



Central Coast Climate Science Education
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Climate Change: Kids get it
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The other day a discussion group I belong to exchanged ideas about whether we humans would really deal effectively with climate change. Or, like the proverbial brainless frog in the warming pot of water, will we wait until it gets so hot that the frog passes the point of no return?



It seemed to us that there were two hopeful possibilities: The first is the impressive creativity of American scientists and engineers. Progress is so rapid that achieving the means of producing and storing electricity at costs that are lower than fossil fuels, even without government subsidies, *may* occur before our frog boils to death.

The second hopeful sign is that we are educating a new generation of citizens---from kindergarten through high school--to understand that

science is based upon *critical thinking and evidence*. With an improved science curriculum (see below) and the computers and other technical gadgets that were not available to me when I was a student, children can easily grasp the basics of climate change and do so enthusiastically.

This was brought home to me by a recent email I received from Janelle, a retired teacher doing after-school volunteer teaching to a group of middle school kids. Here is part of what she said:

I currently volunteer at an after school program and have been tutoring some middle school kids in science. We are currently discussing and working on their first unit as middle schoolers, global warming and climate change. Kids this age love the computer and love to use the internet...

...One of my students, Michael, brought to my attention an article that discusses greenhouse gases, climate change, and energy. He said he found it very interesting and I thought I would pass it along to you, "The Greenhouse Gases, Regulated Emissions, and Energy Use in Cars and Vehicles"

<https://www.titleproloans.com/articles/the-greenhouse-gases-emissions-energy-use-in-cars/...>

Would you mind including it on your page? I'd love to show Michael that his hard work and research will help other kids learn about climate change...

So Michael, thank you for your research and finding that link. And thank you, Janelle, for your dedication in doing volunteer work teaching kids about science. I wish there were a million more of you doing this--and I can't help but believe that there *are* a lot more retired people like Janelle who could do the same thing if we made a greater effort to involve them.

The link that Michael found provides a set of links to four related topics: 1) Greenhouse gases 2) Regulated Emissions 3) Energy Use in Transportation and 4) Green Cars and Clean Energy.

Some of the links are for adults and middle schoolers might find them tough going without a bit of help from teachers. But some of them are especially designed for children. In fact, the very first link is put out by the U.S. Environmental Protection Agency (do we really want to abolish the EPA!?) and is called "A Student's Guide to Climate Change":

<https://www3.epa.gov/climatechange/kids/> which I had previously put in the [Resources: For Teachers and Students](#) on this website. I especially like the section "Think Like a Scientist".

Another link in Michael's list that you will also find in [Resources for Teachers and Students](#) is from NASA and is called:

Climate Kids: NASA's Eyes on the Earth: <http://climatekids.nasa.gov/>

Yet another one that I did *not* know about is called "Global Warming is Hot Stuff" <http://dnr.wi.gov/org/caer/ce/eeek/earth/air/global.htm> which is part of a series called "Environmental Education for Kids" (or EEK!): <http://dnr.wi.gov/eeek/>, produced by the Wisconsin Department of Natural Resources.

So once again, thank you Michael, for your research. I am putting that link in the Teachers and Students section.

Climate Science Education in the Public Schools

There are other "after school" programs that are very valuable for STEM (Science, Technology, Engineering and Math) education, as well for music and art, and of course athletics. These should surely be encouraged. But what about our public schools? A step in the right direction is the development of the Next Generation Science Standards (NGSS) : <http://www.nextgenscience.org/>

You can find a short history of how the NGSS came to be in this link: http://blogs.edweek.org/edweek/curriculum/2013/09/storify_the_story_behind_the_n.html

It was developed at the instigation of the National Research Council, an arm of the National Academies of Sciences, Engineering and Medicine.

As of February 2016, sixteen states, including California, have adopted the NGSS. The NGSS departs from the old science curriculum many of us grew up with by encouraging *understanding* and *critical thinking*, rather than simply memorization of facts. It contains units on Earth Sciences

including climate change. Here is the heading for one unit for middle school kids labeled MS-ESS3-5:

Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include 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. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

One can only hope that this young generation really will learn to understand and appreciate science. They will become our leaders in business, education and maybe even become Senators. If so, perhaps we will no longer see another rather embarrassing display like the following on the floor of the U.S. Senate:

