Controversial issues in the primary science classroom: from theory to practice

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An outline

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- What do we mean by controversial issues?
- Why teach controversial issues?
- Where do controversial issues fit in the new National Curriculum?
- How should we approach teaching of controversial issues in primary science?
- Suggested teaching sequence climate change – PreSEES EU project
- Challenges
- Links & Resources
- References
- Questions/Comments

What makes a science topic controversial?

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- …plurality of views/arguments/possible explanations
- …uncertainty – a definitive answer does not always exist
- …ethical and moral implications
- …local, national and global dimensions
- …socio-scientific – based on scientific evidence with applications being of societal importance
- …personal relevance and links to everyday life

(Ratcliffe & Grace, 2003; Sadler, 2009; Zeidler & Nichols, 2009)

Why should we teach controversial issues in science?

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- ✓ strong links to everyday life will facilitate engagement and will provide a rich context for the children to work in
- ✓ cross-curricular nature
- ✓ a way to model and develop various skills of 'working scientifically'

Controversial Issues in the National Curriculum

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- Animals, Including Humans
- Environmental Education (e.g. habitats, energy efficiency)
- Evolution & Inheritance
- Biodiversity
- Nutrition & Health
- Seasonal changes: global warming & climate change

How should we go about teaching controversial issues in science?

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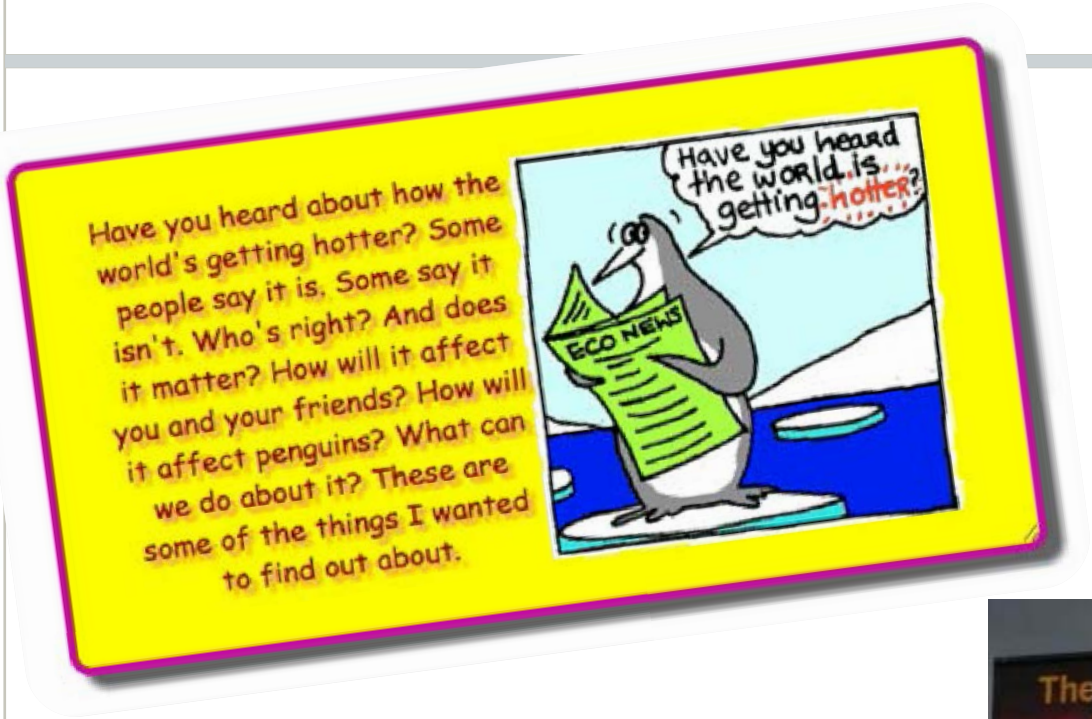
- discussion and negotiation of ideas should be essential elements of the learning environment
- teachers and pupils need to understand the *nature of the controversy;* that is, *why, and in what ways, is this topic controversial?* (Oulton, Dillon & Grace, 2004)
- design activities around building consensus (Garcia-Mila et al., 2013); yet, we should not be pushing students for agreeing on a final solution or right answer at the end of our unit
- should be able to express our own views on the controversial issue

It's not really happening, is it?

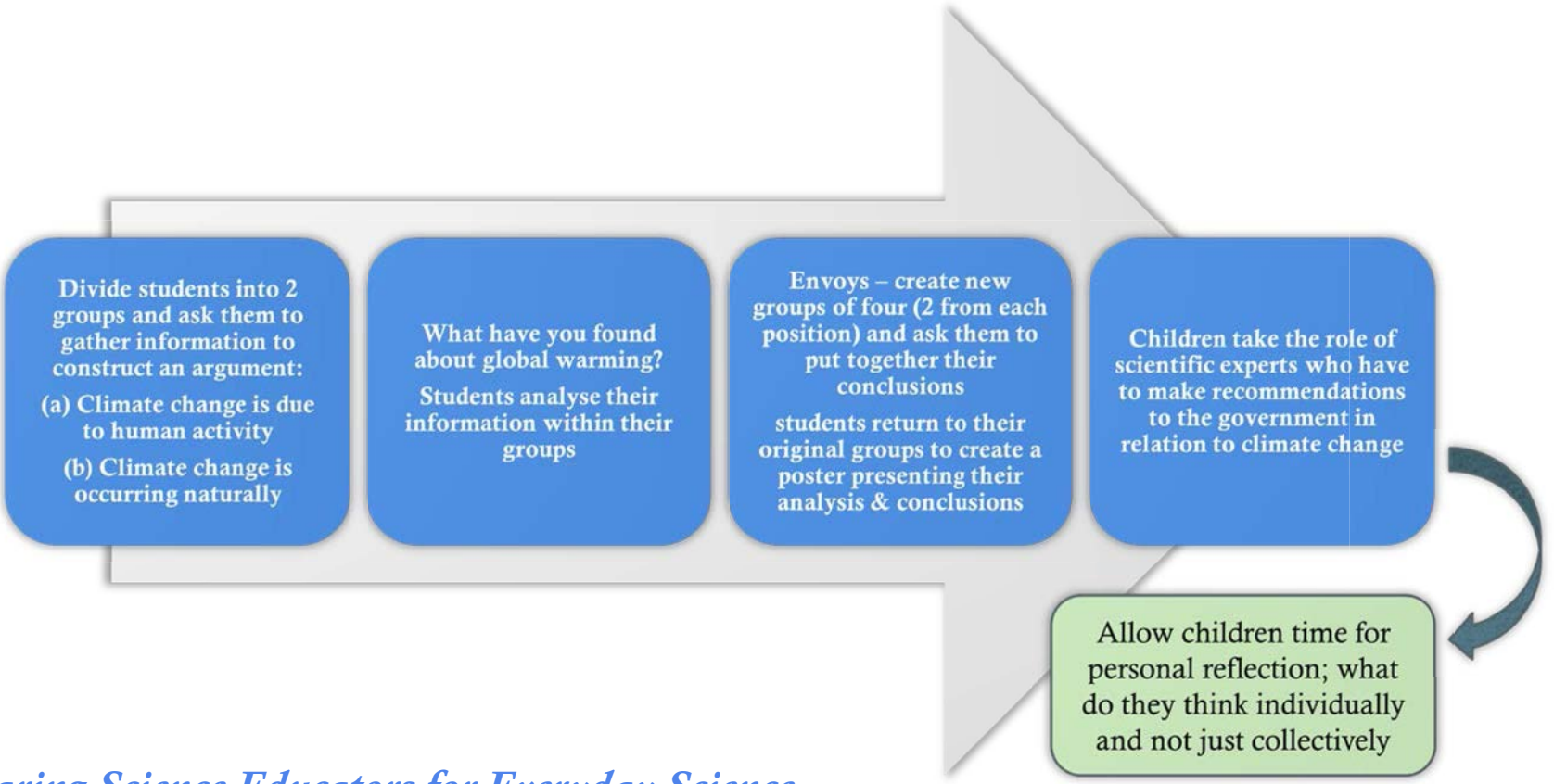


…we know (?) that the planet is getting warmer

- Who's causing climate change?

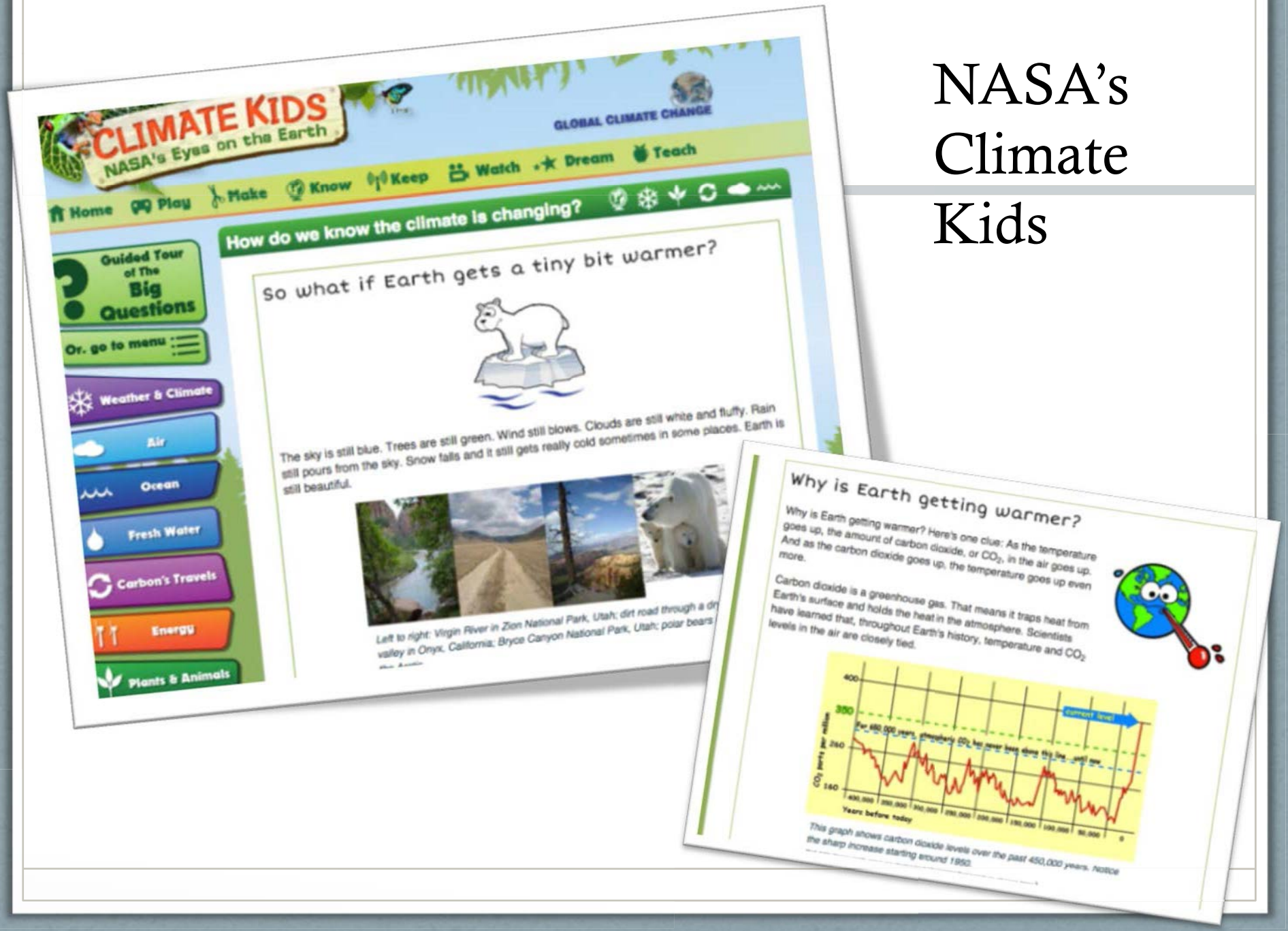
http://tiki.oneworld.net/global_warming/climate7.html

Global warming: a suggested teaching sequence



Preparing Science Educators for Everyday Science
http://www.ssieurope.net/deliverables.html

NASA's Climate Kids



Ban It, Tax It or Leave It Alone? The Great Soda Debate

Should we kill the grey squirrels?

'If you want red squirrels, you have to kill greys'

A project in Cornwall aims to reintroduce captive-bred reds back into grey squirrel-free exclusion zones over the next five years

Leo Hickman in Grampound, Cornwall
The Guardian, Wednesday 5 September 2012
Jump to comments (…)

A red squirrel at Trewithin Gardens, Cornwall. Photograph: apexnewspix.com

http://www.theguardian.com/environment/2012/sep/05/red-grey-squirrels-cornwall

Is it the badgers' fault?

http://www.careforthewild.com/
http://www.savethebadger.com/

Protecting endangered bees: news and resources round up

Will the controversial Europe-wide ban on neonicotinoids help the plight of the bee? We pull together the best news and teaching resources for you to investigate in class

Bees: news and resources to help teach your class about bees and the threat to their existence. Photograph: Patrick Pleul/EPA

Bees pollinate three quarters of all crops, not to mention thousands of wild flowers, and without them the world would be a very different place. But their numbers are in decline. In the past 100 years 20 species of British bee have become extinct, and now 35 more are at risk of extinction.

Bee keepers or bee killers?

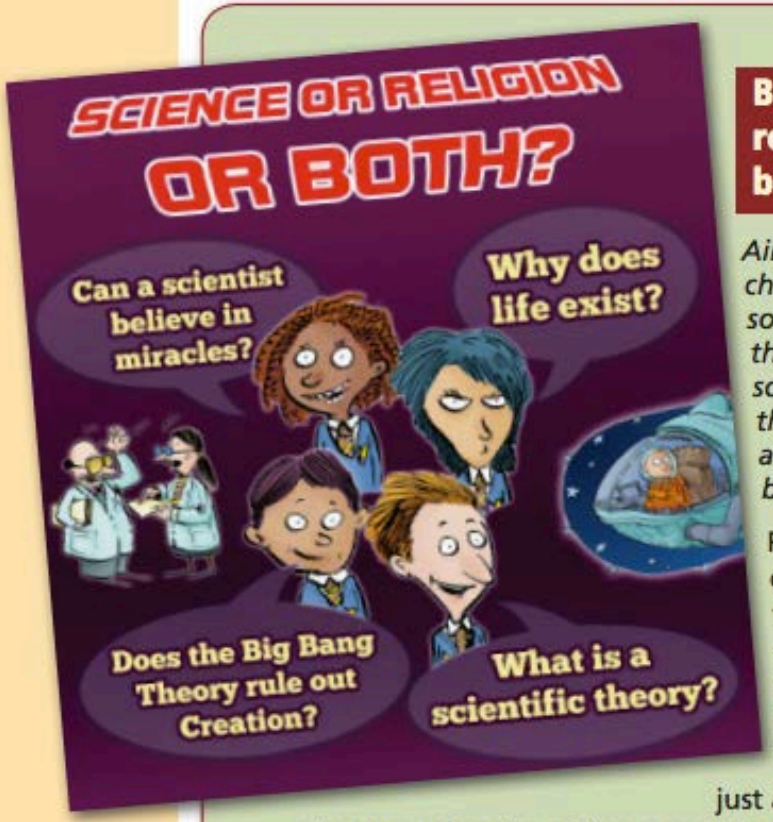
http://www.theguardian.com/teacher-network/teacher-blog/2013/may/05/bees-protecting-endangered-news-resources-round-up

Evolution & Inheritance

Evolution and religion deal with different domains

Science has an empirical, evidentiary basis; seeks to provide explanations of the world around us

Religion is a belief system



Box 2 Science, religion or both?

Aim: To enable children to see that some people view the world through science, some through religion and some through both.

Present the children with two overlapping circles. In one circle, guide them to write things that are just associated with science, such as inventions, empirical experiments, space travel and so on; in the other circle, they write things associated with religion such as prayer, religious symbols. In the overlap, they write things that relate to both. Highlight that it would be possible to live by focusing on things in one circle or in the other or to have an approach to life that draws on both.

Billingsley, B. (2013). The nature of science. *Primary Science, 127*, 23-25

Setting up groupwork activities

In order for groupwork activities to be effective you need to ensure that:

- ✓ Ground rules of talking, sharing and behaving within the group are established
- ✓ Each student has a clear role within the group
- ✓ There is a clear objective and final outcome that students are working towards

Groupwork strategies

- ✓ Talk partners
- ✓ Listening triads
- ✓ Pairs to fours
- ✓ Groups of 4-6
- ✓ Jigsaw method: experts & envoys
- ✓ 'Think – Pair – Share'
- ✓ Line of 'Truth'

Groupwork roles

- ✓ Recorder
- ✓ Researcher
- ✓ Presenter
- ✓ Questioner
- ✓ Group Leader/Coordinator
- ✓ Time Keeper
- ✓ Observer

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Ground rules

- We share our ideas and listen to each other
- We talk one at a time
- We respect each other's opinions
- We give reasons to explain our ideas
- If we disagree we ask '*why*?' and *how do you know?*
- We try to agree in the end
- If we don't understand we ask *'can you explain that to me?'*

Thinking Together Project

(http://thinkingtogether.educ.cam.ac.uk/about/)

Links to Literacy

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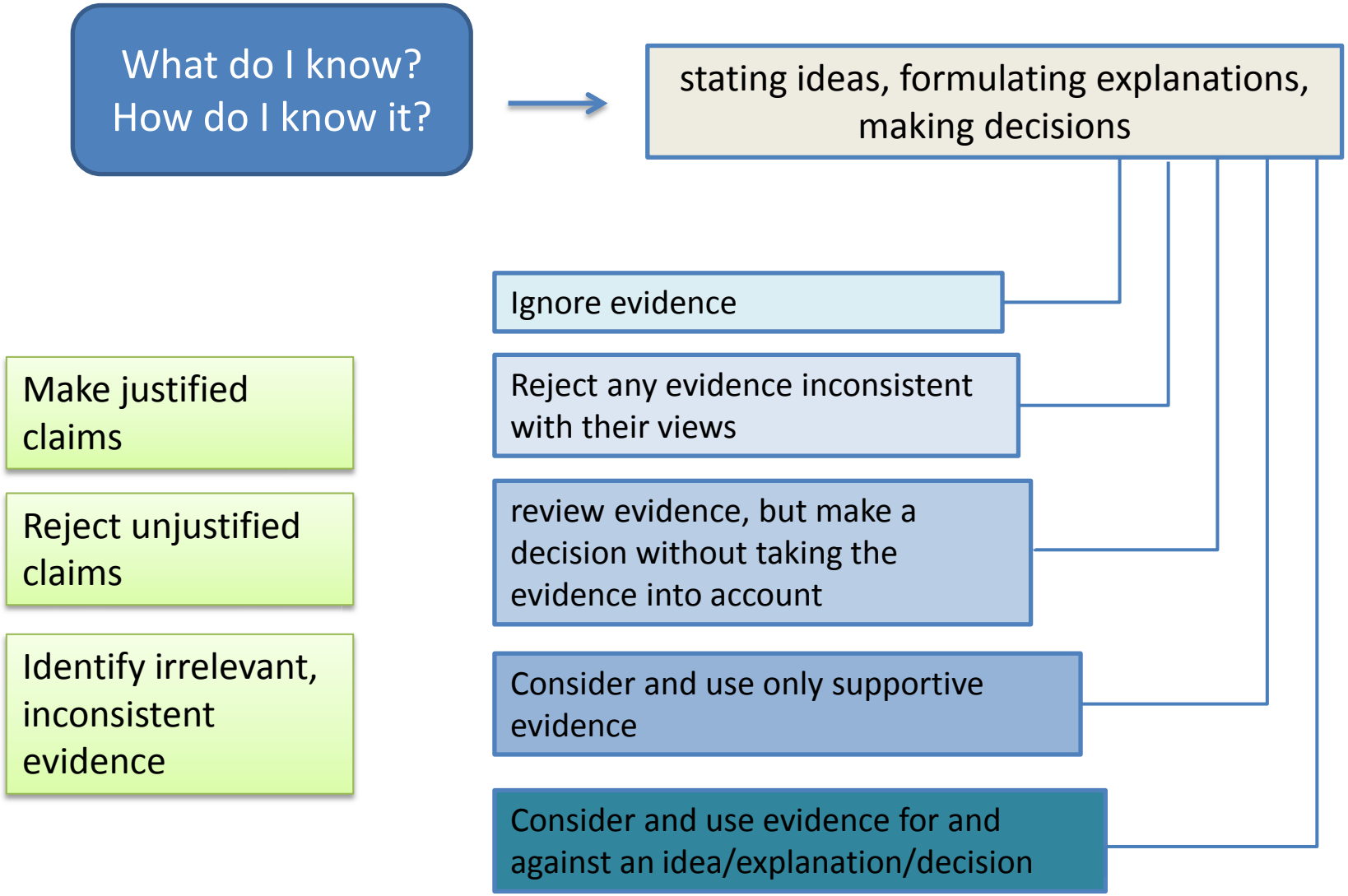
- Speaking
  - when sharing ideas, negotiating solutions, convincing others, reaching a personal conclusion
  - evidence-based discussions (argumentation)
- Writing
  - writing letters to involved parties expressing views and proposing solutions; creating posters to present results of groupwork; providing individual explanations of their own views and justifying these based on moral and/or scientific reasoning
- listening and interpersonal skills

Challenges

- …plurality of views/arguments/possible explanations – *wider subject knowledge base is needed*
- …uncertainty – *children are used to having a right, final answer at the end of a lesson*
- …children's ability to engage in scientific and moral reasoning varies



Adapted from Kuhn (2005, p.89) and Chin & Brewer (1993)

- assessment – *wider range of concepts & skills used*
  – *uncertain nature of issues discussed*

  - 'steps to success' could be addressing this wider range
  - consider evidence of impact from the start (planning stage) and use various forms/strategies of evidence collection for assessment purposes

Links and Resources

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- http://www.learner.org/jnorth/sunlight/sl/1/ts.html (Sunlight and the Seasons)
- http://www.eo.ucar.edu/kids/green/index.htm
- http://kids.niehs.nih.gov/science/experiments/index.htm
- http://ku-prism.org/resources/Bears2005/
- http://www.theguardian.com/science/scienceofclimatechange (Climate change in the media)
- http://old.solar-aid.org/sunnyschools/
- www.faradayschools.com (Faraday Schools - top scientists discussing questions relating to science and religion)
- http://darwin200.christs.cam.ac.uk/pages/index.php?page_id=k2
- http://evolution.berkeley.edu/evolibrary/teach/35fundamentals.php
- http://www.animal-ethics.org/massive-killing-grey-squirrels-europe-continues/

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Thank you!

Questions/comments?