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☐ C 進修/研究 ☐ D 工作會議

國際教師氣候變遷論壇 (International Teacher's Climate Change Forum)

出國報告書

單位名稱：國立臺灣師範大學

出國人姓名職稱：許瑛珩 教授

出國地點：芬蘭赫爾辛基

出國日期：民國 113 年 8 月 23 日至 113 年 9 月 7 日

報告日期：民國 113 年 9 月 10 日

摘 要

此次會議【國際教師氣候變遷論壇】於赫爾辛基大學舉辦，由國科會「臺灣氣候變遷推估資訊與調適知識平台計畫」(TCCIP)共同主持人-國立臺灣師範大學許瑛珺教授參加。許瑛珺教授受赫爾辛基大學 Maija Aksela 教授之邀，擔任今(2024)年度此論壇之國際演講者，以“Co-Designing for Innovative Climate Change Education 為題，發表於 TCCIP 研發的數位課程 (都市熱單元)以及在高中實施的情形，以增進國際對於臺灣氣候變遷教育的理解，並且收集關於此數位課程的相關建議，持續優化所研發的數位課程；此行也參與此研討會的各項國際交流活動，以瞭解芬蘭在氣候變遷教育的發展情形。並透過與芬蘭的學校教師從教學實務角度進行交流，了解芬蘭和臺灣在學校推動氣候變遷教育的相似和差異所在，可能面臨挑戰為何，並探討可能的解決方案。透過交流與討論，同時建立起未來國際合作的可能性。

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1.參加會議經過

國際教師氣候變遷論壇(International Teachers' Climate Change Forum, TCCF) 連結氣候科學與氣候教育，以解決高中氣候變遷學科教育上的問題。TCCF 自 2017 年起開始舉辦；2020 年至 2022 年因 Covid-19 疫情影響，以網路研討會型式辦理；今(2024)年度的 TCCF 則採實體與線上混合方式辦理；實體會議的地點在赫爾辛基大學的海蒂亞拉森林站 (Hyytiälä Forest Station)。

本計畫共同主持人許瑛珺教授受赫爾辛基大學 Maija Aksela 教授之邀，擔任今(2024)年度 TCCF 的國際演講者；以 “Co-Designing for Innovative Climate Change Education 為題，發表於 TCCIP 研發的數位課程 (都市熱單元)以及在高中實施的情形，以增進國際對於臺灣氣候變遷教育的理解，並且收集關於此數位課程的相關建議，持續優化所研發的數位課程；此行參與此研討會的各項國際交流活動，以瞭解芬蘭在氣候變遷教育的發展情形。此次研討會與芬蘭的學校教師從教學實務角度來交流芬蘭和臺灣在學校推動氣候變遷教育的相似和差異所在，尤其是可能面臨挑戰為何，並經由交流來探討可能的解決方案。

TCCF 前，順道參訪赫爾辛基大學，期能經由參訪赫爾辛基大學和研討會的交流與分享，促成未來跨國合作的契機。此行與 Maija Aksela 教授討論未來研究合作，包括：氣候變遷教育的課程設計與教師專業成長相關的研究主題；並分享 TCCIP 數位課程研發過程中如何與科學家和高中教師的合作經驗，以及將 TCCIP 的資源和資料庫的資料轉譯為高中生和一般民眾可適讀的氣候變遷學習材料的具體作法。透過討論 co-design 氣候變遷數位課程在教師專業成長與數位學習設計相關主題上，與赫爾辛基大學的研究團隊研商未來共同進行研究的可能性。

此次行程如下：

8/23-8/25 自桃園國際機場搭機至維也納轉機前往芬蘭赫爾辛基

8/26-9/01 參訪赫爾辛基大學，並與 Professor Maija Aksela 討論
未來的研究合作

9/01-9/05 參加 TCCF 研討會，並於 9/2 受邀演講

9/06 主辦單位接駁，返回市區

9/07 返臺

2.參訪會議紀要

(1) 參訪赫爾辛基大學，並與 Professor Maija Aksela 討論未來的研究
合作(8/26-9/01)

- 8/26 至赫爾辛基大學參訪期間，與 Maija Aksela 教授討論氣候變遷的教科書分析與發表規劃。同時了解到芬蘭的教師比較不仰賴教科書來規畫教學內容，是由下而上的教育體制，教師有較多教學規劃的自主權。
- 8/27 與 Maija Aksela 教授討論教師氣候變遷教育的觀感問卷的資料收集與資料分析規劃
- 8/28 Maija Aksela 教授分享氣候變遷教育的芬蘭現況，並介紹氣候變遷線上資源和赫爾辛基大學科學家參與氣候變遷的情形
- 8/29 與 Maija Aksela 教授如何導入 learning sequence model 設計氣候變遷相關議題的教學內容，同時分享台灣我的團隊如何與學校教師、TCCIP 合作共同研發數位學習的教材。
- 8/30 與 Maija Aksela 教授討論台芬未來在氣候變遷教育相關研究的可能方向，包括:氣候變遷相關議題的教材設計的研究後續規劃，以及在職科學教師專業發展的研習工作坊可能的內容規劃。
- 9/1 參訪赫爾辛基大學

(2) 參加 TCCF 研討會，並於 9/2 受邀演講(9/1~9/5)

- 9/1 前往赫爾辛基大學的海蒂亞拉森林站 (Hyytiälä Forest Station)參與 9/3-5 的國際教師氣候變遷論壇。
- 9/1 傍晚 7 點由赫爾辛基大學的科學家帶領在森林 silent walk，進行森林的生態觀察。



圖 1 與 Majia Aksela 教授討論氣候變遷教育相關研究



圖 2 森林 silent walk，進行森林的生態觀察

- 9/2 上午場次包括來自 Estonia 的學者分享氣候變遷教育在 Estonia 的推動情形，還有兩場平行場次氣候相關資料庫使用與資源介紹工作坊。下午的第一個場次是由氣象學者帶領到森林中觀測站及其周遭，認識測量儀器和資料收集分析流程。接著，由我進行口頭報告與 TCCIP 共同研發的數位教材，也介紹 TCCIP 以及其網站上氣候變遷相關資源，並將科學教育學者如何與科學家和學校教師研發教材過程，以達成確保其教材具備科學正確性和教學有效性的目標。之後由赫爾辛基大學科學家介紹在森林站的綠色建築如何以 living lab 的

方式進行相關研究，以及如何應用藝術和音樂融入氣候變遷教育。



圖 3 分享臺灣我的團隊如何與學校教師合作共同研發數位學習的教材



圖 4 森林觀測站



圖 5 森林觀測站



圖 6 森林觀測站

- 9/3 上午場次是由教師團隊發表如何使用 open data 來設計教材。下午場次由教師團隊發表如何應用 project-based learning 來進行氣候變遷相關主題的探究學習情形。
- 9/4 是以導入藝術和自然體驗於氣候變遷教育的分享與交流。

3.心得及建議

此次最大收穫是在森林中探討和交流氣候變遷教育的作法，由來至歐盟幾個國家的學者和教師聚集於一堂，分享如何應用氣候資料和溫室氣體濃度監控的資料，來引導參與者思考氣候變遷教育相關議題。尤其在科學家導覽參與者在森林中體驗樹木對 carbon sink 的效益，以及其與天氣狀況的關聯性，特別經由測量儀器的佈設與資料呈現的介紹，加深參與者(尤其是學校教師)對於氣候資料有較為深入的認識。

建議未來有機會 TCCIP 可在台大梅峰的生物資源暨農學院附設山地實驗農場辦理類似的教師氣候變遷教育研習活動，讓教師經由在森林中測量儀器的佈設、資料收集與分析的導覽，讓教師能夠更感受到森林在固碳的角色。在森林中相互交流與討論，可深化彼此連結和形成合作的網絡。同時，也可介紹 TCCIP 的資料庫與資源作為教師發展氣候變遷教材的參考。另外，師大的團隊也可以介紹與 TCCIP 共同研發的教材來進行推廣，以及帶領參與研習的教師發想如何應用 TCCIP 網站資源來設計氣候變遷教案與教材，可以彰顯 TCCIP 氣候變遷教育的貢獻。

4.出國效益

赫爾辛基大學的 Maija Aksela 教授成立 LUMA 平台 (網址: <http://www.luma.fi>)，連結芬蘭境內的數所大學和歐盟的希臘、義大利等國來強化科學教學與學習，是不錯的做法。可作為台灣推動氣候變遷教育的參考。

附錄

演講摘要

Title: Co-Designing for Innovative Climate Change Education

Ying Shao Hsu

National Taiwan Normal University

ABSTRACT

The co-designing team includes science educators, school teachers and scientists who developed online courses of utilizing the Socio-Scientific Issues (SSI) approach. Through an online course, teachers learn to integrate SSI, focusing on real-world issues like the Urban Heat Island (UHI) effect. The course is structured into three phases: (1) introducing problems using TCCIP (Taiwan Climate Change Information Platform) data and videos, (2) analyzing UHI factors such as urban density and surface materials, and (3) proposing solutions like increasing green spaces. Students engage in reflective, interpretive, and decisional activities, guided by a SSI worksheet, which encourages them to ask questions, conduct inquiries, and take actions. Tasks include calculating the benefits of solar roofs and discussing solutions aligned with Sustainable Development Goals (SDGs). The document emphasizes the importance of discussing complex issues in class to foster critical thinking and responsible actions toward environmental sustainability. It concludes addressing the challenge of adapting SSI tasks in schools, and the support required for teachers. This approach aims to enhance students' understanding and engagement with socio-scientific issues, promoting practical problem-solving skills.

本次研討會議程



Arrival and departure

We will pick participants up with a minibus transport from the Juupajoki train station on Sunday 1.9. at 16.56 o'clock arriving train.

For departure, you can sign up for transport by emailing Juliana (juliana.friedrichsen@helsinki.fi) or during TCCF)

- Tuesday 3.9. to the 17.25 train from Orivesi to Helsinki
- Thursday 5.9. to the 10:23 - 12:54 train from Orivesi to Helsinki
- Thursday 5.9. to the 10:59 - 13:35 train from Juupajoki to Helsinki

If you are arriving with another train to Orivesi, contact Oriveden taxi (+358) 600 301515. Those using the Juupajoki train station can arrange a ride from Korkeakosken taxi (+358) 400 249064.

Please note that transportation to Hyttiälä is a bit limited, so it is important to plan ahead and inform the organizers.

Accommodation and keys

Bed lining, blanket, pillow, and towel are included. Accommodation is mainly in 2-person bedrooms, and you will get the room key upon arrival. **Don't lock yourself out of your room**, especially during nights and weekend, when spare keys are not readily available. Also remember to leave the keys at the check-out (to the room or to the organizers before your departure).

There is a wireless network (eduroam and HelsinkiUni Guest for visitors) in the institute and accommodation buildings.

If you are interested, there are only few 1-person rooms available. Consult the pricing list [Pricing | Hyttiälä Forest Station | University of Helsinki](#).

Contact juliana.friedrichsen@helsinki.fi if you wish to move to a single room.

Meals

All meals will be provided in the facilities according to the program. The meal times were scheduled according to the kitchen working hours, therefore we kindly ask you to be on time for that, as there aren't restaurant options in the surroundings.

Also, to minimize food waste, meals were planned and will be charged according to your attendance in the program, which means that if you decide to skip a meal, you will be charged for it. We are of course considering your time of arrival and departure. For those arriving on Sunday, we assume that you will come for dinner (unless you have sent additional information on your arrival time) and those on Monday will arrive after breakfast. Please inform us before Friday 23.8. if you have other plans.

Outdoor and social programme

Prepare to spend time outdoors, we will walk to different forest locations in the surroundings, to SMEAR II station, and might visit Siikanen peatland site. Evenings are reserved for social activities, for instance, having a snack in Kota, bathing in the sauna, swimming in the lake or walking in the surroundings. The over one hundred years old historical buildings of Hyttälä (including Old Dining hall where we are on Monday) are an important part of Finnish cultural heritage that is used in their original purpose.

The forest “dress code”

You will not need rubber boots, but proper shoes will keep your feet dry and warm. Also, the weather can change rapidly from warm late summer days to chilly autumn rain. So outdoor clothing that keeps wind and a bit of rain away, and an extra layer of clothing are essential. You may consider a thin pair of gloves and a beanie if you naturally feel cold. For indoors, warm socks or indoor shoes, and a warm sweater should do. Don't forget your swimming suit.

See <https://www.helsinki.fi/en/research-stations/hyttiala-forest-station> for more details. In case of practical questions before or during the TCCF contact Taina Ruuskanen (taina.ruuskanen@helsinki.fi, +358503175409).

Find our program below.

Program for Teachers Climate Change Forum

Sunday 1.9.

Arrival to Hyytiälä

16.56 Minibus transport from Juupajoki train station

16:00-17:30 Dinner, A-building

Room division info and keys to rooms from A-building

19:00-19:30 (Optional) Silent Walk, getting familiar with Hyytiälä surroundings, start in front of A-building

20.00 Get together and snacks in A-building shared kitchen

Division to WS groups: Write your name to the Monday workshops that you are interested in. We will divide you into 4-6-person groups on Monday morning.

Monday 2.9.

7:00-8:00 Breakfast, A-building

8:00 On-site session, Old Dining Hall

Opening words: Maija Aksela and Taina Ruuskanen

8.10 Finnish youth's perceptions of climate change competence, Janina Taurinen

8:35 Climate change education in Estonia, Piia Post

9.00-11.00 Workshops, Old Dining Hall

A) Forests and carbon, Pauliina Schiestl-Aalto

B) IPCC-Interactive Atlas, Janina Taurinen

C) Use of OpenData of SMEAR II station, Peitsa Veteli

D) Climate Warriors - climate action by young people Aulikki, Merja, Jamo and students

11.15-12.00 Lunch, A-building

Note: If you are leaving Hyytiälä on Monday/Tuesday please go to the office Monday-Tuesday 9-15 (not 11-11:30) to arrange accommodation and meal payments.

After lunch

12-13.30 Introduction round at SMEAR II measurement site

The starting point is in front of the A-building. Prepare for a 2 km walk, the tour will be guided by Taina Ruuskanen.

13.30-14 Coffee break, A-building

14:00 Hybrid session, Auditorium in Institute building

Chair, Professor Maija Aksela, online moderator Juliana Friedrichsen

14:10 Co-designing for innovative climate change education, Professor Ying-Shao Hsu, National Taiwan Normal University (NTNU)

15.00 Insights to Hyytiälä Living Lab research

Climate impacts of sustainable wood constructions, Professor Pasi Puttonen

Wooden buildings as a learning environment, Professor Tuula Jyske

15:30 Climate education networks, Laura Riuttanen

15.45 Climate mobilities education: The power of art-science-school collaboration in Finland and Greece, Vilhelmiina Vainikka (remotely)

16.30-17.30 Dinner, A-building

Free evening, optional programme

- Climate education network development, Laura Riuttanen
- Science trail
- Periferia art exhibition walk (those not staying for the Art&Nature experience), Taina Ruuskanen

18-22 Small Sauna and Big Sauna turns

Kota for all (evening snack)

Note that sauna turns will be arranged by gender or mixed. More details will be provided on-site.

Tuesday 3.9.

7:00-8:00 Breakfast, A-building

8:00 Onsite session, Auditorium, Institute-building

Finalizing workshop outcomes

8:15 Group A-D presentation max 10 min per group

9:10 General discussion

9.30 GreenComp and ECF4CLIM Roadmap for sustainability education, Niina Mykrä (remote)

10.15 Identifying core beliefs underpinning climate action. Findings from a European study, Inkeri Rissanen (remote)

11.15-12.00 Lunch, A-building

12:00 Hybrid session, Auditorium in Institute building

12:00 Visioning sustainable futures through creative methods, Anna Lehtonen (hybrid workshop)

13.30 Coffee break, A-building

14:00 Hybrid session continues, Auditorium in Institute building

14:00 Ana Álvarez Piedehierro, Oranssi Lumi (remote)

14.45 Teaching and learning climate-related issues in discipline-based upper secondary school through project-based learning, professor Jari Lavonen (on-site)

15.30-16.00 Closing discussion and words by Maija Aksela

16:30-17:30 Dinner, A-building

Departure

16:45 Minibus in front of A-building for the 17.25 train from Orivesi to Helsinki

16.30-17.30 Dinner, A-building for those staying.

18-22 Big and Small Sauna (see Hyytiälä forest station schedule for details).

Free evening

Evening snack in A-building shared kitchen.

Wednesday 4.9. Art & Nature experience

7:00-8:00 Breakfast, A-building

(7:50 Minibus in front of A-building for the 8.25 train from Orivesi to Helsinki)

Payment to office

9:00 Excursion to surroundings

11.15-12.00 Lunch, A-building

Periferia art exhibition, Art Curator Ulla Taipale

13.30 Coffee break, A-building

Mushroom picking in old forest, Taina and Juliana

16.30-17.30 Dinner, A-building

Evening snack in A-building shared kitchen open

Thursday 5.9. Art & Nature experience