

From literacy to numeracy for 'Nature'

Introducing new themes for 2013 by Jeanie Clark



United Nations Decade on Biodiversity

Time for Maths and Science in Biodiversity this year! My 2012 biodiversity articles had a literacy and farming slant to learning about Nature, for the second year of the United Nations Decade of Biodiversity (UNDB). This was so they could link with two Australian programs – the National Year of Reading and the Australian Year of the Farmer.



In 2013, two global-scale programs are 'ripe for the picking' for learning about biodiversity. They are the Maths of Planet Earth (MPE) and the International Year of Statistics (IYS). MPE can blend the two, since numeracy, like literacy, is at the basis of knowledge and communication. Statistics is a part of Maths, so it falls under the same contention.

MPE Aust aims "to spread the word about the role of maths and stats in understanding the challenges of our world in a fun and accessible way." MPE/2013 has four content themes as a planet:

- To discover
- Supporting life
- Organised by humans
- At risk ^{(1) (2)}

MPE Aust is a part of **MPE2013** (Maths of Planet Earth)

The IYS or **Statistics2013** aims to increase "appreciation for the myriad ways statistics improves the quality of your life and greatly advances our global society".⁽³⁾

How might MPE and IYS be linked under the third year of UNDB, with its vision of 'living in harmony with Nature' supported by its 5 broad aims and 20 Aichi targets? Do the MPE and IYS aims support this? I think they can and I hope to help you and your family discover some Maths and Science for better knowing Nature and our planet during this year.

Summary of UNDB Five Strategic Goals ⁽⁴⁾.

- A. mainstream biodiversity
- B. promote sustainability
- C. safeguard ecosystems
- D. enhance benefits from biodiversity
- E. build capacity for all people to contribute.

What concepts could be covered by Maths for these purposes? The easiest place I know of for a quick idea of the range and complexity of topics possible for Maths and Science, is their AC Scope and Sequence Tables (see Australian Curriculum article).

Models

In *Learning about Nature from Images*,⁽⁵⁾ I suggested using Concept Maps for sorting out ideas. Models can play the same function mathematically – they can be numeric, or visual. How could MPE, IYS, AC Maths, AC Science and UNDB be linked? I have put the key aims in boxes to help. Can they be creatively linked in a model? Try this challenge with older children, before reading my suggestion below.

These are the key aspects of the **AC Mathematics**:

- being able to
 - understand the use of Maths
 - use Maths competently
 - use it to appropriately solve problems
 - reason using maths ideas
- in the Maths Strands (content areas) of Number and Algebra; Measurement and Geometry; Chance and statistics ⁽⁶⁾

So start with Maths – its clear where it fits. The Science is fairly clear too, with similar meaning words.

These are the key aspects of **AC Science**

- curiosity
- Scientific vision
- Scientific inquiry
- Communication skills
- Problem solving
- Historical and cultural contributions
- Knowledge of the Strands (content areas) of: Biology; Chemistry; Earth and Space Sciences; and Physics ⁽⁷⁾

There are lots of ways these five can be linked. Mine is only one way. Other models should be encouraged – consider Venn Diagrams, tables, other texts, and Art!

My model begins with the IYS as a sub-folder in a folder of Maths programs and data. Science and MPE are the operators for content from Maths. MPE works with Science's Strands to discover:

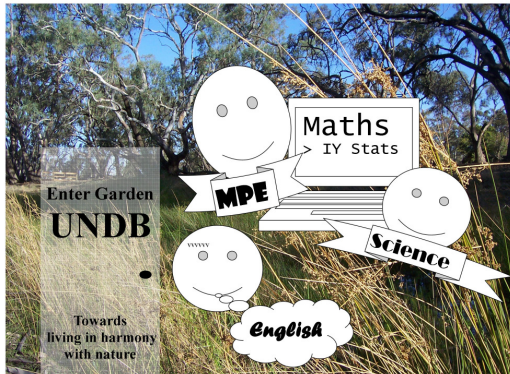
- what supports life,
- how it is organised
- and risks.

They are working in a garden called UNDB where MPE's task is to reorganise Science for understanding from a Biodiversity slant:

- living things are in Biology;
- their home comes under Earth Sciences;
- their molecular make-up and operation comes under Chemistry
- and their movements and reactions to light under Physics.

What is missing? Communication skills – literacy! Science needs English, MPE does too. So English will circulate in this UNDB garden, to guide and interact with MPE and Science as they use the Maths programs. This room produces knowledge and communicates it, raising awareness and understanding of living things – a key aim in the UNDB. Would you add Arts in too for communication?

2013



In exploring biodiversity ideas this year, I plan to have the MPE at the forefront. My model shows that:

- the MPE can sit under the UNDB
- compartmentalised learnings are of value to the whole and can be integrated with it.
- literacy and numeracy are of critical importance as the foundations of all of this.

Where lead does MPE give that kids could do?

The global mission of the MPE project is to:

- Encourage research in identifying and solving fundamental questions about planet earth
- Encourage educators at all levels to communicate the issues related to planet earth
- Inform the public about the essential role of the mathematical sciences in facing the challenges to our planet ⁽²⁾

- I see two key ideas that can be applied by educators:
- 1 **Discover** - research questions about our planet – supporting life (for UNDB link)
 - 2 **Communicate** – share findings with others.

Communication

With whom could findings be shared? Immediate family, not present when discoveries are made? Extended family and friends? Contributions are regularly needed for *Otherways*. The MPE websites? It's up to you to choose the audience and style – spoken, drawn, tabled, photos etc! Often this is where English and Arts come in to help the Maths and Science. Whatever sort of communication best fits the Science and your brain's workings? Some people think better in numbers, others in words, others with music etc Which of my model's communication styles above worked better for you?

How important is communicating Science? Recently ABC Radio Science Show presenter lamented the current state of Science communication. "We are facing a real crisis in science communication."⁽⁷⁾ The AC Science curriculum recognises this in its fourth aim "to communicate scientific understanding and findings to a range of audiences"⁽⁸⁾ People want to know about Science. Some Australian National University research found that "Australians would prefer to hear about health, medical discoveries and the environment in the news [than sport]." ⁽⁷⁾ Yet, with newspaper cutbacks, Science reporters have gone. "As my profession faces away, it's up to someone else to do the job of explaining science".

Perhaps home educators can start developing these 'someone's' this year. Home education encourages new ways of doing things. If you don't already communicate the Science that you do, this could be a challenge to adopt this year. It should be a good year for this, with the MPE's and IYS also making communication a key aim.

MPE Website

Given MPE's global mission, what's on their website <http://mpe2013.org/> ? The MPE is really quite big and the global website is also worth a look at.. The curriculum section is American based: NASA, free downloads, mainly targeting middle years 5-9, eg *Earth Maths* has 46 problems. *Space Maths* is for primary years- instructions given, read before use. The National Council of Maths Teachers suite of maths resources covers all levels – registration needed. There is a lot more there, and it is growing all the time. The list of supporters is huge and I haven't had time to check their offerings out, so have a look yourself.

MPEA Website

MPE Australia's (MPEA) website is quite impressive too, <http://mathsofplanetearth.org.au> and will also grow. For communication, it has a 'blog' section with short videos of people talking about their Science field and how Maths is involved. Suited for secondary students, I suggest parents view them first for their levels of complexity and what follow-up they may inspire – so you are ready! A taste of their wide scope: *Boom boxes, opera singers, blood pressure and a French revolutionary* - Assoc Prof C.Wright, Mon.Uni. *The Mathematics of Fire: predicting the growth of bushfires* - Dr J. Sharples, App. & Ind. Maths. Res. Gp

Discover

The MPEA is also hosting a series of photographic competitions, and a video one, that your children may like to enter. These are also ways of communicating Maths/Science. How could you show 'probability and chance' in a photo (due 17 May)? The entry requires an explanation to go with it. Currently 'symmetry' is the theme and photos. Photos add interest to the concept of symmetry. Can you find your own examples? Perhaps shared them in *Otherways* to inspire others!

References and further reading

- (1) Australian Mathematical Sciences Institute, About *Maths of Planet Earth* 2012 at <http://mathsofplanetearth.org.au/about-maths-of-planet-earth/>
- (2) National Science Foundation, *Maths of Planet Earth Brief Overview*, 2012, at <http://mpe2013.org/wp-content/uploads/2012/12/mpeoverview2a.html>
- (3) International Year of Statistics. *About Us*, 2013 at <http://www.statistics2013.org/about-us/>
- (4) Convention on Biological Diversity Secretariat, *Aichi Biodiversity Targets* at <http://www.cbd.int/sp/targets/>
- (5) Clark, J. *Learning About Nature from Images*. *Otherways* vol 134 Oct 2012 pp
- (6) Victorian Curriculum and Assessment Authority *The AusVELS Curriculum Mathematics 2012* pp 2-4 download at <http://ausvels.vcaa.vic.edu.au/>
- (7) *ibid*, The AusVELS Curriculum Science 2012 pp 2-5 download at <http://ausvels.vcaa.vic.edu.au/>
- (8) Williams, Robin, *Speaking up for the intellect*. In the Age, Voice Vol 9 no.1 Jan 2013, p2