Science Special Interest Group (SIG) Symposium, September 30 2019

Notes compiled by Rosemary Hipkins

The following notes bring together ideas from the symposium convened in Auckland on September 30, to explore: Post-normal science education: what might it look like?

At the end of a busy day in which many different ideas were explored, everyone agreed that there was a need to process and share the ideas, and keep the conversation going. However we ran out of time to agree on a specific process. I have picked up this challenge and distilled all the papers presented, along with what I was personally able to capture of the table conversations, to arrive at the summaries that follow.

The ideas are presented as a series of inter-related conundrums to support ongoing debates. There are seven of them. No doubt others will think of more – or see some of them from different perspectives to me. I got some feedback to the notes, but not enough to say that the following represents a consensus view. A summary prepared by Ally Bull, written specifically for a teacher audience, can be found on the Science Learning Hub.

## Seven challenges in brief

**Challenge 1:** We need radical change in science education, not just tinkering at the edges. Specifically we need to urgently rethink the purpose(s) for school science learning.

**The conundrum:** How do we create the sense of urgency that will compel people to accept the need for change (and actually follow through by making changes)? How do we confront the “dragons of inaction”? (a phrase used by Thomas when presenting his paper on climate change).

**The opportunity:** Is the moment now when climate change is beginning to cause many of us to rethink taken-for for-granted aspects of our lifestyles (but not nearly quickly enough) and enabling us to make critically informed changes?

**Challenge 2:** We need students to be/become complex systems thinkers

**The conundrum:** Could we inadvertently contribute to the impression that science is no more trustworthy than any other knowledge source, especially when we see many people falling back on false assurances for of leaders who promise that the old certainties still hold, despite all evidence to the contrary?

**The opportunity**: If we follow a principled process to reduce science content, while maintaining a focus on important “big ideas”, we can make space for building systems thinking capabilities and awareness along with epistemic knowledge about science.

**Challenge 3:** We need to introduce a more robust epistemic element into science learning. One specific need is to keep the integrity of science in cross-disciplinary inquiries.

**The conundrums:** There are three inter-interrelated conundrums here:

* How can we build a stronger focus on epistemics when many secondary teachers lack the necessary expertise and experience, and feel most comfortable teaching the (safe) settled knowledge products of past science activities?
* Is it realistic to expect primary teachers to have the disciplinary knowledge needed for epistemic conversations, when science is only one of the learning areas they must teach? (Can the model provided by the “science capabilities” help overcome this dilemma?)
* At what stage of their schooling are young people developmentally ready for these sorts of conversations? How might we know?

**The opportunity:** The need for more/different PLD was a focus of table group conversations, with the science capabilities seen as providing one means of making some inroads into the challenges. How to “rebalance” epistemic and other aspects of science education could provide a productive focus for conversations about the need for change.

**Challenge 4:** We need students to build an appreciation that they are part of the natural word, not separate from it, and all our actions have profound effects well beyond our imagining.

**The conundrum:** How can we counter the distancing effects of consumerism and urbanization that precludes meaningful encounters with natural environments for many students and when the traditional treatment of science knowledge (e.g. in textbooks, exams) “others” knowledge of natural phenomena?

**The opportunity:** New pedagogies such as Imaginative Education and teaching for complex systems thinking can help. This challenge also potentially provides an authentic way of bringing in indigenous knowledges into science education conversations (see next conundrum).

**Challenge 5:** We need to be more respectful/humble about the contribution science can make to solving the complex dilemmas that confront us in the Anthropocene.

**The conundrum:** How can we respectfully draw on other knowledges, in particular indigenous knowledges, and specifically Mana ōrite mō te mātauranga Māori, in non-binary ways? When worldviews clash (as will be inevitable) how do we better support epistemic conversations that help students to think about parallel ways of seeing the challenges, and to bring more flexible and open-minded thinking to bear?

**The opportunity**: I have already outlined the need for a greater emphasis on epistemic conversations (which was a strong thread through many of the papers). The next challenge provides another angle for this conversation.

**Challenge 6:** We need to shift to a more collectivist process for ethical and practical decision-making, so that individual persons do not need to be solo “filterers” of multiple and often-conflicting information inputs.

**The conundrum:** How can we achieve this shift in an age of social media that is underpinned by neo-liberal assumptions of the primacy of the rational self-interested individual whose goal is to acquire more for themselves?

**The opportunity**: The need for a fundamental re-examination of the purposes of science education was a clear thread throughout the day. An explicit focus on building capabilities for ethical thinking could also help. Knowledge-building pedagogies also have an explicit focus on building ideas in the spaces between individuals (but see also the final conundrum in this set).

**Challenge 7:** We need teachers to be actively experimenting with new pedagogical approaches, and to become skilled curriculum designers.

**The conundrum:** Teachers need to make pedagogies their own in order to be confident and responsive in using them, but how can we ensure they do so in ways that maintain fidelity to the intentions and ideas that underpin any specific approach?

**The opportunity:** Several contributors described new pedagogical approaches such as learning through games, knowledge-building, imaginative education, integrated learning in contexts such as exploring socio-scientific issues. The research and experimentation is happening—our challenge might be to support and share these ideas in ways that encourage deeper thinking about purposes for learning in general, and using the specific strategy in focus in particular. That is, curriculum design thinking needs to be more explicit.

Papers presented at the symposium

The symposium speakers are listed below. Hyperlinks are included where a paper has been posted to the NZARE website. If there is no hyperlink, this means that the paper is probably undergoing further work for possible publication in an academic journal, but feel free to contact the author for a copy of the paper that was presented at the conference if you are interested.

Also check out the Science Learning Hub to access the summary of the day that has been written for a teacher audience.

**Jane Gilbert**: Re-balancing science education for the Anthropocene era. jane.gilbert@aut.ac.nz

**Sally Birdsall**: Re-envisaging science education: learning for an uncertain, complex future. s.birdsall@auckland.ac.nz Access Sally’s paper here

**Rose Hipkins**: “Platforming” the science curriculum: a strategy for reframing content. Rose.Hipkins@nzcer.org.nz Access Rose’s paper here

**Ally Bull**: Re-imagining school science for the Anthropocene. allybull2@gmail.com

**Michael Johnston** (with Edit McIntosh): The role of epistemology in science education. michael.johnston@vuw.ac.nz

**Kelly Price:** Addressing misinformation and pseudoscience by fostering meta/macro thinking in school science. price.kelly@gmail.com

**Simon Taylor**: Knowledge-building as a future focused pedagogy in science classes. simont@waikato.ac.nz Access Simon’s paper here

**Thomas Everth:** On the urgent need for a National Climate Science Education Initiative for Aotearoa New Zealand. evertht@mbas.ac.nz

**Siu Kit (Dennis) Yeung:** Gamification for future-oriented science education. sk.yeung@auckland.ac.nz

**Danielle Myburgh:** The reality of the future focused science classroom. danielle@edchatnz.com