Learning for now and the future

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Theme 1: Who do we want our young people to be?

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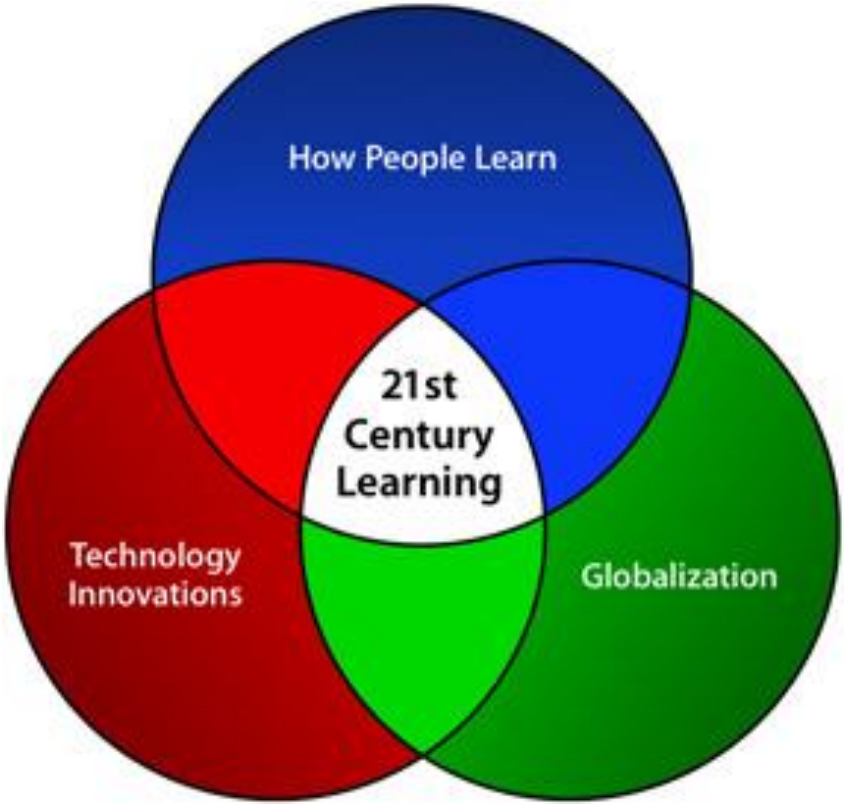
Rangahau Mātauranga o Aotearoa

The International Baccalaureate® aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.



http://digitallearningworld.com/wp-content/uploads/2010/12/ACOT1.png

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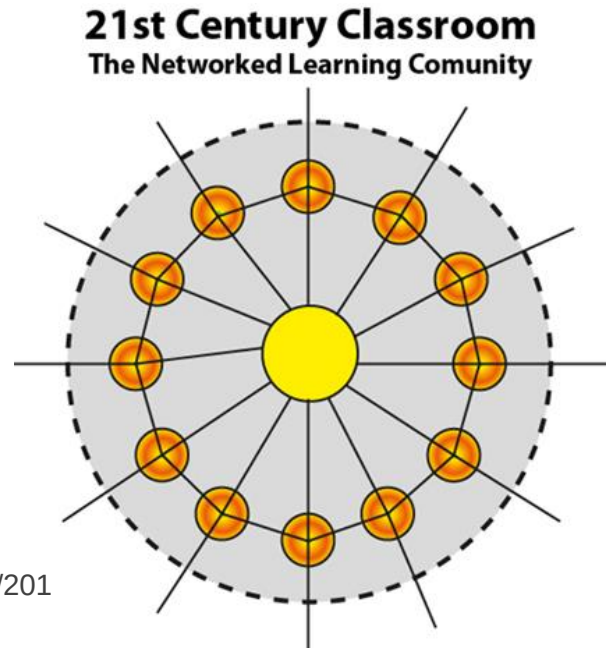


https://learning21c.files.wordpress.com/2011/10/21st_networked_learning.jpg

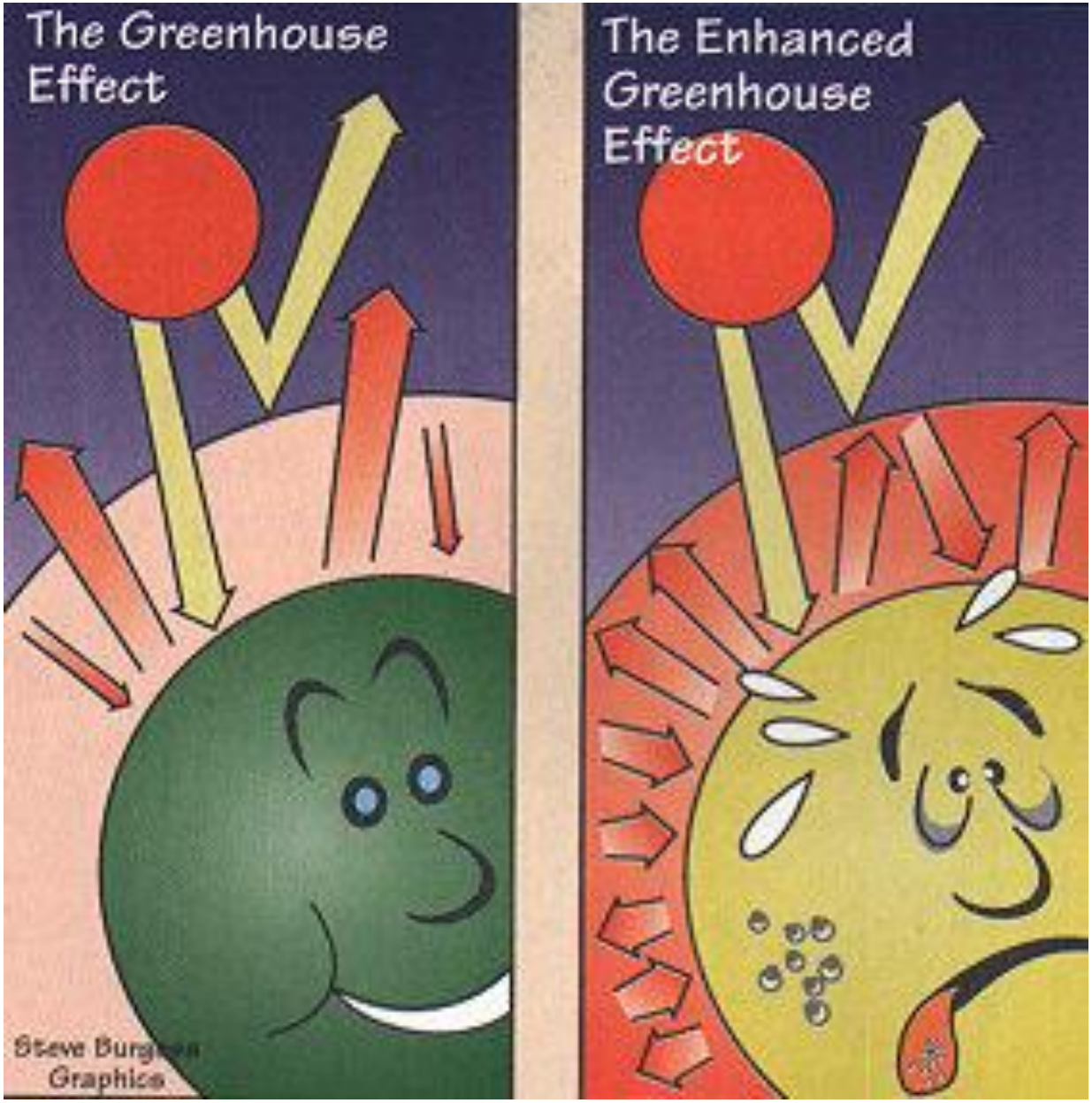
http://edicio.files.wordpress.com/2012/10/learn-21st-century.jpg

UNESCO's idea was "four pillars of learning" (but one of them is missing here….)

Most of us would say we want our young people to be engaged and productive citizens….

In science students explore how both the natural and physical world and science itself work so that they can participate as critical, informed, responsible citizens in a society in which science plays a significant role

In technology, students learn to be innovative developers of products and systems and discerning consumers who will make a difference in the world.


The Greenhouse Effect
The Enhanced Greenhouse Effect
Steve Burgess Graphics

Symbol and how interpreted
Larger circles (earth) read as representing the sun "... **the** tired and exhausted sweaty sun.."
Arrows (energy flow) read as movement of gases "... **more** gases will be entering and exiting the atmosphere.."
Colour intensification (temperature increase) read as visual pollution "... if we have a dirty environment the earth will get hotter and hotter."

Image and quotes from Assessment Resource Banks (ARBs) www.arbs.nzcer.org.nz

We live at the bottom of a thin layer of gases called our atmosphere.

This layer keeps us alive protects us from the harsh conditions of space.

It is fragile and we need to look after it better than we do.

http://image.slidesharecdn.com/04-thesolarsystemandres-131211120346-phpapp01/95/celestial-bodies-in-the-solar-system-the-sun-planets-satellites-comets-asteroids-and-meteorids-7-638.jpg?cb=1386763503

Measures of Variation:
The Sample Standard Deviation

DCOVA

- Most commonly used measure of variation
- Shows variation about the mean
- Is the square root of the variance
- Has the same units as the original data

- Sample standard deviation

$$S = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}}$$

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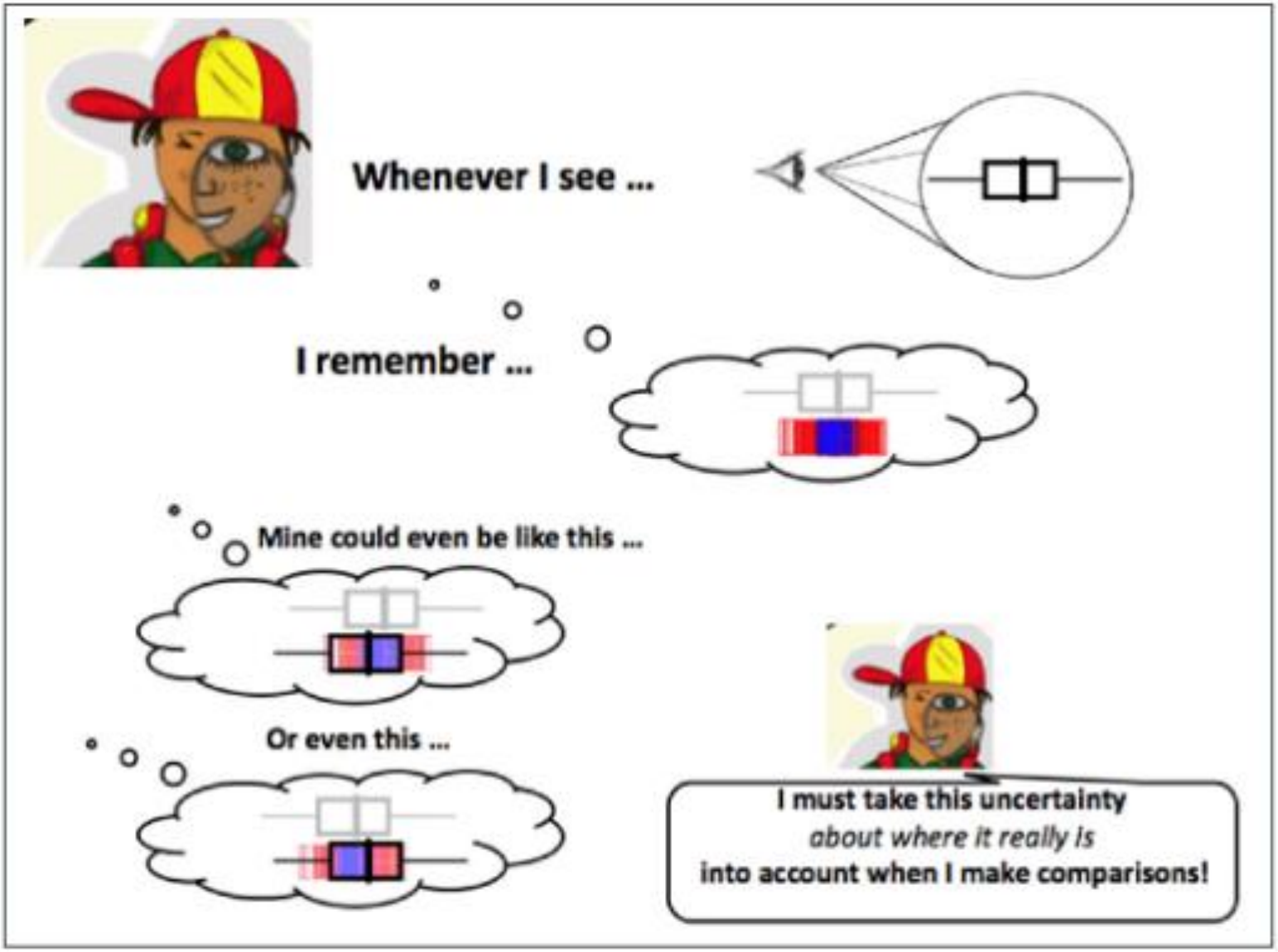


http://www.tlri.org.nz/tlri-research/research-completed/school-sector/building-students-inferential-reasoning-statistics

Looking carefully/ pattern recognition

Distinguishing observation from inference

Building awareness that what we already know influences what we observe

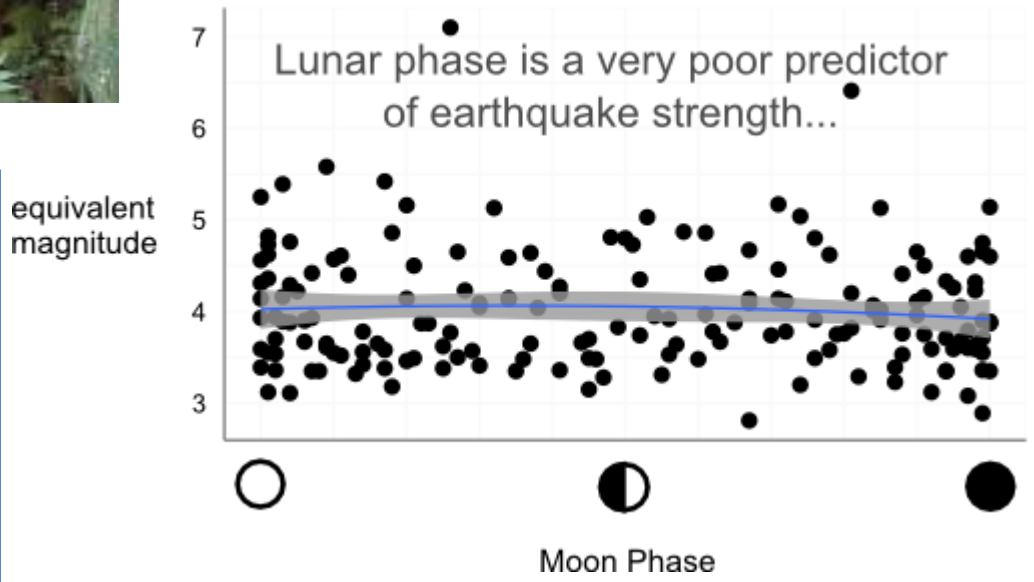
Asking curious questions/ finding ways to check our inferences

http://www.outreach.canterbury.ac.nz/chatham/resources/resources_5.shtml
http://scienceonline.tki.org.nz/Introducing-five-science-capabilities/Gather-interpret-data

Charlatan Ring merits contempt
Ring's tip sends families fleeing
(NZ Herald headlines)

What knowledge, skills and dispositions are needed to think like this?

Can we teach them?



http://history-herstory-scubanurse.blogspot.com/2011/03/galileo-could-kick-ken-rings-ring.html

Theme 2: Key competencies can add ‘something more’ to the learning that we plan for students

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In the NZ curriculum key competencies are defined in an interesting way

But many NZ teachers and school leaders can't tell me what the words in the circle say

Key Competencies
Capabilities for living and lifelong learning

The New Zealand Curriculum identifies five key competencies:

- thinking
- using language, symbols, and texts
- managing self
- relating to others
- participating and contributing.

People use these competencies to live, learn, work, and contribute as active members of their communities. More complex than skills, the competencies draw also on knowledge, attitudes, and values in ways that lead to action. They are not separate or stand-alone. They are the key to learning in every learning area.

The development of the competencies is both an end in itself (a goal) and the means by which other ends are achieved. Successful learners make use of the competencies in combination with all the other resources available to them. These include personal goals, other people, community knowledge and values, cultural tools (language, symbols, and texts), and the knowledge and skills found in different learning areas. As they develop the competencies, successful learners are also motivated to use them, recognising when and how to do so and why.

Opportunities to develop the competencies occur in social contexts. People adopt and adapt practices that they see used and valued by those closest to them, and they make these practices part of their own identity and expertise.

The competencies continue to develop over time, shaped by interactions with people, places, ideas, and things. Students need to be challenged and supported to develop them in contexts that are increasingly wide-ranging and complex.

Thinking

Thinking is about using creative, critical, and metacognitive processes to make sense of information, experiences, and ideas. These processes can be applied to purposes such as developing understanding, making decisions, shaping actions, or constructing knowledge. Intellectual curiosity is at the heart of this competency.

Students who are competent thinkers and problem-solvers actively seek, use, and create knowledge. They reflect on their own learning, draw on personal knowledge and intuitions, ask questions, and challenge the basis of assumptions and perceptions.

Using language, symbols, and texts

Using language, symbols, and texts is about working with and making meaning of the codes in which knowledge is expressed. Languages and symbols are systems for representing and communicating information, experiences, and ideas. People use languages and symbols to produce texts of all kinds: written, oral/aural, and visual; informative and imaginative, informal and formal; mathematical, scientific, and technological.

Students who are competent users of language, symbols, and texts can interpret and use words, numbers, images, movement, metaphor, and technologies in a range of contexts. They recognise how choices of language, symbol, or text affect people's understanding and the ways in which they respond to communications. They confidently use ICT (including, where appropriate, assistive technologies) to access and provide information and to communicate with others.

Managing self

This competency is associated with self-motivation, a "can-do" attitude, and with students seeing themselves as capable learners. It is integral to self-assessment.

Students who manage themselves are enterprising, resourceful, reliable, and resilient. They establish personal goals, make plans, manage projects, and set high standards. They have strategies for meeting challenges. They know when to lead, when to follow, and when and how to act independently.

Relating to others

Relating to others is about interacting effectively with a diverse range of people in a variety of contexts. This competency includes the ability to listen actively, recognise different points of view, negotiate, and share ideas.

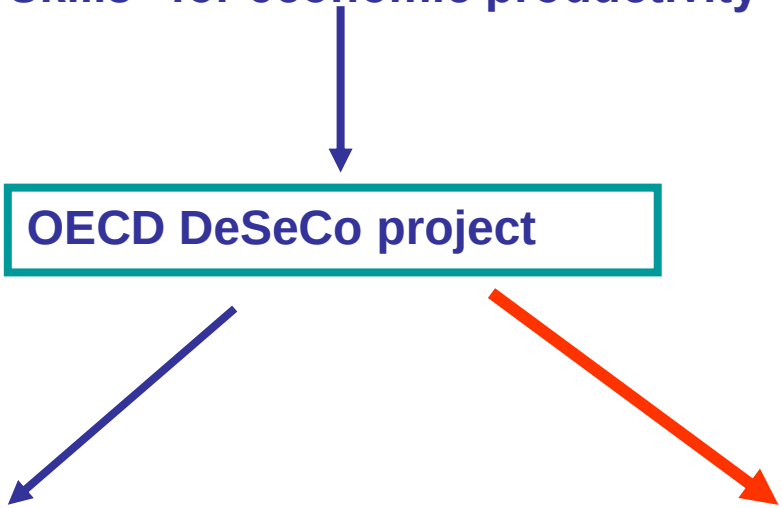
Students who relate well to others are open to new learning and able to take different roles in different situations. They are aware of how their words and actions affect others. They know when it is appropriate to compete and when it is appropriate to co-operate. By working effectively together, they can come up with new approaches, ideas, and ways of thinking.

KCs are …..capabilities for living and lifelong learning

	OECD key competencies to underpin PISA assessment frameworks	**New Zealand introduced its own version in to our national curriculum framework (NZC)**
Thinking (cross-cutting)	**Acting autonomously**	**Managing self**
	Functioning in socially heterogenous groups	**Relating to others** **Participating and contributing**
	Using tools interactively	**Using language, symbols and texts**
		Thinking (not identified as cross-cutting)

Two possible pathways for implementation

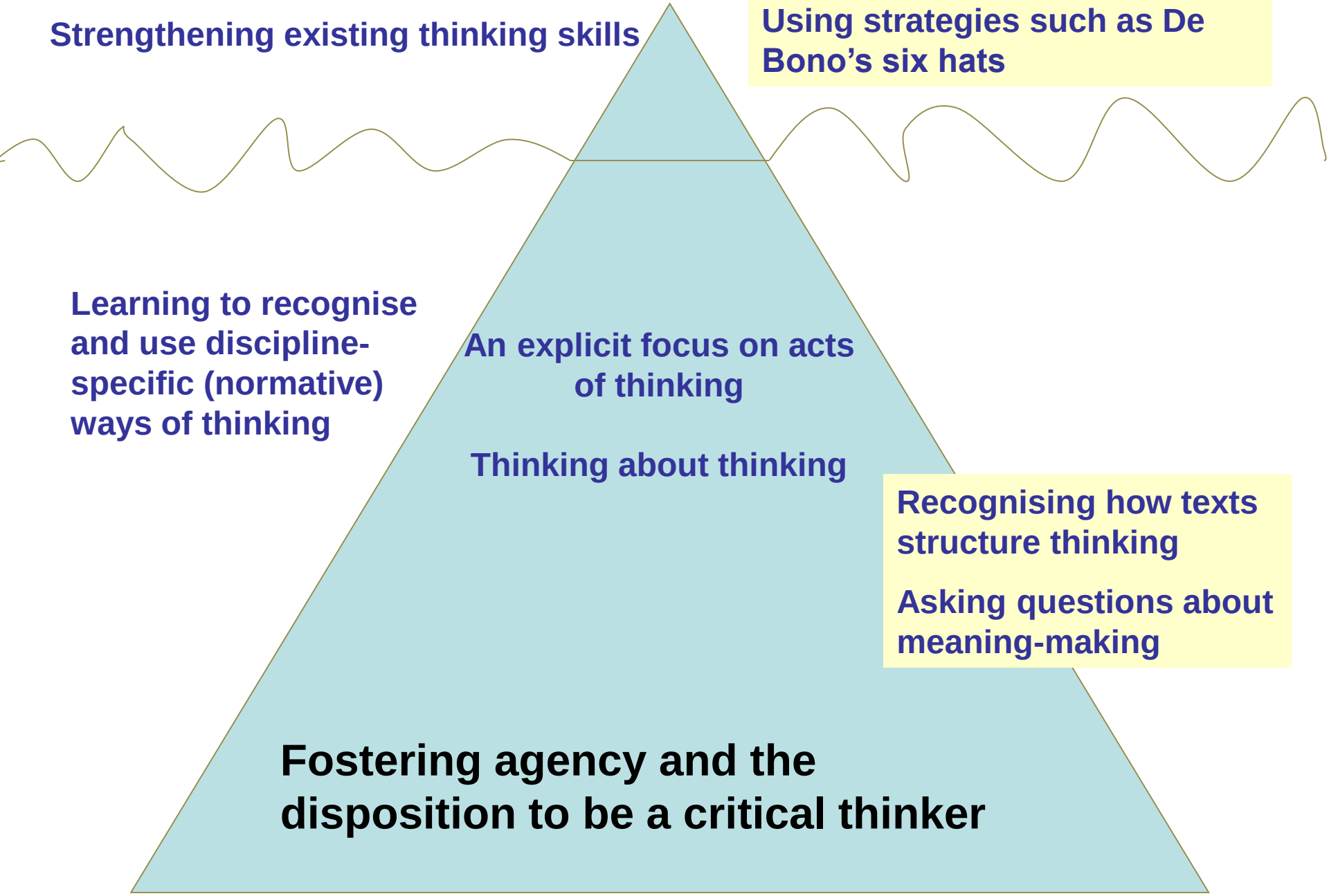
1990s – “Essential Skills” for economic productivity



New and better essential skills

Social justice/democratic participation
Transforming learning for the 21st century

After Reid, 2006

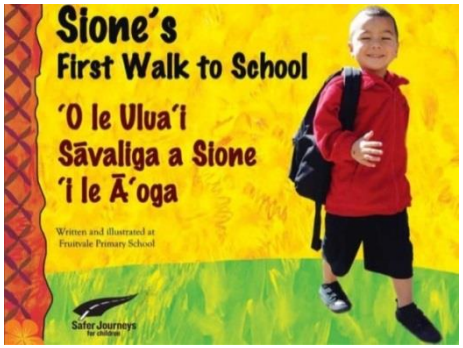

Strengthening existing thinking skills
Using strategies such as De Bono's six hats
Learning to recognise and use discipline-specific (normative) ways of thinking
An explicit focus on acts of thinking
Thinking about thinking
Recognising how texts structure thinking
Asking questions about meaning-making
Fostering agency and the disposition to be a critical thinker

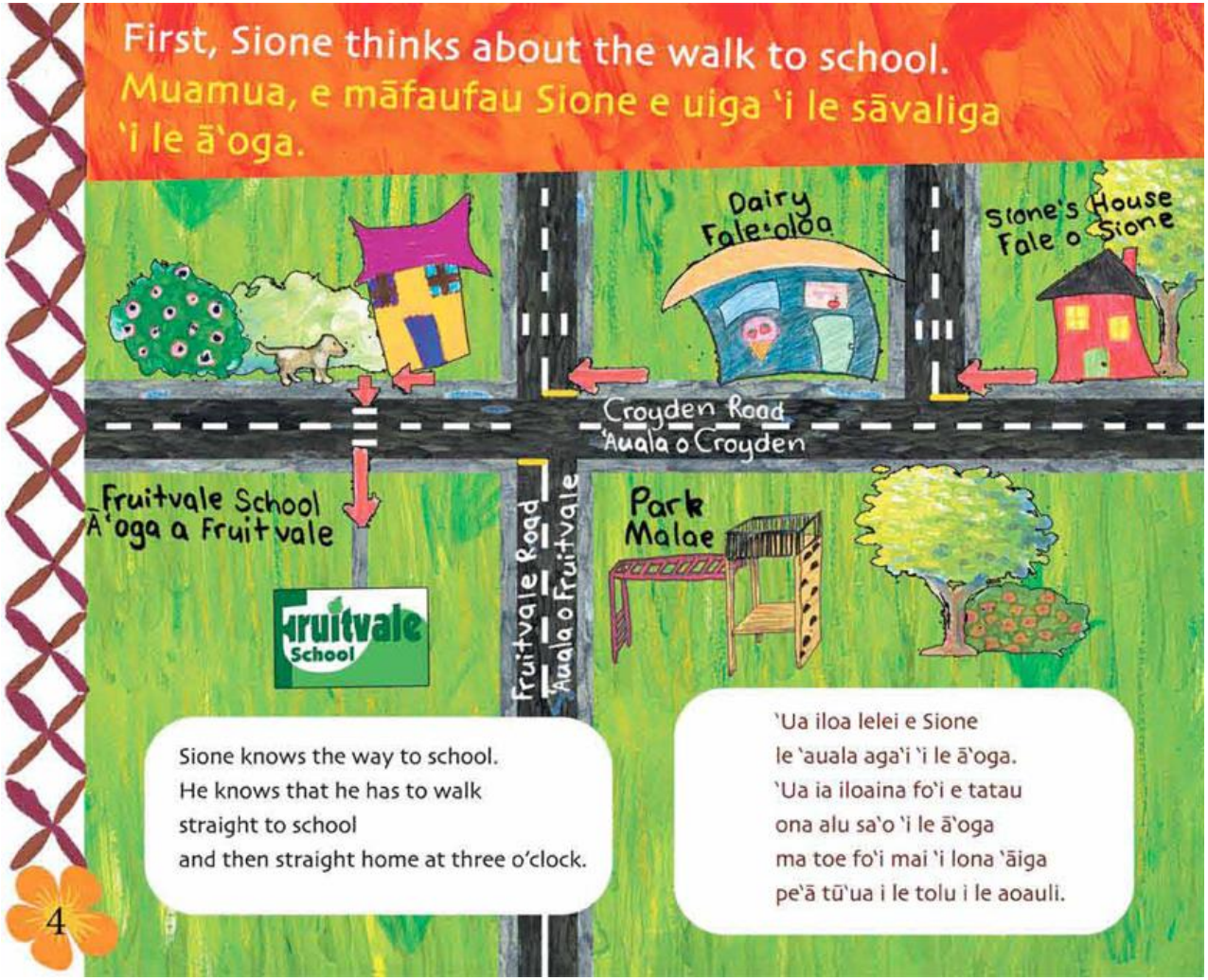
A ‘both/and’ way of thinking …

There are reciprocal relationships between the learning areas and the key competencies.

When these relationships are purposefully exploited both the learning areas and the key competencies are strengthened.

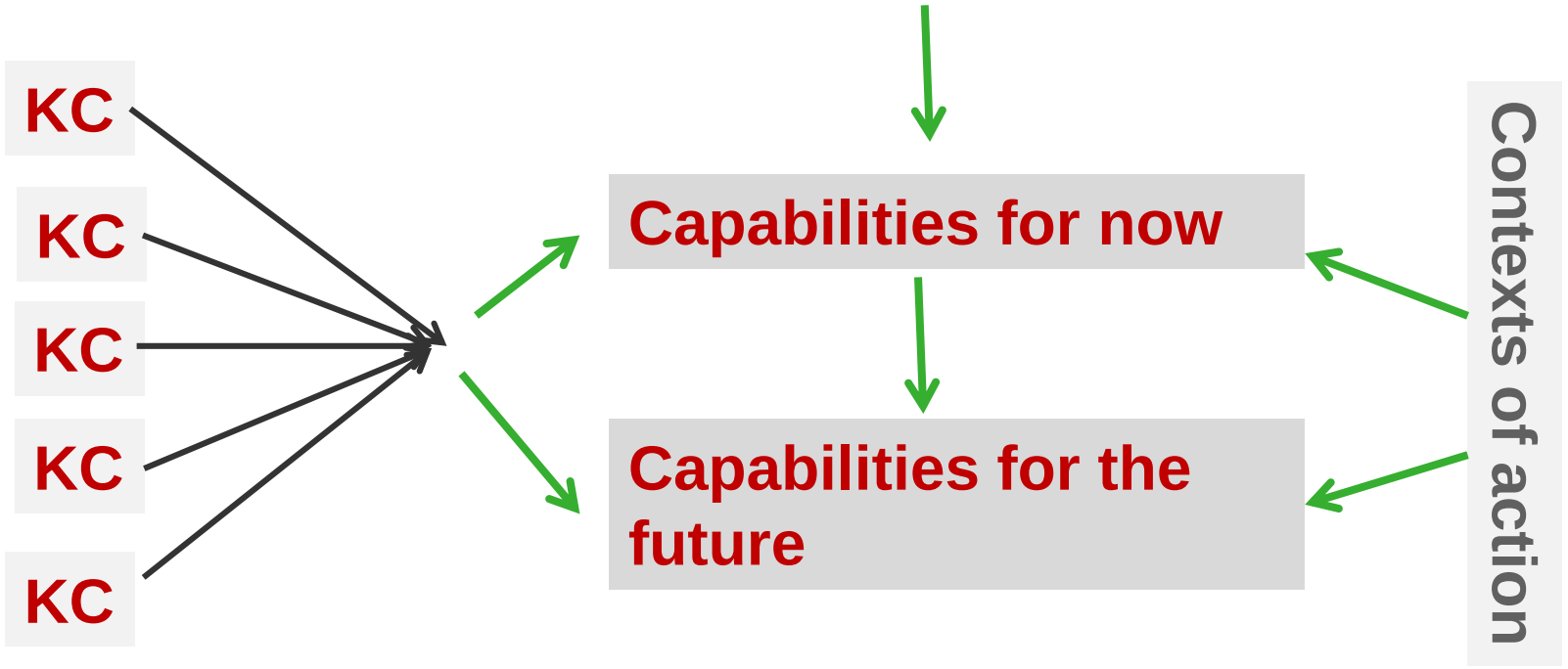
Opportunities to develop key competencies can play out as opportunities to develop learning areas and vice versa.


Sione's
First Walk to School
'O le Ulua'i
Sāvaliga a Sione
'i le Ā'oga
Written and illustrated at
Fruitvale Primary School
Safer Journeys


First, Sione thinks about the walk to school.
Muamua, e māfaufau Sione e uiga 'i le sāvaliga
'i le ā'oga.
Dairy
Fale'olōa
Sione's House
Fale o Sione
Croyden Road
'Auala o Croyden
Fruitvale School
A'oga a Fruitvale
Fruitvale Road
'Auala o Fruitvale
Park
Malae
Fruitvale School
Sione knows the way to school.
He knows that he has to walk
straight to school
and then straight home at three o'clock.
'Ua iloa lelei e Sione
le 'auala aga'i 'i le ā'oga.
'Ua ia iloaina fo'i e tatau
ona alu sa'o 'i le ā'oga
ma toe fo'i mai 'i lona 'āiga
pe'ā tū'ua i le tolu i le aoauli.
4

http://education.nzta.govt.nz/resources/secondary/english#

Specific subject-based learning challenges



Key competency/subject combinations contribute to contextually specific sets of capabilities

Theme 3: Students need to build capabilities for futures we cannot predict

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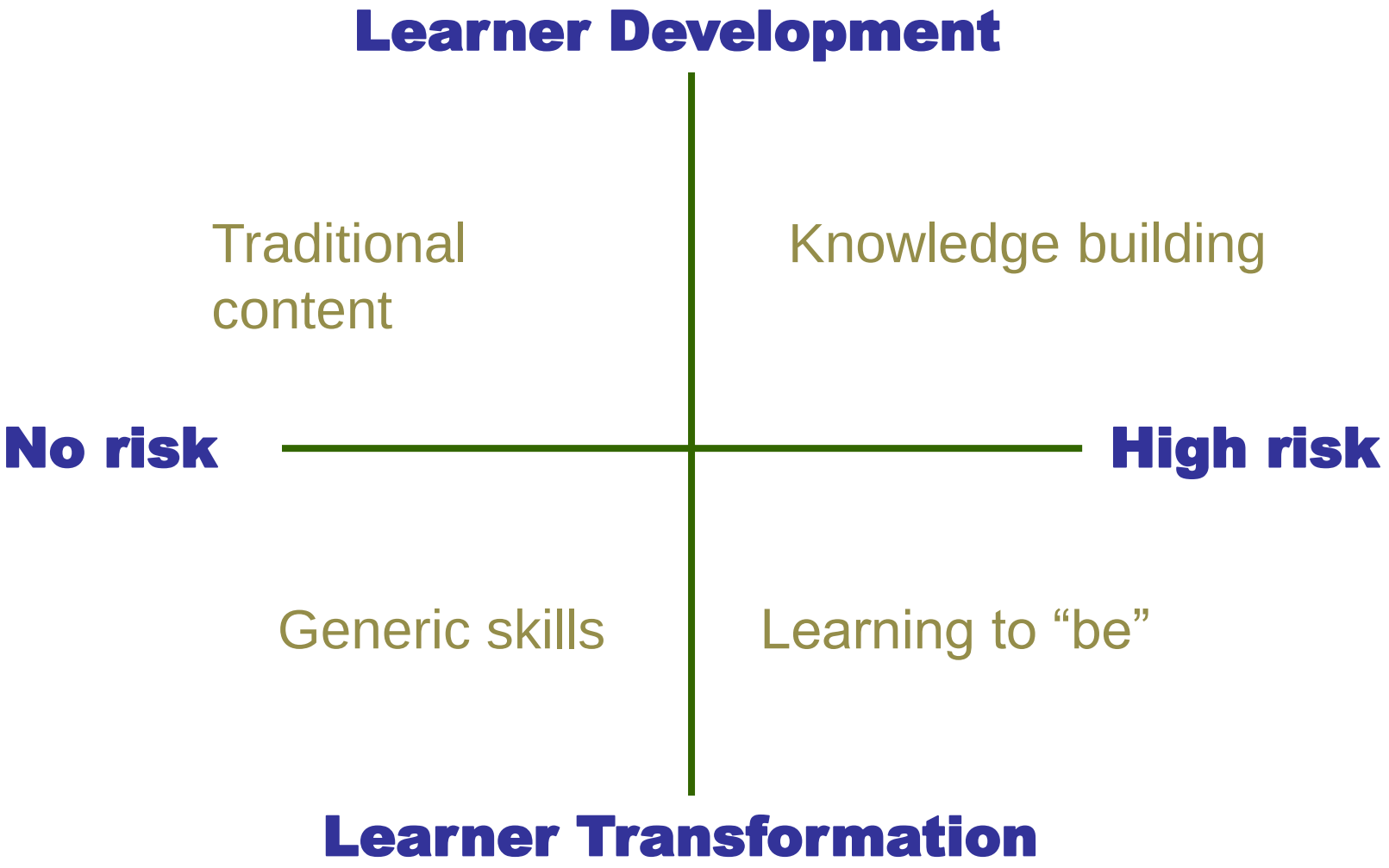
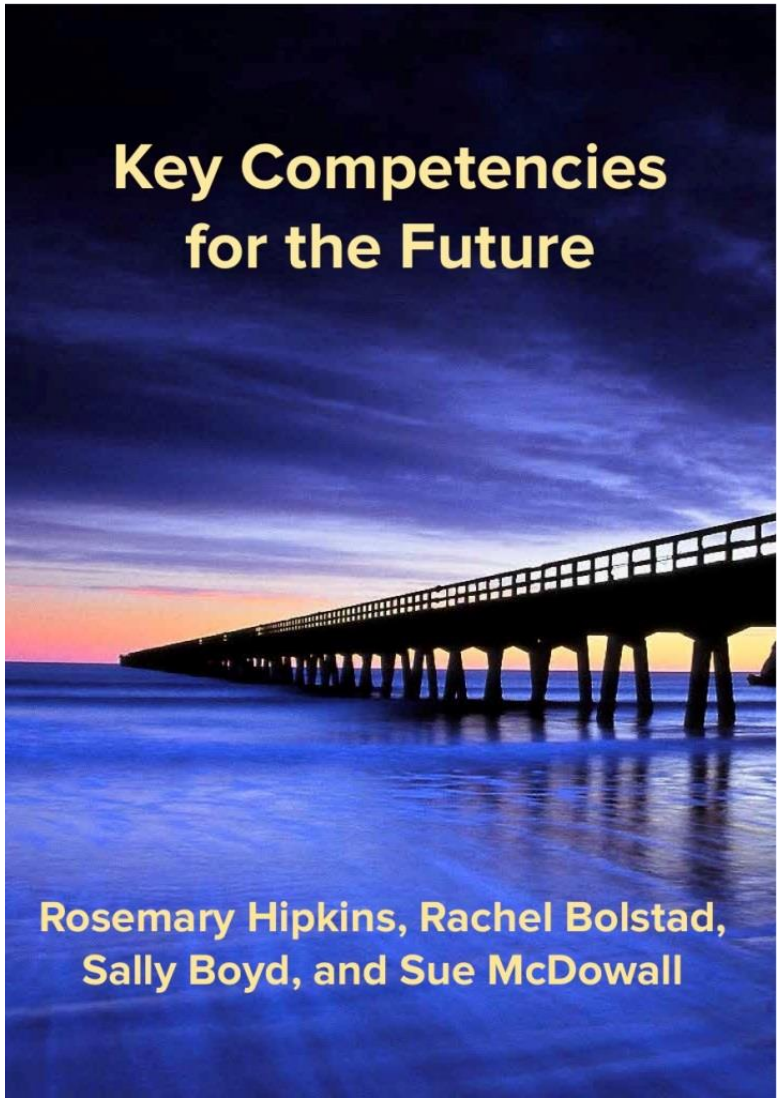
Learning for an unknown future



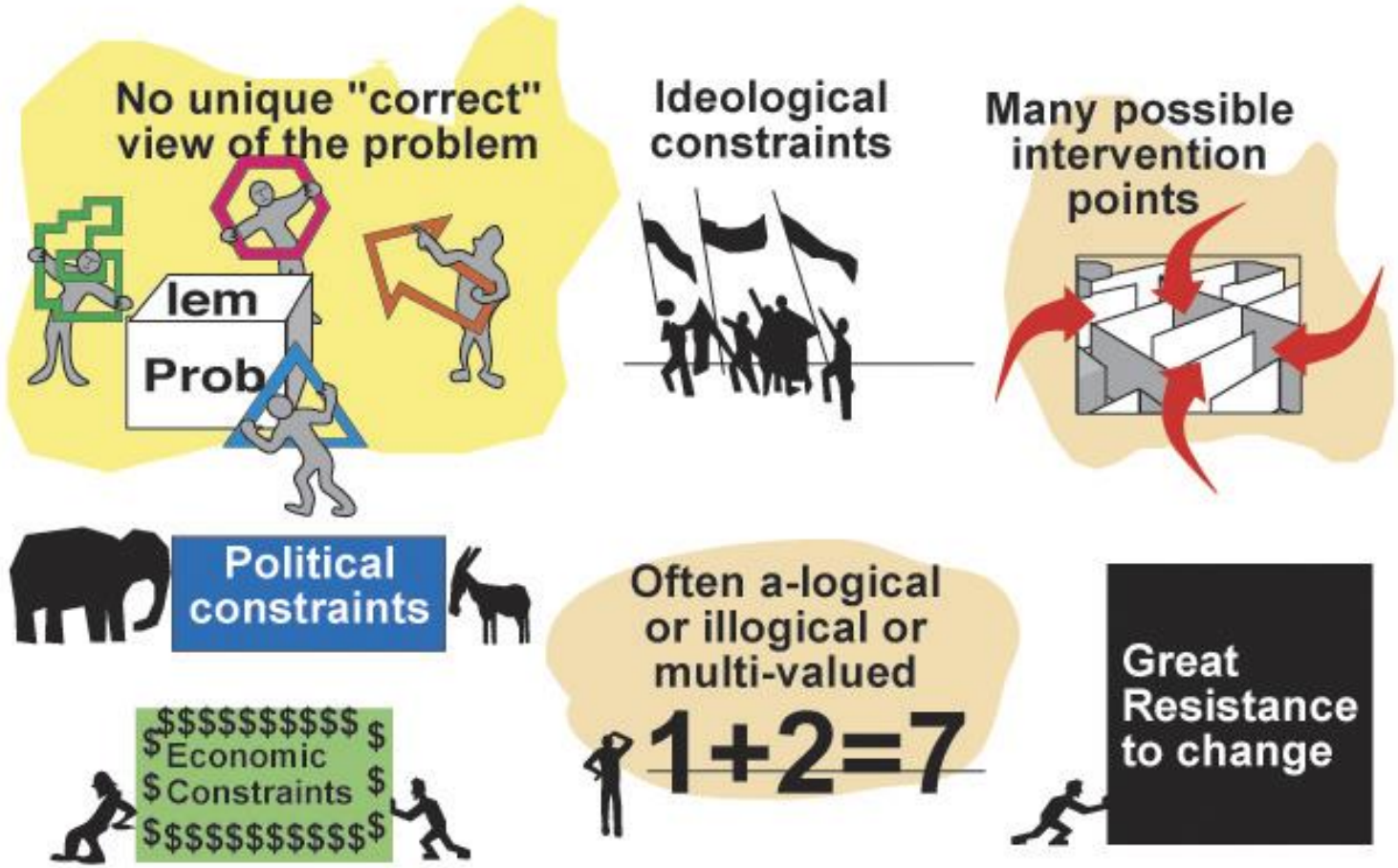
After Barnett, 2004



What sorts of capabilities will today's young people need to thrive in futures we cannot predict?

Social Messes

Representing Wicked, Ill-Structured Problems



http://robertweber.typepad.com/photos/uncategorized/2007/09/22/1representmesses.jpg

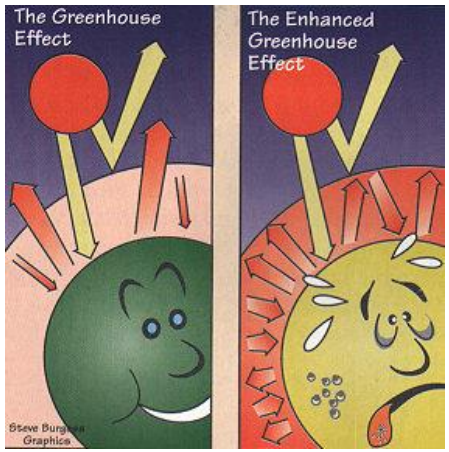
When knowledge claims conflict..

Climate change as the wicked problem

Exploring matters of truth, belief and evidence

Building discipline-specific ways of thinking

Developing a critical radar for truth claims and fostering the disposition to use it



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MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Science Online

- Home
- New resources to support science education
- Science Capabilities for citizenship
- **Introducing five science capabilities**
  - Gather & interpret data
  - Use evidence
  - Critique evidence
  - Interpret representations
  - Engage with science

Home » Introducing five science capabilities

Print

Introducing five science capabilities

Five basic capabilities in the science learning area have been identified from our Nature of Science (NOS) research. We asked what capabilities could contribute to a functional knowledge of science. We also thought about what these capabilities would look like for students at different ages and what we might expect to see them do and say.

Within each capability you will find over ten resources to explore and use in the classroom. Explore the capabilities and resources below. These capabilities are a guide for adapting teaching and learning and are not an exhaustive list.
The boundaries between the capabilities are blurry. Any learning activity could provide opportunities to strengthen more than one of them, but for planning, teaching and assessment purposes, it is useful to foreground one specific capability.

Teachers often ask why they were called 'capabilities'. Dr Rosemary Hipkins of NZCER explains why the capabilities were developed (what they are supposed to "do" in terms of teaching and learning), why they were called that, and how they fit in with our curriculum's key competencies. Read her article " *Unlocking the idea of capabilities in science* ".

http://scienceonline.tki.org.nz/Introducing-five-science-capabilities

Fostering systems thinking

Food security as the wicked problem

Looking for connections between seemingly disparate events and actions

Fostering dispositions to consider wider impacts of our own decisions

Looking at ways social systems create relative advantage and disadvantage

Practicing ‘it depends’ thinking

Photo source: Waikato Times

Students in one school were challenged to weigh up conflicting interests in relation to the culling of the wild horses of the ecologically fragile Kaimanawa Plateau

- **What are our young people capable of now?**
- **What do they hope to <u>be and become</u> capable of?**

However we answer these questions, we can't leave capability-building to chance. We need to be clear about purposes for learning that are more expansive than gaining content and skills for their own sake.

Strategically weaving key competencies and content together can create powerful learning for now and for the future

Barnett's dispositions for an unknown future

- Carefulness
- Thoughtfulness
- Humility
- Criticality
- Receptiveness
- Resilience
- Courage
- Stillness

Selected references to our work

Hipkins, R. (2013a). Competencies or capabilities, what's in a name? *set: Research Information for Teachers*, 3, 55-57. https://www.researchgate.net/publication/262224056_Competencies_or_capabilities_What's_in_a_name

Hipkins, R., & McDowall, S. (2013). Teaching for present and future competency: A productive focus for professional learning. *Teachers and Curriculum, 13*, 2-10. http://tandc.ac.nz/tandc/issue/view/3

Hipkins, R. (2014) Unlocking the idea of capabilities in science. New Zealand Science Teacher, http://www.nzscienceteacher.co.nz/curriculum-literacy/key-competencies-capabilities/unlocking-the-idea-of-capabilities-in-science/#.VYXQ4fmqpBc

Hipkins, R., Bolstad, R., Boyd, S. & McDowall, S. (2104). *Key competencies for the future*. Wellington, NZCER Press.

Other references

Barnett, R. (2004). "Learning for an unknown future." *Higher Education Research and Development* 23(3): 247-260.

Reid, A. (2006). Key competencies: a new way forward or more of the same? *Curriculum Matters, 2*, 43-62.

Other resources

Building students' inferential reasoning: Statistics curriculum Levels 5 and 6 (The TLRI research project)
http://www.tlri.org.nz/tlri-research/research-completed/school-sector/building-students-inferential-reasoning-statistics

Examples of teaching for reciprocal relationships between key competencies and learning areas (subjects)
http://nzcurriculum.tki.org.nz/Key-competencies/Key-competencies-and-effective-pedagogy