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Teaching climate change to the young

July 4, 2013 6.36am AEST

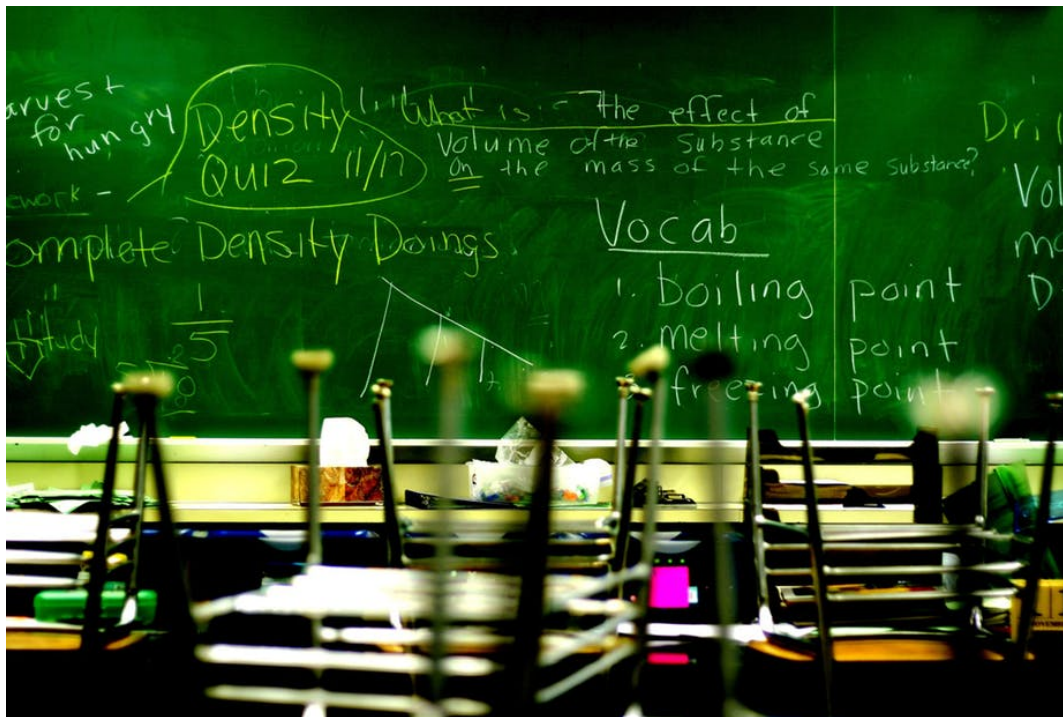
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The US plans to introduce sweeping science education reforms. Does Australia need to open up the same discussion? Flickr/Sidereal

Recently the Next Generation Science Standards (NGSS) for Today's Students and Tomorrow's Workforce were released to guide American state education authorities in redeveloping their science curriculum from Kindergarten to Grade 12.

Unlike Australia, the U.S. Federal Government is not responsible for the national school science curriculum. The NGSS project is privately funded and was developed by a group of 26 American states. The standards are strongly endorsed by the National Science Teachers Association.

The NGSS are intended to counter “widespread” scientific ignorance among the American public and reveal how “real life” science is done. US state education systems decide whether or not to implement these standards on a state by state basis, though science teachers remain optimistic that they will be accepted nation-wide. But the matter of teaching climate change, and the age at which the topic of climate change is introduced, is still cause for controversy.

One of the reasons for this controversy is that the standards place emphasis on the matter of scientific evidence: What evidence is; how to distinguish between weak and strong evidence; how evidence can be tested; and how “insights from many disciplines fit together into a coherent picture of the world”. Denial toward the science of climate change and general confusion over the evidence are two of the reasons that there is still a debate in both the US and Australia.

American states will ask students in grades six, seven and eight to “clarify the evidence of the factors that have caused the rise in global temperatures over the past century”. Examples of this evidence are “tables graphs and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane and the rates of human activities [such as] fossil fuel combustion, cement production and agricultural activity”.

High school students will learn how to “use a model to describe how variations in the flow of energy into and out of Earth systems result in changes of climate” and then “analyze geoscience data and the results from climate change models to make evidence based forecasts of the current rate of global and regional climate change and associated future impacts to Earth systems”.

The standards are framed within socio-ecological systems thinking. Students at all grade levels learn seven, cross-cutting principles: patterns; cause and effect; scale, proportion and quantity; systems and systems models; energy and matter; structure and function; and stability and change. By grade three, students learn “a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot” and they are tasked to “describe a system in terms of its components and their interactions”, such as plants and animals.

It is not hard to see how climate change, as a cause for environmental change, would come into such classroom discussions.



Who wants to challenge preconceived notions? AAP Image/Dan Peled

Climate change in the Australian Curriculum

Unlike the US, the Australian federal government is highly invested in determining a national curriculum, though the many problems of whole-scale state implementation are not yet solved. In the **Australian Curriculum: Science version 5.0**, the three most controversial elements of a school science curriculum – the origin of the universe, evolution by natural selection and climate change/global warming - are explicitly taught at Year Ten.

However, the language of environmental change and global human impacts in the curriculum from Foundation Year to Year Nine is unclear and tentative. The impacts humans “can have” on environments are cautiously positioned around personal choice and actions. Science contributes to the general capabilities fostered by the Australian Curriculum, where “students use their scientific knowledge to make informed choices about issues that impact their lives such as health and nutrition and environmental change, and consider the application of science to meet a range of personal and social needs.” This is not robust language for addressing a global crisis.

There is nothing to prevent an educator from actively teaching climate change to younger children. Students can learn about conservation of natural resources and recycling in Year Two and pollution in Year Three. One theme in Year Four is that the “Earth’s surface changes over time as a result of natural processes and human activity”. Sustainable energy (solar panels, etc.) and disasters are introduced in Year Six, where students “describe and predict the effect of environmental changes on individual living

things”. By Year Nine, students can consider “how choices related to the use of fuels are influenced by environmental considerations”.

Teachers can also implement the **Sustainability cross curriculum priority** that promotes “individual and collective endeavours shared across local and global communities [to] necessitate a renewed and balanced approach to the way humans interact with each other and the environment”. However, there are few practical incentives to do this, and most classrooms concentrate on implementing the key disciplines of the Australian Curriculum at present.

Australian curriculum developers are still looking to a **Holocenic past** rather than the **Anthropocenic future**. Their caution is understandable in the current political climate (especially in Queensland) where education about climate change unfortunately remains contentious. Educators work within settings where there is **remnant apathy (or even hostility)** towards educating young people about the likely shape of their lives. However, young people at school today will not have the luxury of making “informed choices” about environmental change. They are going to have to deal with severe and disruptive changes in their lifetimes no matter what cautions are deployed in the curriculum.



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