

Dear Colleagues

We would like to extend an invitation for you to attend the following sharing session:

Speaker

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National Institute of Education

**Designing innovative learning environments for the development of 21C competencies:
Designing STEM curriculum using open-source sensors**

Date : 20 January 2016

Time : 9.30am to 10.30am

Venue : NIE7-02-08 (Seminar Room)

Abstract

In June 2013, Singapore experienced trans boundary air pollution so severe that the Pollutant Standards Index (PSI) of air quality reached the maximal level on the scale - termed as 'hazardous' - regularly. Although such trans boundary air pollution arising from slash-and-burn agricultural practices in neighbouring Indonesia has been a well-documented phenomenon in the region since the 1990s, the levels of air pollution experienced in Singapore during that period were unprecedented.

The relatively multi-disciplinary nature of Environmental Science (together with its Values orientation) makes it an ideal candidate for Science, Technology, Engineering and Mathematics (STEM)-based curriculum design. Designing curriculum around STEM is often predicated upon finding tasks which are meaningful and authentic to students. Traditionally, however, data presented to students is often abstract, decontextualized, and presented in forms which presume relatively high numeracy and graphicacy among students. Thus, for example, conventional weather data is complicated by the microclimate of the built environment, especially of urban heat island effects. As students typically have no access to a mesh of data points, nor means to observe concomitant weather phenomena, the cause-and-effect reasoning is usually abstract and far removed from the experience of the daily lives.

Over the past two years, a team of researchers from the National Institute of Education has been working on the use of a network of low cost, open-source, unobtrusive environmental sensors placed throughout a school campus.

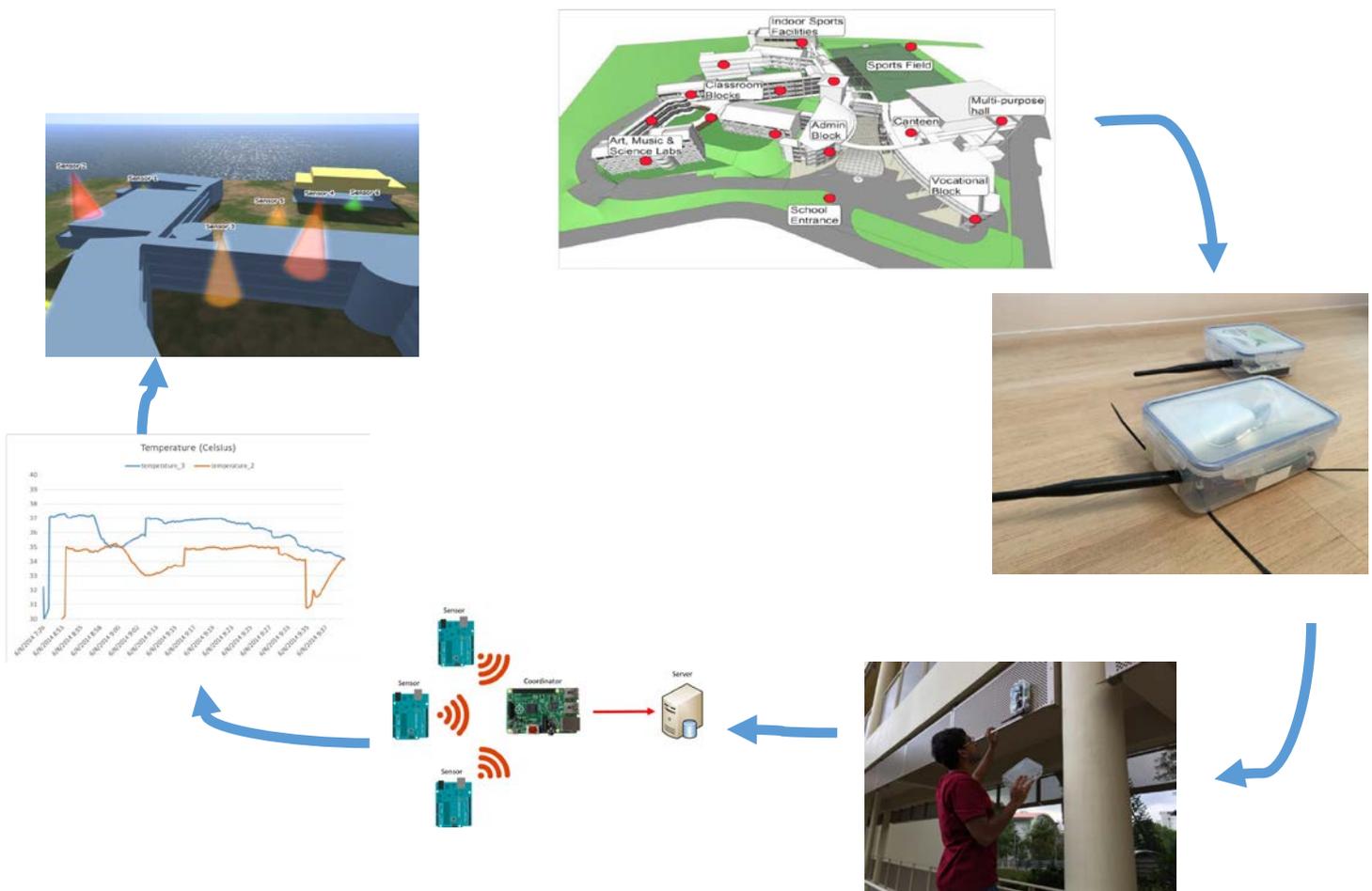
Inspired by the vision of Singapore as a Smart Nation – which seeks to harness ICT, networks and data to support better learning - the network was operational in time for the official opening of a school on 31 July 2015, during which the Guest of Honour was the Minister for Education.

Through this network, teachers had the wherewithal to design a science curriculum which permitted and encouraged the interrogation of real-world micro-climatic data from within an environment already familiar to the students, so that their intuitions about local environmental factors and systemic relationships - which would otherwise have remained tacit - were surfaced and dialogued upon in collaboration with their peers and teachers.

Such a multi-disciplinary approach to curriculum design helps learners develop their graphicacy and data literacy in authentic ways (the 'M' in 'STEM'). Using datasets derived in real-time from their own school campus, learners are potentially able to interrogate the data in ways which would be contextualised to their own local knowledge of their school (the 'S' in 'STEM'). The datasets are generated from a wireless mesh of remotely connected sensors placed around the school campus, potentially at sites determined – at least in part – by the learners themselves (the 'T' in 'STEM'). In turn, the sensors are designed and assembled using readily available open-source hardware and software, such as the Raspberry Pi and Arduino (the 'E' in 'STEM').

With their own sensor mesh and a means to visualise the data, we believe students will be better able to 'talk' through these datasets to surface their intuitions, confront them, and develop means to move from nascent forms to more expert forms of knowledge.

Real-time localised data adds spatial context, resulting in more authentic inquiry-driven curricula



Please let us know if you are attending.

Thank you.

OER Grants Management Unit