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Achieving Sustainable Development Goals (SDGs) and Carbon Neutrality in Seven Globally Leading Cities: A Cross-cultural and Trans-institutional Community-based Teaching and Learning Initiatives

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1. INTRODUCTION

This Working Paper reports the findings of the effectiveness of a cross-cultural, trans-institutional, community-based teaching and learning initiatives in the higher education sector in Hong Kong, with a specific reference to a Small Private Online Courses (SPOCs) project funded by the Hong Kong Baptist University, which was conducted during 1 December 2023 to 31 March 2025

The SPOC project explores how the integration of the elements of globalisation, cross-cultural learning, community-based experiential activities and transdisciplinary research-led learning initiatives contributed to the innovation in university teaching and impacts on the Sustainable Development Goals (SDGs) and carbon neutrality.

In this project, a total of 104 students were engaged in the project, with 61 HKBU students from energy course GEOG 4016, GEOG 4065, GEOG 3007 and the project Student Interns; 1 undergraduate students from non-BU local university; and, 42 undergraduate and postgraduate students from overseas universities.

We adopted a multi-method approach to assess the outcomes and impacts on students. We incorporated quantitative data from two sets of student surveys—the Post-SPOC questionnaire (n=30) and an online deliberative workshop (n=40)—as well as qualitative data from student interviews (n=2). Our findings shows the positive impacts on students in three key domains: Knowledge, Attitude and Perceived Behaviour Change.

2. DESIGN OF THE SPOC PROJECT

This SPOC project applied a 3-stage co-learning model of engaging undergraduate students. Through a collaboration between HKBU and seven non-local tertiary institutions (including Stanford, University of Kyoto and Sun Yet-sen University), students engaged in three complementary learning initiatives which are sequenced in a three-stage co-learning model.

Stage 1 - Co envisioning:
Empowering BU Students as Community Energy Ambassador! Energy-saving Coaching to Households

Six Students from GEOG 4065 were capacity-built and empowered to conduct community-based research-led experiential learning activities. In preparing for the Energy-saving Coaching to Households, students attended an one-hour interview skills workshop that was delivered by our teaching assistant and watched a video about energy-saving tips delivered by Mr. Lam Chiu Ying, a former director of Hong Kong Observatory.

After training, students were divided into three groups, each group interviewed a household about their energy consumption practices. Upon completing the interview, each group of students gave a

7-10-minute presentation to summarize their interview findings and identify the improvement action the household can take.

Students were able to understand the electricity usage locally, which helped students to brainstorm the energy policy by thinking of diverse energy-saving solutions.

Stage 2 - Co-production:
Development of a series of mini-lecture and learning materials

11 committed students co-developed an online mini-lecture series with lecturers on a broad range of themes which are relevant to sustainable energy communities. The mini-lectures were made online and archived on the KEEP Moodle platform to enable participants to acquire knowledge in a self-directed way for 114 students. In AY 2023/24, three mini-lectures had been co-developed with the support from Dr Hana Kim, Prof Lee Taedong and Dr Kim Gyuhwan. The mini-lectures aim to enhance students' understanding towards green start-up, social innovation and community engagement with different case studies. Apart from the mini-lectures, case studies, guidelines and online training videos were provided to support students to brainstorm comprehensive ideas during the online deliberative workshop. The case studies include the green start-up in the global.

Stage 3 - Co-deliberation:
Online cross-city university students deliberative discussion workshop

Two online deliberative discussion workshops have been organised:

(i) "Green Energy Startups in my City's Net Zero future" (11 March, 2024)

There were 65 participants from HKBU, Korea Advanced Institute of Science and Technology (KAIST), Kyoto University, Macquarie University, National Taiwan University (NTU), and Sun Yat-sen University. It engaged 45 students and 20 observers including teaching/research staff from the above universities and staff from CISL.

Students were asked to conduct desktop research about the green start-ups in their home countries. During the workshop, students were divided into eight discussion groups to focus on community project design for multiple age groups, role of different stakeholders (public, government and marginalized groups) in contributing to the low-carbon transition.

(ii) "Online Youth Energy Dialogue: From Global Kids' Dream to Hong Kong Energy Policy Action Plan" (12 April, 2025)

26 participants from HKBU (GEOG 4016 and GEOG 4065) and five non-BU university students from ALUN network including National Taiwan University and Kyoto University attended the dialogue (see event photos in Appendix 2).

For the pre-dialogue preparation, 60+ envisioning worksheets and drawings were collected from two primary schools in Hong Kong and primary students in Bristol, the content includes how they envision their future communities may look like, the low carbon energy measures they wish to have

etc. BU students were required to study the envisioning worksheet and drawings from children from Hong Kong and Bristol and read at least two online case studies about the smart energy community on the KEEP Moodle.

During the dialogue, based on the children's envisioning of a low carbon energy future, students were divided into three groups each with one moderator and one guest to discuss their findings and form a policy action plan.

3. FINDINGS

3.1. Impacts on Students

In order to understand how engaging with the SPOC platform would impact participants' capabilities in achieving carbon neutrality and participants' feedback on the SPOC platform, both quantitative and qualitative approaches are used: (i) the Post-SPOC questionnaire; (ii) survey of an online deliberative workshop, and; (iii) student interviews.

Based on our findings, students are reported to have the following benefits from the SPOC project:

(i) The utilisation of technology, particularly a mixed mode of communication in online student deliberative workshops, has saved time and costs associated with organising and implementing cross-institutional cooperation.

(ii) Students were able to connect "concepts", "methods", and "action" in real-world contexts. Through the KEEP Moodle online course, students were trained with energy concepts (such as smart energy communities and carbon neutrality) and learned to present the concepts to others through oral and dialogue workshops etc. Eventually, students applied their knowledge and skills in delivering the low-carbon messages to various stakeholders and discussing among students and experts.

From our analysis, it is suggested that students were overwhelmingly positive about the SPOC learning experiences. The majority of the students agreed that SPOC capacity built their capability in achieving carbon neutrality across three domains: Knowledge, Attitude, and Perceived Behavioural Change. Furthermore, more than 80% of the students considered the material on the SPOC platform useful in clarifying their positions on the SPOC workshop's topic regarding green energy business development. In addition, the discussion chatroom function in the SPOC platform was considered to be the most useful function to facilitate students' learning on the SPOC workshop's topic.

3.1.1. Knowledge

Overall, students offered predominantly positive feedback regarding their knowledge acquisition of energy and climate concepts.

After using the SPOC platform, 80% of the students agreed that they have adequate energy knowledge and concepts. In addition, 90% of the students agree that they know the relationship

between energy and weather after using the SPOC platform. Regarding the confidence in developing creative solutions for local communities to address climate and energy challenges, 73.33% of the students agreed with the statement.

From interviewing students' feedback, their knowledge towards sustainable practice and technology were enhanced through exchanging ideas with students from other countries and feedback sharing from experts. Besides, the SPOC on the KEEP Moodle provided basic understanding towards the topics of the deliberative workshop.

Interviewed Student A:

> *"Since there were experts sharing about the policies, the feasibility, how to perform better, how to make things become feasible. It also enhanced my understanding towards sustainable energy technology in Hong Kong"*

3.1.2. Attitude

Overall, students exhibited positive feedback in the attitude formation of eco-consciousness and commitment to carbon neutrality.

After using the SPOC platform, 93.33% of the students agreed that they are aware their energy habits would contribute to Hong Kong's net-zero future. In addition, 90.00% of the students agreed that they are willing to take environmentally friendly energy behaviour in their daily life. Regarding the contribution to the net-zero goal of Hong Kong, 96.67% of the students appreciate the importance of a community-based approach for such contributions.

Interviewing students show a positive attitude towards the low-carbon neutrality and environmental protection issue through having discussion with oversea students and having a deeper understanding of different sustainable policies. Meanwhile, students were able to identify some challenges when achieving climate action in Hong Kong.

Interviewed Student A:

> *"Everybody has a consensus of achieving carbon neutrality by 2050. I saw the hope of energy transition and the positive attitude as there are some existing policies pushing forward"*

3.1.3. Perceived Behaviour Change

Overall, students exhibited positive feedback in their Perceived Behaviour Change in terms of the ability to network with community stakeholders, conduct energy knowledge transfer, and self-learn actively.

After using the SPOC Platform, 83.33% of the students perceived that they had the skills to get along well with community stakeholders. 86.67% of the students agreed that they know how to explain solar concepts to the community households. 90.00% of the students considered themselves to be capable of developing skills in enquiry learning using information and communication technology. 86.67% of the students agreed that they can carry out self-directed learning.

Interviewed students shared that they would like to learn more about the topics. The projects also motivated students to promote the sustainable message to others and join discussion or conference for idea exchange. This indicated that the project helped to increase students' learning motivation and participation in achieving sustainable development.

Interviewed Student A:

> *"I would like to join more conferences to understand more…some new solar technology."*

Interviewed Student B:

> *"I would like to promote the message of low-carbon to others…I would like to share opinion with different people"*

3.1.4. Feedback on the materials in the SPOC Platform

Apart from the impact on three domains after using the SPOC platform. Students also provided positive feedback after the online deliberative workshop regarding the usefulness of the materials placed in the SPOC platform in assisting them to participate in the workshop.

Questionnaire results indicated that 82.50% of the students considered the information, briefing video, and slides provided in the SPOC platform were useful. In addition, regarding the SPOC platform functions that facilitated students' learning, the average score in Table 5 showed that "Discussion chatroom" received the most support, "Introduction of 2 startup environments' scenarios" ranked second, and "Case Study PowerPoint" ranked third.

Interviewing students' views matches with the questionnaire results. They agreed that the platform provided different resources supporting their learning which give them basic understanding on the discussion topics. From feedback collected from interviewed students, it is suggested to provide more guidelines for those students being moderators. In terms of the type of material, students prefer video format instead of article.

Student Interview B:

> *"The platform provided more background information about the green start-up, which made our discussion during the deliberative workshop more efficient and I could have more ideas for discussion"*

3.2. How the Project achieve SDGs

This cross-cultural and trans-institutional community-based teaching and learning project helped to achieve SDGs in different aspects. The project has empowered the students to contribute to sustainable development in the following ways:

(i) enhancing students' knowledge about low carbon communities, green start-ups development, sustainable energy development with both local and global perspectives;

(ii) engaging students in communities low carbon envisioning, green policies discussion and action plan formation;

(iii) equipping students with creative problem skills, communication skills and self-directed learning skills for developing and promoting sustainable development; and,

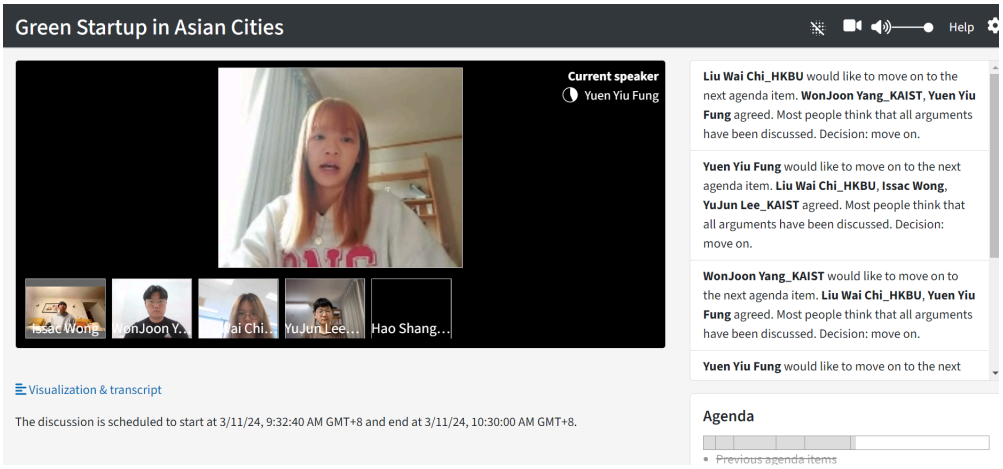
(iv) encouraging students to act for reducing carbon emission and achieving sustainable development.

Table 1. The project outcomes in relevant to the SDGs

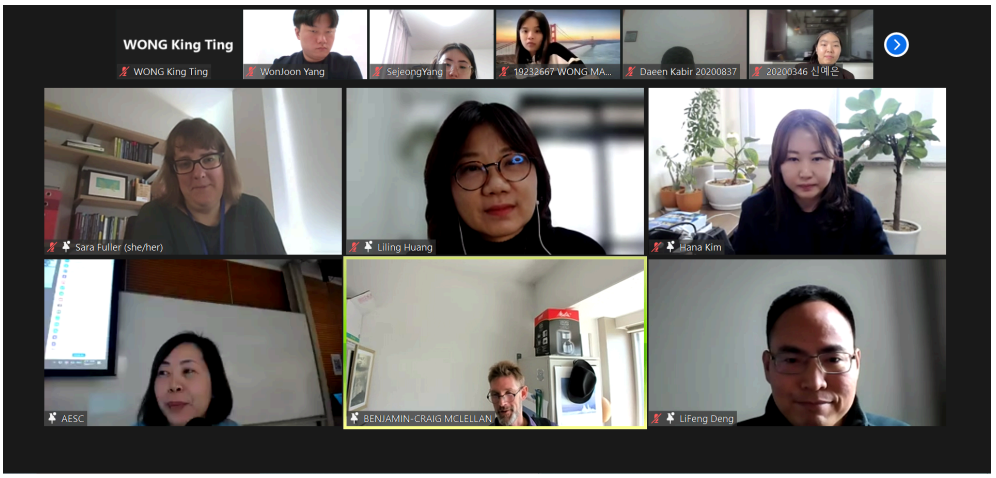
Achieved SDGs		Details
	Goal 7: Affordable and clean energy	The project promoted solar energy as an affordable alternative to both students and households. Meanwhile, students were guided to brainstorm more alternatives for clean energy with reference to other cities.
	Goal 10: Reduced inequalities	The project engaged communities such as children, housewives, to enhance their knowledge about sustainable energy choices and hence, students' research outputs were published on AESC's official website, favouring public education.
	Goal 11: Sustainable cities and communities	The project engaged the households and children to envision their sustainable community. Students could reflect on their agency in initiating sustainable development in their own community and learnt to suggest actions and policy plans for the sustainable development.
	Goal 12: Responsible consumption and production	Students were led to develop ideas and promote the message of energy saving by different engagement, which include providing advice to households about their energy consumption practices, and formulating energy action plans for the cities.
	Goal 13: Climate action	By promoting an energy alternative and the idea of energy saving, the project helped to initiate the community to work on climate action as a goal in the long run. Students' knowledge enhancement in the low-carbon energy community and climate action enhanced students' capacity in contributing to climate action initiatives.
	Goal 17: Partnerships for the goal	The project had engaged households in Hong Kong, university students from HKBU and the global network of ALUN, which collectively achieved the goal of energy sustainable community.

Appendix 1: Project Photos

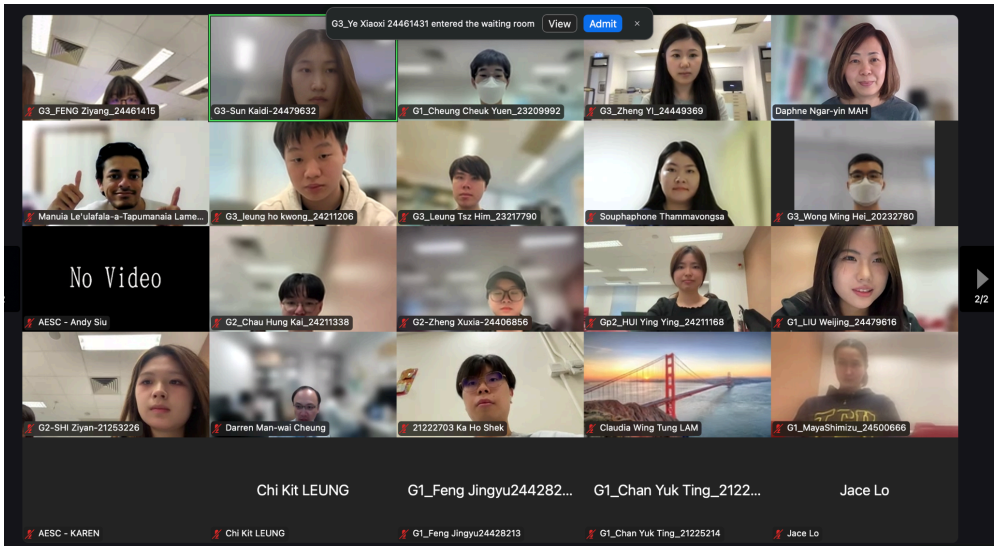
Picture 1. A photo of the workshop on site.



Picture 2. A screencap of one of the discussion rooms in the online deliberative workshop.



Picture 3. A screencap of students and experts from different countries joining the discussion.



Picture 4. A screencap of a group photo in the online dialogue.

Appendix 2: Statistical graphics

Table 2. Questionnaire results about the SPOC Platform

Questions	M	SD	Agree (%)	Neutral (%)	Disagree (%)
Knowledge (*n*=30)					
I have adequate energy knowledge and concepts (e.g. the mechanism of solar generation).	6.76	1.93	80.00%	10.00%	10.00%
I know the relationship between energy and weather.	7.11	1.85	90.00%	3.33%	6.67%
I am confident in developing creative solutions for local communities to address climate and energy challenges.	6.84	1.90	73.33%	23.33%	3.33%
Attitude (*n*=30)					
I am aware of how my energy habits contributes to the Hong Kong's/Asian's net-zero future.	7.57	1.67	93.33%	3.33%	3.33%
I am willing to take environmentally friendly energy behaviour such as energy saving in my daily life.	7.53	1.76	90.00%	6.67%	3.33%
I appreciate the importance of a community-based approach to contributing to the net-zero goal of Hong Kong/Asia.	7.92	1.38	96.67%	3.33%	0.00%
Perceived Behaviour Change (*n*=30)					
I have skills to get along well with community stakeholders.	7.11	1.76	83.33%	10.00%	6.67%
I know how to explain some basic solar concepts to community households.	7.07	1.65	86.67%	6.67%	6.67%
I can develop skills related to enquiry learning, including self-management skills, problem-solving skills, communication skills, information processing skills and skills in using information and communication technology.	7.23	1.85	90.00%	6.67%	3.33%
I can carry out self-directed learning which includes the processes of setting goals, making and implementing plans, analysing data, solving problems, drawing conclusions, reporting findings and conducting evaluations.	7.07	1.85	86.67%	3.33%	10.00%
Feedback on the materials in the SPOC Platform (*n*=40)					
How useful was each of the following in helping you clarify your positions on the theme? The Information provided in SPOC Platform	7.14	1.90	82.50%	2.50%	15.00%

How useful was each of the following in helping you clarify your positions on the theme? The briefing Video and Slides	7.12	1.89	82.50%	5.00%	12.50%

Note. All rating questions were given on an 11-point Likert scale

Table 3. Rankings of which SPOC platform functions facilitate your learning.

Functions	Ranked 1st	Ranked 2nd	Ranked 3rd	Average Score
Video	2	6	5	0.58
2 scenarios	11	10	12	1.63
Discussion chatroom	15	13	6	1.93
Introduction of 2 start-up environments' scenarios	11	10	8	1.53
Other Comments on the SPOC platform	1	1	9	0.35

Note. n=40