Climate Across the Curriculum

Developing school teaching resources at the AMOS National Conference

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Given the importance of climate change and its high profile, particularly among young people, it is perhaps surprising that there are real challenges in teaching climate science in secondary schools. Leaving the politics of climate change aside, these include a dearth of educational resources tailored to the needs of teachers, and, depending on the school subject being taught, limited space in the curriculum for climate science. This year's AMOS conference in Fremantle provided an ideal opportunity to work towards overcoming these challenges. Secondary school teachers were invited to join a dedicated group of conference attendees the day after the conference to participate in a "Climate Across the Curriculum" workshop.

The aim of the workshop was to contribute secondary school lesson plans on climate science to an international repository run by TROP ICSU project (https://tropicsu.org/). TROP ICSU ("Trans-disciplinary Research Oriented Pedagogy for Improving Climate Studies and Understanding") is a global project funded by the International Council of Science. It aims to improve understanding of climate science by providing educators with teaching tools and lesson plans. TROP ICSU collates and curates a collection of these teaching resources so that teachers in schools and colleges/universities across the world can use them to introduce examples and case studies from climate science and climate change to their teaching. The TROP ICSU team promotes the use of workshops to develop lesson plans to help teachers incorporate climate change examples into their teaching of the curriculum of existing school subjects. It was a meeting between members of the TROP ICSU team and Robyn Schofield (University of Melbourne) in Pune, India that ultimately led to the building of a "Climate Across the Curriculum" team in Australia to run a workshop at the AMOS 2020 conference.

Once the 60 workshop participants had found their seats, new AMOS President Angela Maharaj introduced the workshop and speakers Vaille Dawson (UWA) and Marion Cahill (Catholic Education Office of WA) set the scene on how climate science relates to secondary school teaching. Participants then divided themselves into groups of 2–9 individuals seated at round tables. Tables were labelled with different school subject and level, either school years 7–10 or 11–12.

The "Climate Across the Curriculum" team:

Angela Maharaj[1,2], Robyn Schofield[2,3], Ian Macadam[1,2], David Holmes[4], Sanaa Hobeichi[1,2], Linden Ashcroft[2,3] and Vaille Dawson[5].

1. Climate Change Research Centre, UNSW Sydney
2. Centre of Excellence for Climate Extremes
3. University of Melbourne
4. Monash Climate Change Communication Research Hub
5. University of Western Australia

Each group was charged with developing a lesson plan for the school subject and level displayed on their chosen table. Sanaa Hobeichi (UNSW) then guided the groups through a structured lesson plan development process. This was aided by a shared Google workspace pre-populated with lesson plan templates. This allowed the groups to record ideas for their lesson plan, structure them in a way that could be easily communicated and assimilated into the TROP ICSU repository and, importantly, ensured that the work was captured and could be developed further after the workshop.

After a few hours of energetic engagement between the teachers and climate scientists, lunch was served...but the work did not cease! As the participants ate, they were treated to three talks, each addressing one of the three cross-cutting priorities of the Australian curriculum**:** "Asia and Australia's Engagement with Asia", "Sustainability", and "Aboriginal and Torres Strait Islander Histories and Cultures". These themes are often challenging to teach, and the talks were designed to help teachers by providing some ideas for content. Robyn Schofield addressed "Asia and Australia's Engagement with Asia" with a talk focussed on the importance of the Japanese Himawari weather satellite to Australia, including during the recent bushfires. Roger Dargaville (Monash University) addressed "Sustainability" by showing how basic physical laws and the maths associated

All set up for the workshop with teachers at AMOS 2020. Source: Sanaa Hobeichi.

with them could be used in calculations of the energy that could be harnessed from renewable sources—solar, wind and hydro. Rowena Bullio (CSIRO) addressed "Aboriginal and Torres Strait Islander Histories and Cultures" by running a conversation with the workshop participants about their engagement with Indigenous people.

The afternoon was dedicated to the groups consolidating their work and reporting back on their lesson plans. It was only then that the full achievements of the workshop became clear. Group after group stood up and presented well-developed lesson plans for school subjects including Biology, Chemistry, Earth and Environmental Science, Geography and English. Some groups were able to precisely map their lesson plans to points in the Australian Curriculum. For example, a Year 9 Chemistry lesson plan used the example of chemical reactions related to atmospheric carbon dioxide concentrations to address curriculum point ACSSU179 ("Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer"). The plan also exposed students to one of Australia's major contributions to international climate science by incorporating graphs of atmospheric carbon dioxide data from CSIRO's Cape Grim air monitoring station. Some of the lesson plans used novel combinations of student activities. For example, a Year 11 Biology lesson plan combined experiments involving Coke and Mentos and experiments involving the running of a simple online climate model. As well as educating the students about the effect of climate change on the uptake of carbon by the ocean and, it is designed to help them develop the ability to identify and construct scientific questions for investigation and learn how to organise data in a meaningful way.

At the end of the workshop it was clear that it had not only produced an impressive array of draft lesson plans, but also that the process of producing them had been a lot of fun! Many participants commented on the energy in the interactions between the teachers and climate scientists. The teachers enjoyed having the opportunity of working with climate scientists and vice versa.

So, what's next? Over the coming months the workshop team will be pushing the lesson plans towards completion, getting them reviewed for science content and then submitting them to the TROP ICSU repository. In the longer term, there's an eye to promoting the lesson plans and how they were developed at teaching conferences and running further lesson plan development workshops (Anyone for "Climate Across the Curriculum" at the AMOS 2021 conference?).

The workshop team welcomes engagement with the readership of BAMOS on "Climate Across the Curriculum", including feedback, questions and ideas. The team can be reached via i.macadam@unsw.edu.au.

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The success of the workshop relied on the time and enthusiasm of the participants. The "Climate Across the Curriculum" team thanks you all!