Blue sky thinking for climate education

Applied climatologist Dr Lesley-Ann Dupigny-Giroux explains how her innovative project-based learning initiative based on satellites, weather and climate activities, is inspiring students of all ages to engage with the important issues surrounding climate and geospatial sciences

(RIGHT): SWAC TEAM ENGINEER MICHAEL FORTNEY WORKING WITH PARTICIPATING TEACHERS D. DEZOTELL AND M. POWERS ON LOADING THE CRICKETSWAC SENSORS INTO THEIR PROTECTIVE CASING PRIOR TO LAUNCHING THE BALLOONS.

IN LIGHT OF the current global challenges we face, it is more important than ever to draw people to the study of climate sciences; however, many young people face a psychological barrier with mathematics and science which puts them off undergraduate study and a career. With this in mind, a new professional development pilot study, entitled 'SWAC: Satellites, Weather and Climate (SWAC): Contributing to geospatial climate education and literacy', has been set up at the University of Vermont (UVM) to mitigate against this trend, seeking to engage and motivate children from kindergarten-grade 12 levels with the pertinent issues. The NSF funded 2-year study, led by Dr Lesley-Ann Dupigny-Giroux, is helping to support teachers in the STEM disciplines (Science, Technology, Engineering, and Mathematics) to enhance their curricula through a novel and engaging approach to climate sciences that increases the climate literacy of their students, thereby increasing the likelihood that some will be moved to pursue a career in the field.

Amongst the key components of SWAC's framework is an emphasis on peer mentoring, project-based learning and service-learning, as Dupigny-Giroux is keen to point out: "The beauty of SWAC lies in its interdisciplinary approach to a given issue or part of the atmosphere. This method allows students both to better understand individual disciplines while providing them with a holistic toolkit with which to view the world around them. Participants appreciate the varying dimensions that a climatologist, meteorologist and engineer may use to address the same question."

This represents a departure from conventional teaching practices which tend to be very linear and passive in nature, conveying vast swathes of knowledge, but in such a way that it is arguably much harder to fix in the minds of students. The socially constructivist learning style adopted by SWAC is manifest both in the problem-based outdoor group activities that comprise about 50% of modules, and in the 'just-in-time teaching' approach, whereby new material is introduced only as the students need it. Moreover, as Dupigny-Giroux explains, teachers are encouraged to analyse their techniques through a cycle of reflection, learning, and action, which accounts both for the intellectual value of their work, and the overall impact upon students.

FIELD STUDY

The uniqueness of SWAC lies in its use of remote sensing principles and interpretation as the focus for examining both atmospheric and land components. Training modules for participating teachers range from weather forecasting, to satellite interpretation and cloud monitoring, conducted both from the ground and from geostationary satellite (GOES) visible and infrared images. Perhaps the most engaging aspect of the programme is the measuring of varying temperature, pressure, humidity, light and motion, based on data from sensors flown under a miniature balloon (CricketSWAC). Although fairly complex in terms of its planning, technology and implementation, Dupigny-Giroux is in no doubt as to the impact of the balloon launch in enhancing the learning process: 'When collated and graphed, the vertical profile of the troposphere reveals critical information about temperature inversions and isothermal layers," she explains. "Students and teachers alike have found this a compelling way to study and understand atmospheric processes." One of the key benefits of utilising these real world examples of core concepts is that they are just as applicable to an Earth Science lesson as they would be to Chemistry, Biology or Mathematics, thereby enhancing SWAC as a framework for a whole-school approach to climate and geospatial content.

WIDENING PARTICIPATION

The next phase of the project will involve compiling and publishing SWAC instructional materials with the aim of scaling up participation from teachers in the state of Vermont and beyond. "The feedback and interest in SWAC has been overwhelmingly positive," outlines Dupigny-Giroux, before pointing out that nevertheless, there are still some institutional barriers that must be overcome in this endeavour: "Teachers are obligated to cover a certain amount of material in any given semester, and the challenge for them has been the incorporation of SWAC content and methodology in ways that enhance their existing curriculum." Positive enquiries about collaborative enterprise with SWAC, ranging from the American Meteorological Society, to several schools and a national museum, would suggest that there is much to gain from widening the scheme. Furthermore, the Department of Education at the State of Vermont has awarded SWAC a year's funding to support an additional 6 high school teachers in the programme, pointing towards a bright future for SWAC.

INTELLIGENCE

PROJECT TITLE

SATELLITES, WEATHER AND CLIMATE (SWAC): REMOTE SENSING MEETS THE ATMOSPHERIC SCIENCES TO ENHANCE CLIMATE LITERACY

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