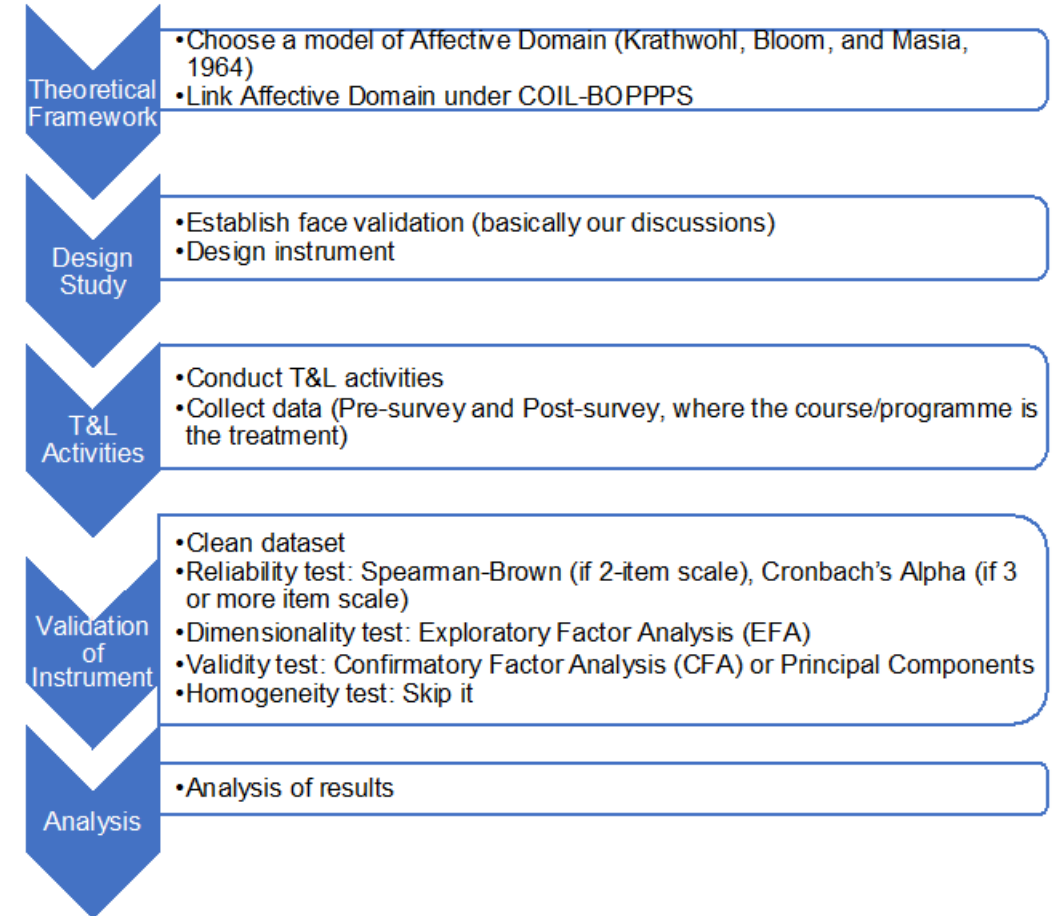
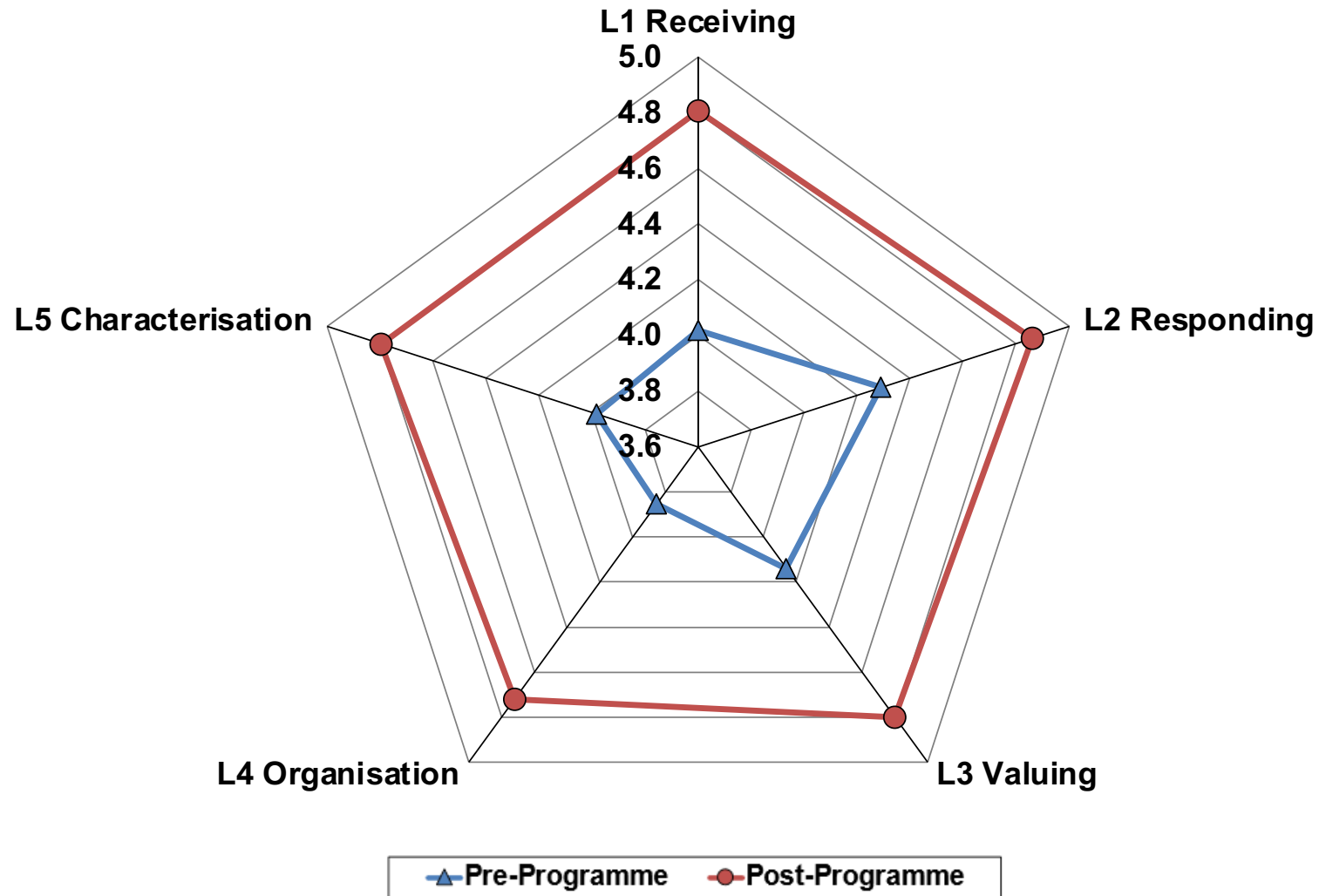


Figure 2: Proposed methodology for conducting the study.

Research design

Affective Category	Subcategory	Assessment Tool : Rating Scale using Likert Questions				
L1 Receiving	Awareness	<ol style="list-style-type: none"> 1. I am familiar with the Sustainable Development Goals (SDGs) and their objectives. 2. I am knowledgeable about the key principles and targets of the SDGs. 3. I can accurately identify the main areas of focus for the SDGs. 	L3 Valuing	Acceptance of value	<ol style="list-style-type: none"> 19. I embrace the values and principles promoted by the SDGs, such as equality, sustainability, and social justice. 20. I wholeheartedly support the values of equality, sustainability, and social justice promoted by the SDGs. 21. I believe that the principles advocated by the SDGs, such as equality and social justice, strongly resonate with my own values. 	
	Willingness to receive	<ol style="list-style-type: none"> 4. I am open to learning about the various issues addressed by the SDGs and the actions required for their achievement. 5. I actively seek out opportunities to learn about the different challenges targeted by the SDGs and the steps to address them. 6. I am curious and interested in understanding the diverse issues that the SDGs aim to tackle. 			Preference for a value	<ol style="list-style-type: none"> 22. I prioritize a particular SDG or set of SDGs in my personal actions and decision-making. 23. I consciously integrate the specific goals of the SDGs into my personal actions and decision-making processes. 24. I consider the impact on the priority SDGs that I have identified when making choices and decisions.
	Controlled or selected attention	<ol style="list-style-type: none"> 7. I focus well on understanding the specific targets and indicators related to each SDG. 8. I make a conscious effort to comprehend and remember the specific targets and indicators linked to each SDG. 9. I am attentive to the details and specifics of the targets and indicators relevant to each SDG. 			Commitment	<ol style="list-style-type: none"> 25. I am committed to actively contribute to the achievement of the SDGs and to promoting their implementation in my community and beyond. 26. I actively seek opportunities to engage in initiatives that promote the implementation of the SDGs in my community. 27. I am committed to advocating for the importance and progress of the SDGs and their implementation.
L2 Responding	Acquiescence in responding	<ol style="list-style-type: none"> 10. I am willing to take action in support of the SDGs when opportunities arise. 11. I actively look for chances to engage in activities that align with the goals of the SDGs. 12. I am eager to participate in actions and initiatives that promote the attainment of the SDGs. 	L4 Organization	Conceptualisation of a value	<ol style="list-style-type: none"> 28. I can define and explain the importance and relevance of a specific SDG or its associated targets. 29. I am capable of providing a clear definition of a specific SDG and its significance in addressing global challenges. 30. I am able to articulate the importance of a specific SDG and its associated targets in driving positive change. 	
	Willingness to respond	<ol style="list-style-type: none"> 13. I am motivated to actively contribute to the implementation of the SDGs in my daily life and in my community. 14. I am driven to make a positive impact in my community through actions aligned with the SDGs. 15. I have a strong desire to actively participate in SDG-related initiatives within my community. 			Organisation of a value system	<ol style="list-style-type: none"> 31. I can effectively integrate the SDGs into my personal values and prioritize them in my daily life and long-term goals. 32. I successfully incorporate the principles of the SDGs into my personal values and beliefs. 33. I actively integrate the SDGs into my long-term goals, ensuring they are a guiding force in shaping my future actions.
	Satisfaction in response	<ol style="list-style-type: none"> 16. I feel satisfied when I make progress or achieve positive outcomes in alignment with the SDGs. 17. I feel a sense of fulfilment when achieving positive outcomes that contribute to the SDGs. 18. I enjoy seeing the positive impact of my actions on SDG-related issues. 				

Affective Domain (Net Zero-Carbon Fuels)

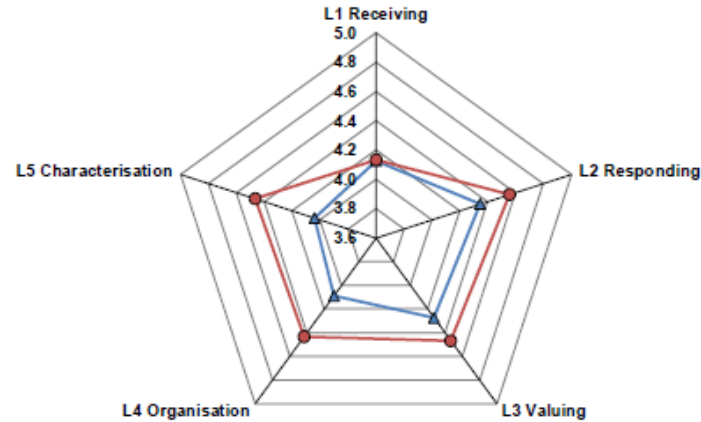


Affective domain attainment before and after the programme by affective category

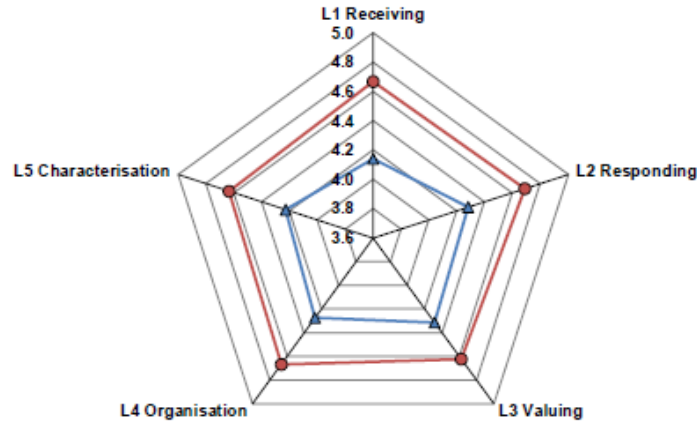


Affective domain attainment for all the individual courses by affective category

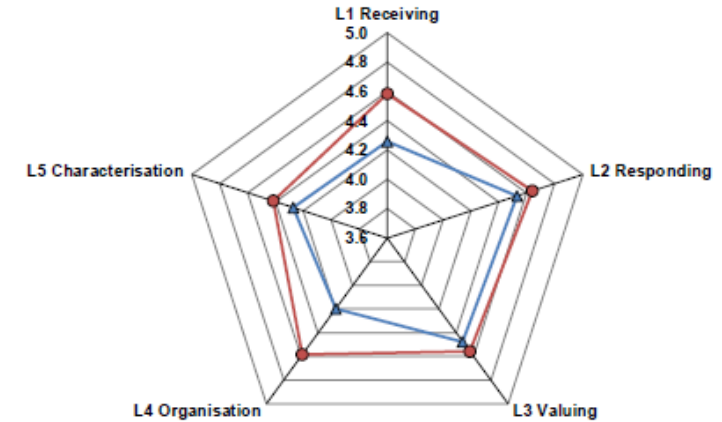
Ecosystem Restoration and Sustainable Development



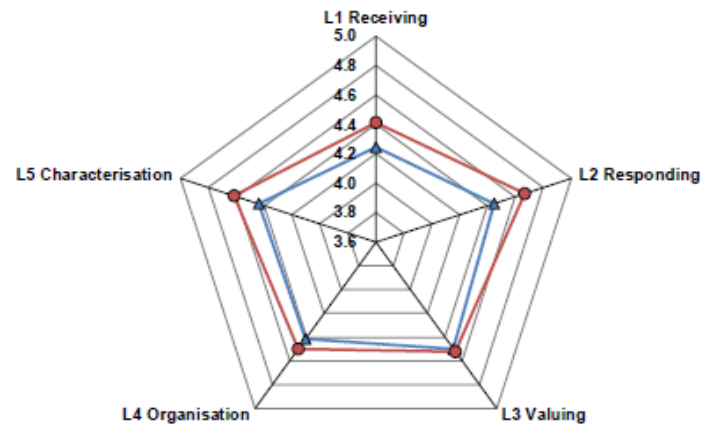
Electrochemical Energy Storage



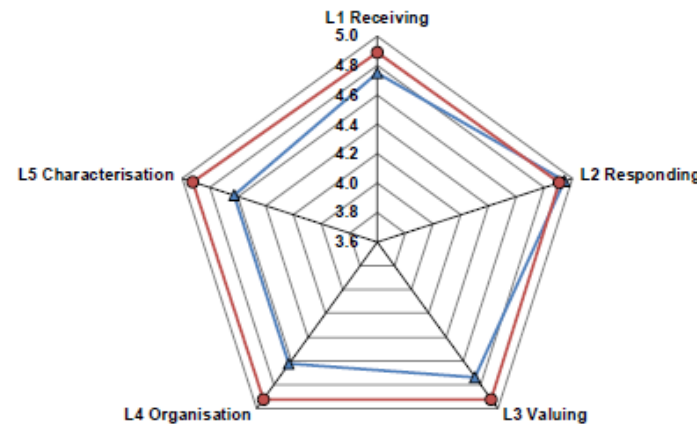
ESG in Business Law and Economic Growth



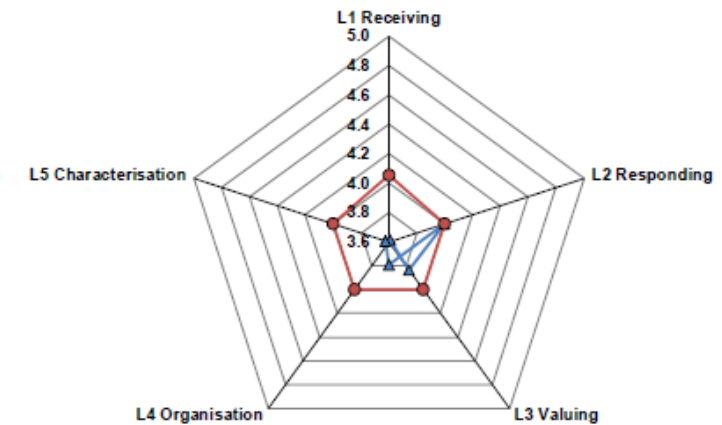
Gender in Development and Education



Green Shipping and Marine Renewable Energy



Green Sustainable Transport

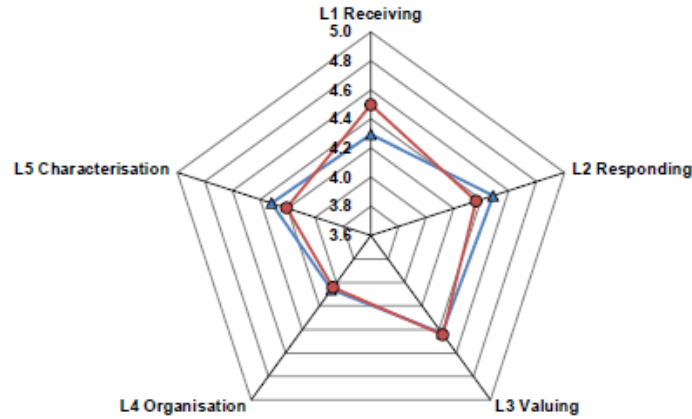


▲ Pre-Programme ● Post-Programme

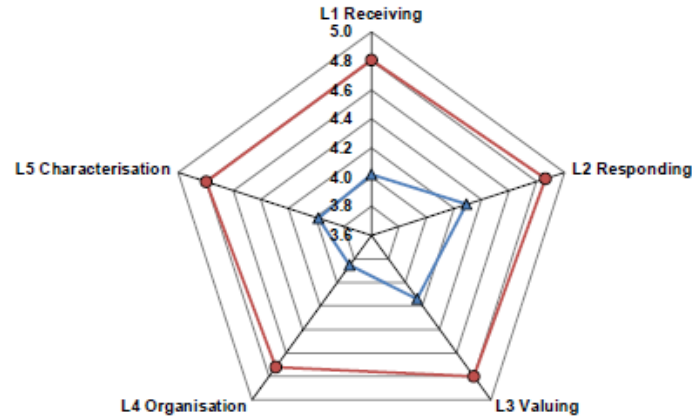


Affective domain attainment for all the individual courses by affective category

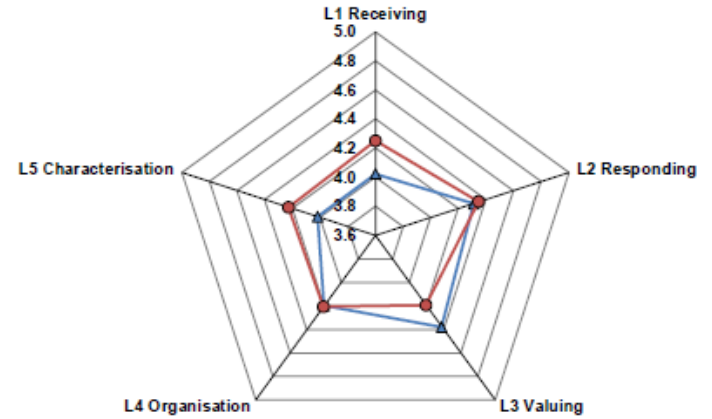
Low-Carbon Buildings and Cities



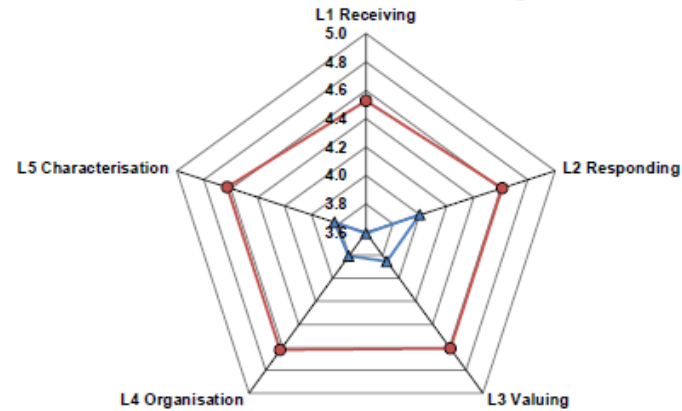
Net Zero-Carbon Fuels



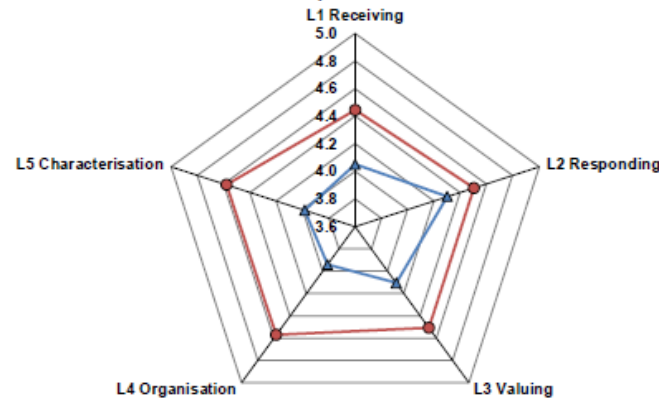
Poverty & Mental Health



Sustainable Ocean Intelligent Autonomous Monitoring



Traditional Medicine and UN Sustainable Development Goals

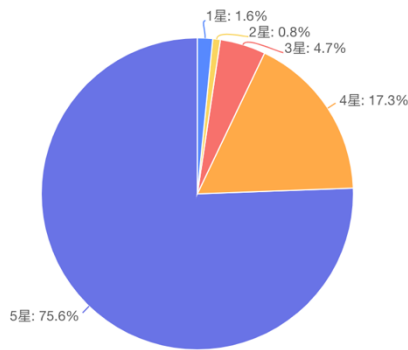


2022 SJTU SDG July Camp-Questionnaire

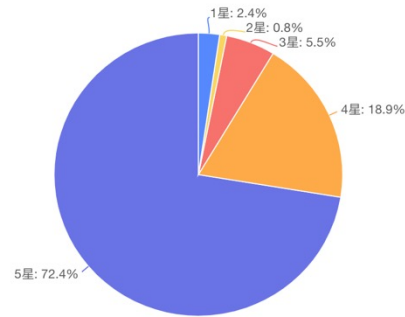
■ According to the 100 questionnaires live data, a total of 94% students rated their experience as “four stars” or “five stars” on a five-star scale.

Sample questions:

1、* I have developed a better understanding of the SDGs through the program.



2、* The program has been helpful to develop my communication skills. [评分题]

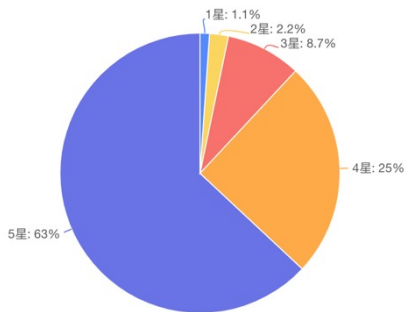


21、Please describe your overall experience in this program in three words. [问答题]

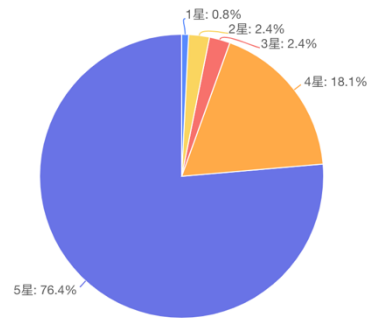
展示关键词个数 1 50



7、* The program has helped me become more comfortable in using English for communication.



15、* I always received helpful feedback from the instructor to guide my progress in the course.



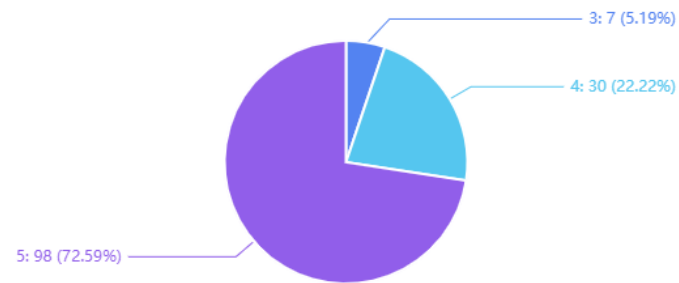
2023 SJTU SDG July Camp-Questionnaire

■ According to the 135 questionnaires live data, a total of 95% students rated their experience as “four stars” or “five stars” on a five-star scale.

Sample questions:

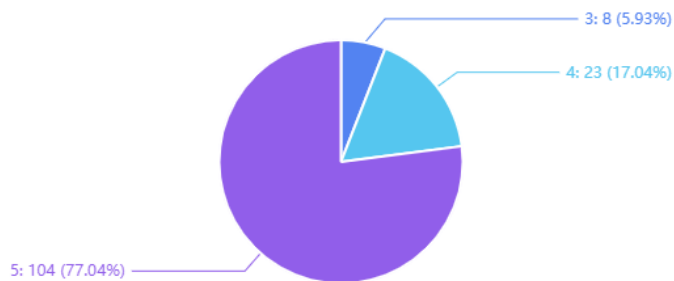
:: Generally speaking, I am satisfied with the program. ...

● 3 ● 4 ● 5



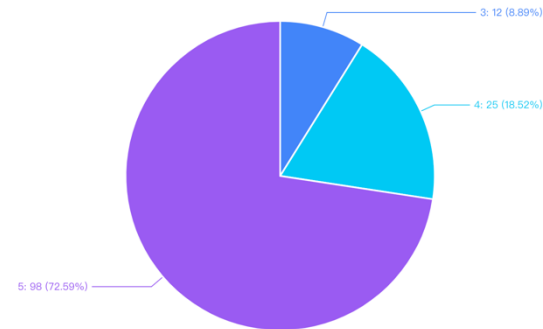
:: I have developed a better understanding of the SDGs through the progr... ...

● 3 ● 4 ● 5



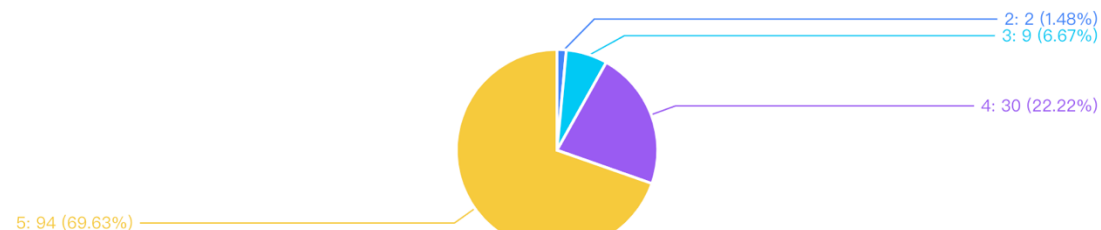
The program has been helpful to develop my communication skills. ...

● 3 ● 4 ● 5



I always received helpful feedback from the instructor to guide my progress in the course. ...

● 2 ● 3 ● 4 ● 5



:: Please describe your overall experience in this program in three words. ...





Here listed a few words from our students:

- "Excellent course instructors" -- Nishigandh Bhambid, from India
- "This was very fruit full course I get a lot of information from this program."-- Ambreen Ali, from Pakistan
- "Great experience, i met a lot of lovely friends and it was such memorable summer camp." -- student from "Gender in Development and Education"
- "Very informative.. fruitful learning and amazing interaction among students and teachers"--Taj Gul, from Pakistan
- "Developing, Inspiring and quality"--Steven Kockaya, from UK

Collaborative Online International Learning (COIL)

Onsite Course at SJTU

- SJTU instructor will deliver the course as planned.




Bilateral Workshops (Optional)


Project-based groupwork (Compulsory)

Onsite Course at a Partner University

- The instructor at the partner university will deliver the course as planned.

Responsibilities of Instructors

- Identify a collaborator with similar course content;
- Share and compare syllabus; similar momentum
- Co-design interactive activities/projects for students
- Co-create the criteria for students' group work

Highlight

- Collaborative learning & Intercultural Communication

Partner Schools

- Stanford University
- Cornell University
- University College London
- Eötvös Loránd University
- Central Washington University
- Xiamen University Malaysia Campus
- The American University in Cairo
- Universiti Putra Malaysia
- Tribhuvan University
- To be continued...

COIL Programs

- JC6505 Qualitative Research Methods
- Data - Driven AI Based Compact Modeling for Post - Moore Transistors
- Carbon Neutral Fuel
- Advanced Fuel Science
- Aesthetic Nutrition
- International Healthcare Systems
- To be continued...

Different mode of International Learning

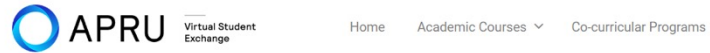
SDG July Camp



2022, 2023, 2024 Summer

In July, during break, open to students worldwide

Global Virtual Classroom



2023 Spring

During semester, open to APRU members, credit exchange

Collaborative Online International Learning (COIL)



2023 Autumn

During semester, involve 2 institutions

COIL structure

COIL duration: 13-10-2023 to 15-12-2023 (~2 months)



SJTU Course Information	Department	China-UK Low Carbon College
	Professor	Dr. Chong Cheng Tung
	Course Title	Net Zero-Carbon Fuels
	# of Students	21
	Course Level	Postgraduate

Partner Course Information	Partner Institution	Xiamen University Malaysia
	Department	School of Energy and Chemical Engineering
	Professor	Dr. Vincent Woon Kok Sin
	Course Title	Energy Economics and Policy
	# of Students	44
	Course Level	Undergraduate

COIL activities



COIL activities





NAVIGATING THE WINDS OF CHANGE:

A Comprehensive Exploration of European Energy Policy and Offshore Wind Development, with a Comparative Analysis of China

João Graça Gomes is a Senior R&D Engineer at the Sino-Portuguese Centre for New Energy Technologies (SCNET), a joint venture between the China Three Gorges Corporation and EDP. His work is focused on joint research projects between Portugal and China, mainly related to energy storage, electricity planning and offshore wind. Before joining SCNET, João worked in the Portuguese Renewable Energy Association (APREN) as a Renewable Energy Policy Analyst and served as a teaching assistant in the University of Lisbon and the Shanghai Jiao Tong University (SJTU). He holds a BSc and an MSc in Energy and Environmental Engineering from the University of Lisbon and an MPhil in Power Engineering from the SJTU. He has published numerous scientific articles and collaborated on reports of organizations such as the World Bank, Bioenergy Europe, REN21, the World Energy Council and others. Due to his research and contribution to the energy sector, he received several awards from the Portuguese Engineers Society, the Institution of Engineering and Technology, several exclusive scholarships such as the China Three Gorges Scholarship and the Outstanding International Student Scholarship of the Chinese Ministry of Education, and was the Ambassador of the European Climate Pact for China between 2020 and 2022.



João Graça Gomes

TIME:
2023.10.27 (Friday) 12:15 pm – 13:15 pm

LOCATION:
Lecture hall, 5th floor of main LCC building

ZOOM:
89628203854

PASSWORD:
468510



ZERO-FOOTPRINT COMBUSTION AND MATERIAL RECOVERY ORIENTED COMBUSTION

OPEN CHALLENGES AND PERSPECTIVES

The seminar will cover selected topics on advanced combustion concepts and challenges associated with implementation to realistic scale setups using bio and waste derived fuels. Having zero environmental footprint in mind, the topic will be covered from fundamental principles to highly applied perspectives present in continuous combustion in burners and gas turbines. In the second part, seminar will cover processes on solid feedstocks where combustion is an unavoidable step to achieve high material efficiency.

TIME:
1 Nov 2023 (Wed) 12:15 pm – 13:15 pm

LOCATION:
Lecture hall, 5th floor of LCC building

ZOOM:
81843414278 161047



Assist. Prof. Dr. Tine Seljak,
University of Ljubljana,
Faculty of mechanical engineering

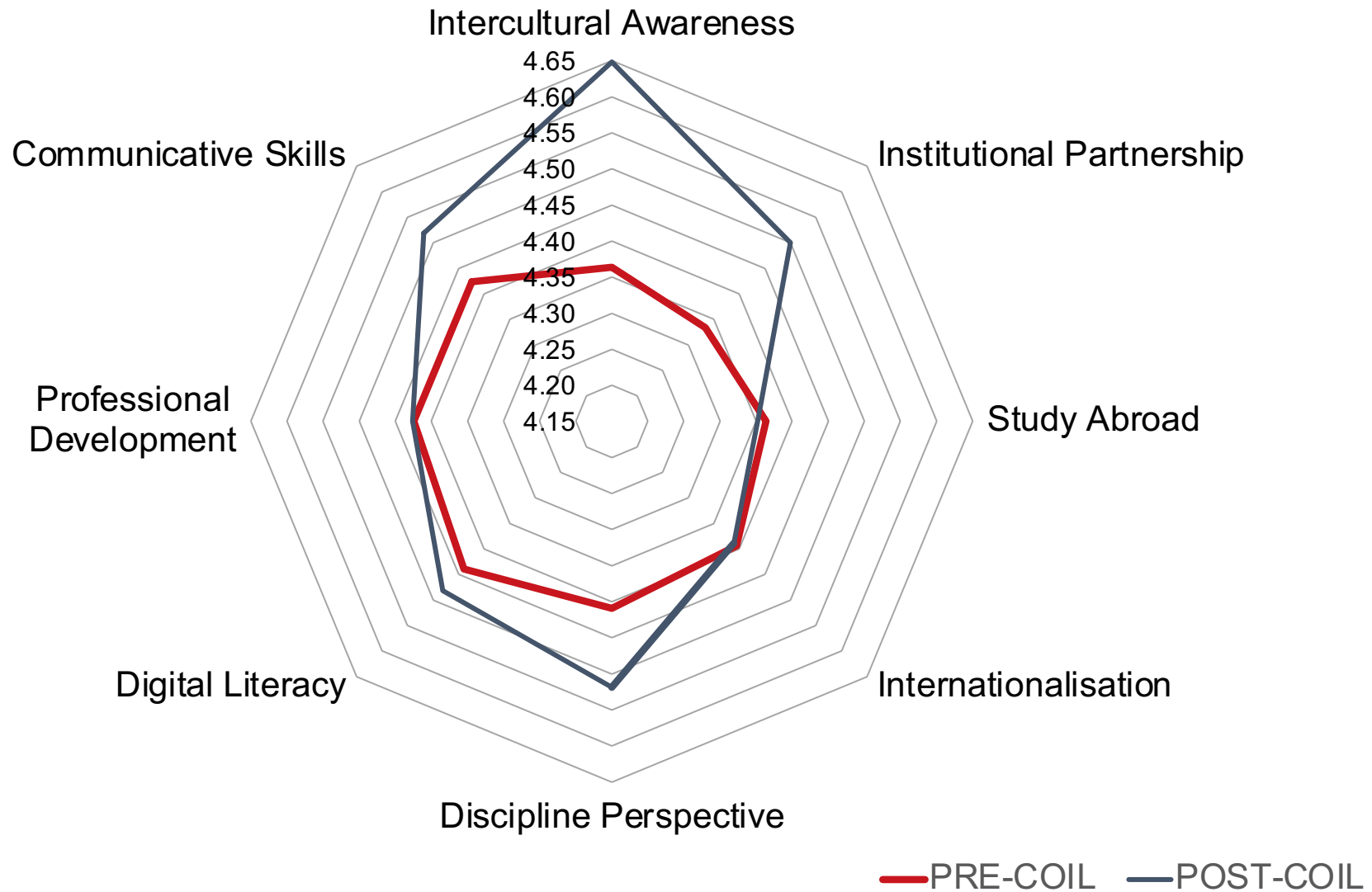
1. Intercultural awareness
2. Institutional partnership
3. Study abroad
4. Internationalization
5. Discipline perspective
6. Digital literacy
7. Professional development
8. Communicative skills

8 dimensions (Based on John Rubin's model)

Key Elements of COIL	Assessment <u>Tool</u> : Rating Scale using Likert Questions
E1 Intercultural Awareness	<ol style="list-style-type: none"> 1. I believe that my fellow students and I have gained intercultural awareness and understanding. 2. This initiative has encouraged discussions and interactions with diverse cultures. 3. I can recognise and appreciate cultural differences as a result of this initiative.
E2 Institutional Partnership	<ol style="list-style-type: none"> 4. I think that this method of learning may represent an opportunity for my institution to attract international students to study at our campus. 5. This initiative's potential to attract international students to my institution is promising. 6. I believe that my institution's global presence will increase due to this initiative.
E3 Study Abroad	<ol style="list-style-type: none"> 7. I feel that I am better prepared and more oriented to study abroad as a result of this initiative. 8. This initiative has provided me with valuable insights and resources for studying abroad. 9. I am confident in my ability to navigate international study opportunities due to this initiative.
E4 <u>Internationalisation</u>	<ol style="list-style-type: none"> 10. I believe that this initiative has generated a dynamic and inexpensive curricular internationalisation experience on my institution. 11. The curriculum changes brought about by this initiative have positively impacted internationalisation for my course. 12. This initiative has made internationalisation more accessible and cost-effective for my institution.
E5 Discipline Perspective	<ol style="list-style-type: none"> 13. I feel that my peers and I can learn about the discipline we are studying from another perspective. 14. This initiative has exposed me to diverse viewpoints within our field of study. 15. Learning from different perspectives has enriched my understanding of our discipline.



Effectiveness of COIL (SJTU)



COIL feedback

“practice spoken English, enhance international communication, make more friends”

“Know a few Malaysian friends, Learnt how to lead”

“Know more friends, understand different culture”

“Research on a topic is interesting”

“Know new friends, learn teamworking”

“Enhance communication and organization skills”

“Can improve English communication skills, under language barrier we tried to clarify the problem and commit to solving the problem”

“Can work with people of different background, exchange idea, besides we can discuss a lot of topic outside the project, learnt cultural difference.”

SJTU students feedback

“Interaction between local uni and china uni”

“Learn multicultural”

“Enhance communication with other university”

“Gain ideas from people with different minds”

“Strengthen the ability of cooperation”

“Communication with other people with different background”

“Even though we are freshmen, but we could work with master on this group assignment and in the progress I learned how to communicate and collaborate with each other through online platforms. For me, even though I ended up taking on more than some people in the group, I think it was a learning process and I really learnt a lot. Also, the content of the assignment was very interesting and made me learn something new. The lecturer also very responsible and always cared about all the groups throughout the COIL program.”

XMU students feedback

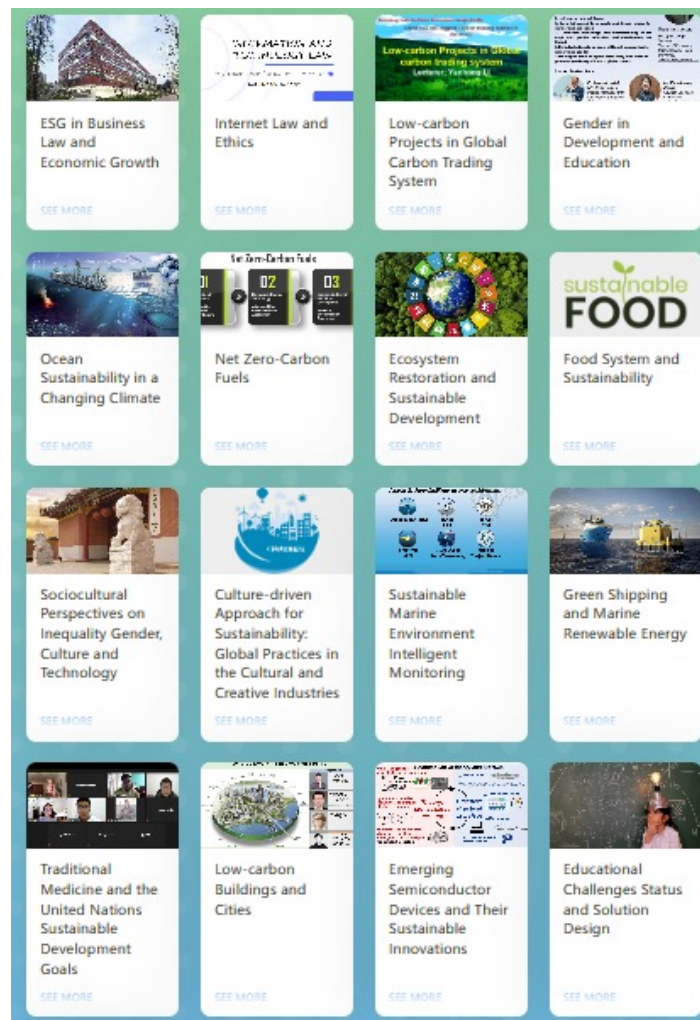
Conclusion

- The **International Affairs Office** of Shanghai Jiao Tong University (SJTU) is committed to promote transnational education by introducing various programme (SDG July Camp, Global Virtual Classroom, COIL etc.).
- Through the integration of Sustainable Development Goals (SDGs), the **SDG July Camp** is promoted to the world, making it a truly borderless education (**SDG 17 – Partnership**).
- The 12 courses of SDG July Camp were successfully delivered and received excellent feedback from the students. **Effective online pedagogy** is key to successful implementation of the program.
- SJTU is committed to promote **internationalization** and play a role in sustainable future development.
- We welcome institutions from around the world to join us to form **partnership** in transnational education.



<https://global.sjtu.edu.cn/en/studyatSJTU/SDG>

Google search: SJTU July Camp 2024



Highlights of SDG July Camp 2024

- ✓ 17 courses to choose from
- ✓ Open to undergraduate and postgraduate from around the world
- ✓ It's FREE!
- ✓ Students will get an e-cert upon completion of course

Feel free to promote the SDG July Camp to your institution

SHANGHAI JIAO TONG UNIVERSITY

上海交通大學



Thank you

The support from the International Affairs Office of
Shanghai Jiao Tong University is gratefully acknowledged



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APAIE 2024



PERTH, AUSTRALIA 4-8 MARCH 2024

#APAIE24

APAIE 2024



PERTH, AUSTRALIA 4-8 MARCH 2024

Collaborating for sustainable impact: partnerships across the Asia Pacific

APAIE Perth 4 - 8 March 2024

