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What's the story? Making sense of conflicting literacy and numeracy results

Juliette Mendelovits, *ACER*

What's the story?
Making sense of conflicting literacy and numeracy results

National Adult Language, Literacy and Numeracy Assessment Conference 2014

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ACER

Contributors

This presentation is based on research begun in 2012, sponsored by the
Victorian Department of Education and Early Childhood Development

with advice from

Ian Burrage, David Clements, Rebecca Gray, David Gallagher, David Howes, Meredith Nolte, Nathan Zoanetti

The ACER project team

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Overview

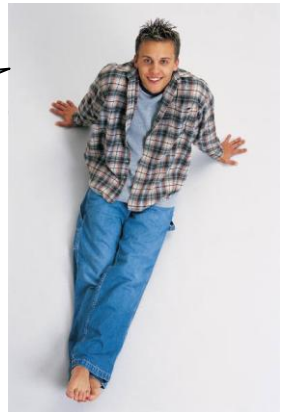
- Why was the research commissioned?
- Our approach to the task
- Findings

WHY WAS THE RESEARCH COMMISSIONED?

Our question in 2012: How can this be true?

PISA

About **15%** of Australian 15-year-olds are below the required standard of reading and maths



ALLS (PIAAC)

About **50%** of Australian adults are below the required standard of literacy and numeracy

NAPLAN

About **6%** of Australian Year 9 students are below the required standard of (reading) literacy and numeracy

The research question

- What's going on here, and is there any way of reconciling these claims?
  - Can we find an answer to the question, "Why are the standards of proficiency reported in various studies so different"?
  - Would it be possible to build a single composite map for (each of) developing literacy and numeracy?

Programs to be investigated

- NAPLAN (year 9 only)
- PISA reading and mathematical literacy
- Australian Core Skills Framework (ACSF)
- Programme for the International Assessment of Adult Competencies (PIAAC)
- International English Language System (IELTS)
- Literacy and numeracy assessm
  VCE, VCAL and VET Certificate

Referred to interchangeably with International Adult Literacy Survey (IALS, 1996) and Adult Literacy and Life Skills Survey (ALLS, 2006)

OUR APPROACH

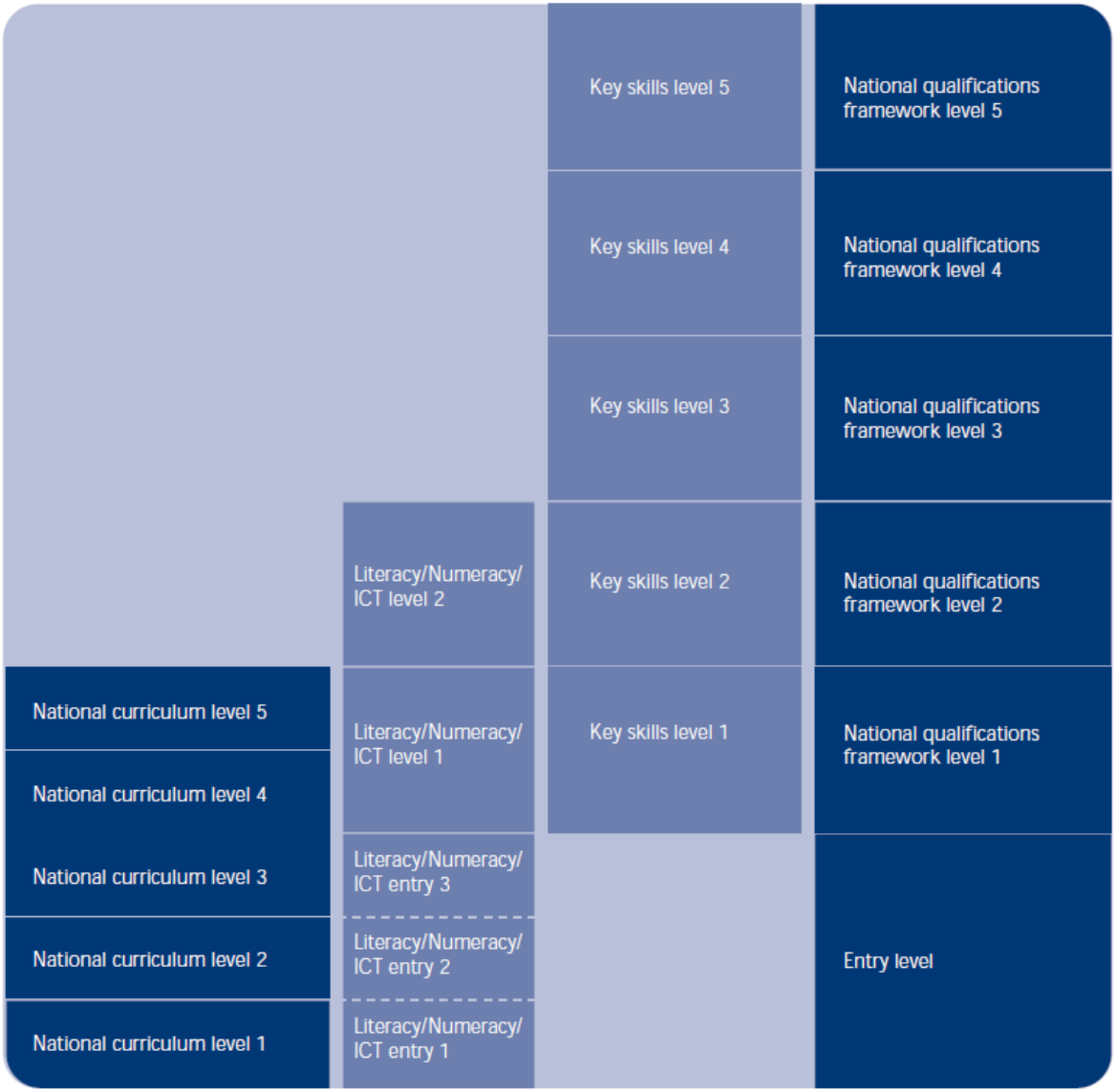
Two stages

- Stage 1:
  - Review the specified assessment programs and frameworks
  - Conduct pair-wise comparisons of programs and their standards
- Stage 2:
  - Attempt to explain discrepancies in standards
  - Consider the possibility of constructing single continua for literacy and numeracy

For Stage 1,
a set of criteria for examining comparisons and contrasts among program standards

- Construct orientation
- Purpose and use
- Key stakeholders and drivers
- Method used to generate standards or levels

For Stage 2
A possible model for the 'single continua' idea



Qualifications and Curriculum Authority (2005), *National standards for adult literacy, numeracy and ICT* , London.
http://www.ifl.ac.uk/__data/assets/pdf_file/0006/6639/14130_national_standards_for_adult_literacy_numeracy_ict.pdf

FINDINGS

A set of criteria for examining comparisons and contrasts among program standards

- Construct orientation
- Purpose and use
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Key characteristics of numeracy programs

	Construct orientation	Purpose and major use	Key stakeholders and drivers	Statistical method
NAPLAN Numeracy	Curriculum based	Snapshot, benchmark	Government, school, students, parents	Scaled scores, about RP60
PISA Mathematical literacy	Life skills	Snapshot, benchmark	Government, OECD	Scaled scores, RP62
ACSF Numeracy	Life skills	Diagnostic, framework	Government, industry, VET sector, students	Not applicable: competency
ALLS Numeracy (& PIAAC)	Life skills	Snapshot, benchmark	Government, OECD	Scaled scores, RP80
VCAL Numeracy	Life skills	Credential	Government, industry, students	Not applicable: competency
VCE Further mathematics	Curriculum based	Credential, gatepost	Government, Tertiary sector, students	Statistically ranked

A set of criteria for examining comparisons and contrasts among program standards

- Construct orientation
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Content and constructs: numeracy

Similarities

- Include application of maths in context
- Include mathematical knowledge, skills & reasoning
- Content covers range of strands (number & algebra, measurement & geometry, statistics & probability)

Differences

- May focus more on curriculum content such as abstract/formal mathematics
- May focus more on practical application of skills
- May include or emphasise different strands

Content and constructs: literacy

Similarities

- Focus on verbal language
- Include reading literacy
- Range of genres (expository, persuasive, instructional)
- Skills include finding, interpreting, synthesising and evaluating information

Differences

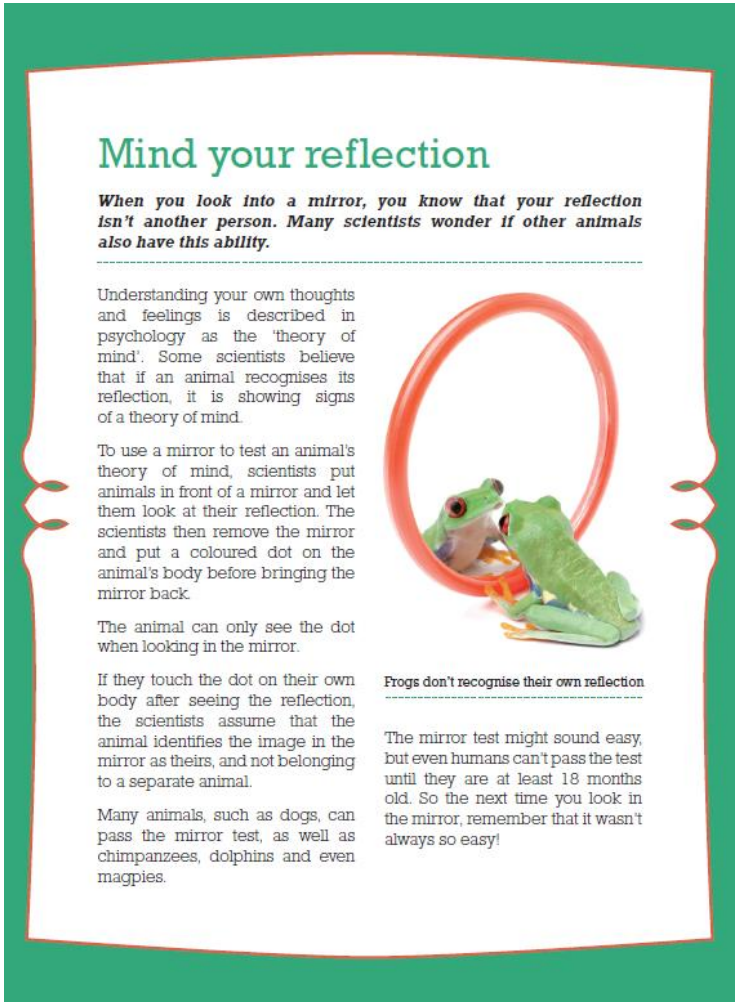
- May comprise oral as well as written language
- May include or emphasise different genres (eg narrative)
- May include different types or balances of productive and receptive language skills

NAPLAN: Year 9 reading

Example of a very easy reading question (2013)

What information is given to show that it is not easy to recognise your own reflection?

- Scientists have to use a mirror several times.
- Many animals pass the mirror test.
- Humans don't pass the test until they are about eighteen months old.
- Scientists have tried this experiment on humans and other animals.



Mind your reflection

When you look into a mirror, you know that your reflection isn't another person. Many scientists wonder if other animals also have this ability.

Understanding your own thoughts and feelings is described in psychology as the 'theory of mind'. Some scientists believe that if an animal recognises its reflection, it is showing signs of a theory of mind.

To use a mirror to test an animal's theory of mind, scientists put animals in front of a mirror and let them look at their reflection. The scientists then remove the mirror and put a coloured dot on the animal's body before bringing the mirror back.

The animal can only see the dot when looking in the mirror.

If they touch the dot on their own body after seeing the reflection, the scientists assume that the animal identifies the image in the mirror as theirs, and not belonging to a separate animal.

Many animals, such as dogs, can pass the mirror test, as well as chimpanzees, dolphins and even magpies.

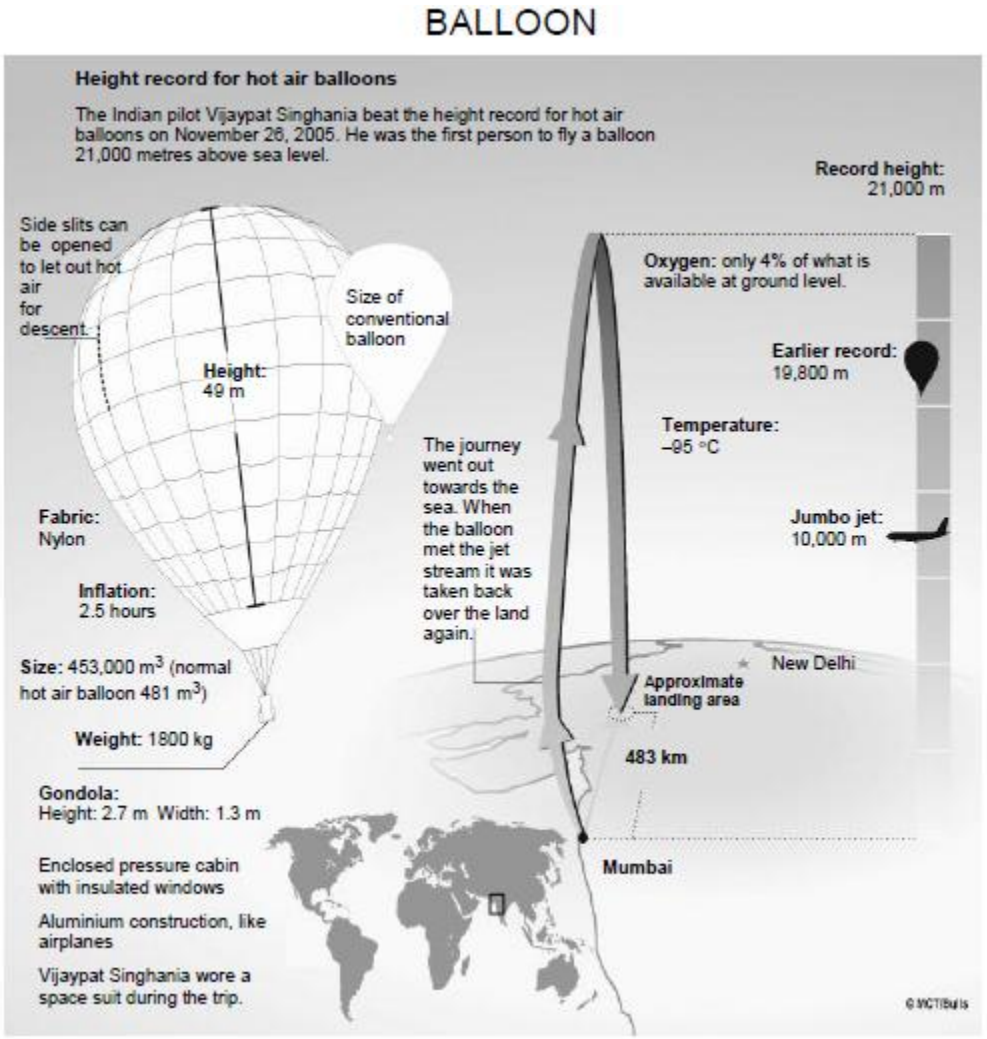
The mirror test might sound easy, but even humans can't pass the test until they are at least 18 months old. So the next time you look in the mirror, remember that it wasn't always so easy!

PISA: example of a Level 3 reading question

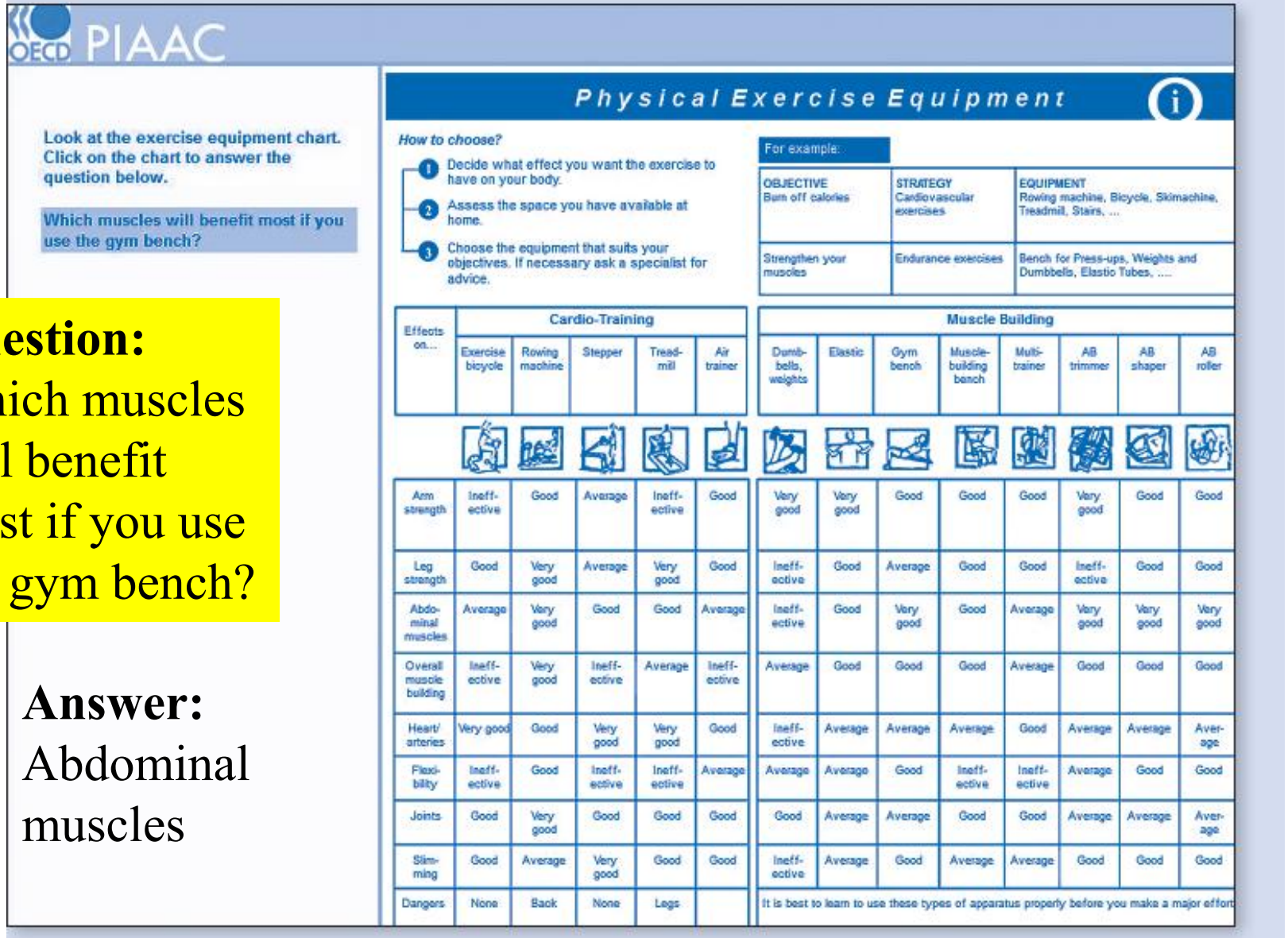
Question:
What is the purpose of including a drawing of a jumbo jet in this text?

Answers:

- *To show how high the balloon went*
- *To show how impressive this record was*



A Level 2 literacy item from PIAAC



OECD PIAAC

Look at the exercise equipment chart. Click on the chart to answer the question below.

Which muscles will benefit most if you use the gym bench?

Physical Exercise Equipment

How to choose?

1. Decide what effect you want the exercise to have on your body.
2. Assess the space you have available at home.
3. Choose the equipment that suits your objectives. If necessary ask a specialist for advice.

For example:

OBJECTIVE	STRATEGY	EQUIPMENT
Burn off calories	Cardiovascular exercises	Rowing machine, Bicycle, Skimachine, Treadmill, Stairs, ...
Strengthen your muscles	Endurance exercises	Bench for Press-ups, Weights and Dumbbells, Elastic Tubes, ...

Effects on...	Cardio-Training					Muscle Building							
	Exercise bicycle	Rowing machine	Stepper	Tread-mill	Air trainer	Dumb-bells, weights	Elastic	Gym bench	Muscle-building bench	Multi-trainer	AB trimmer	AB shaper	AB roller
Arm strength	Ineff-ective	Good	Average	Ineff-ective	Good	Very good	Very good	Good	Good	Good	Very good	Good	Good
Leg strength	Good	Very good	Average	Very good	Good	Ineff-ective	Good	Average	Good	Good	Ineff-ective	Good	Good
Abdo-minal muscles	Average	Very good	Good	Good	Average	Ineff-ective	Good	Very good	Good	Average	Very good	Very good	Very good
Overall muscle building	Ineff-ective	Very good	Ineff-ective	Average	Ineff-ective	Average	Good	Good	Good	Average	Good	Good	Good
Heart/ arteries	Very good	Good	Very good	Very good	Good	Ineff-ective	Average	Average	Average	Good	Average	Average	Aver-age
Flexi-bility	Ineff-ective	Good	Ineff-ective	Ineff-ective	Average	Average	Average	Good	Ineff-ective	Ineff-ective	Average	Good	Good
Joints	Good	Very good	Good	Good	Good	Good	Average	Average	Good	Good	Average	Average	Aver-age
Slim-ming	Good	Average	Very good	Good	Good	Ineff-ective	Average	Good	Average	Average	Good	Good	Good
Dangers	None	Back	None	Legs		It is best to learn to use these types of apparatus properly before you make a major effort							

Question:
Which muscles will benefit most if you use the gym bench?

Answer:
Abdominal muscles

A set of criteria for examining comparisons and contrasts among program standards

- Construct orientation
- Purpose and use
- Key stakeholders and drivers
- Method used to generate standards or levels

One purpose and use:

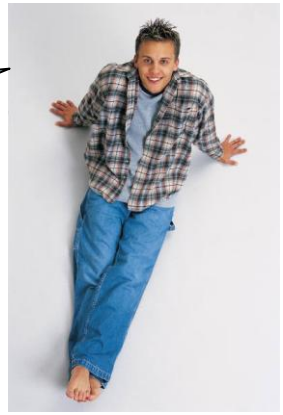
Setting minimum competency standards, and measuring populations against them

Three of the programs included in the study had defined minimum competency standards:

- **NAPLAN's National Minimum Standard at Year 9 is Band 6**
- the level **below which students 'are at risk** of being unable to progress satisfactorily at school without targeted intervention' ; students 'at the National Minimum Standard may also require additional assistance to enable them to achieve their potential'
- **PISA's international baseline level of proficiency is Level 2**
- the level at which students '**begin to demonstrate** the (competencies) that will enable them to participate effectively and productively in life'
- **ALLS (2006) identified its Level 3 as the minimum standard**
- a 'suitable minimum for **coping** with the demands of everyday life and work **in a complex, advanced society**'

Our question in 2012: How can this be true?

PISA



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A set of criteria for examining comparisons and contrasts among program standards

- Construct orientation
  - Some differences, but this is not the overriding explanatory criterion
- Purpose and use AND
- Key stakeholders and drivers
  - Using results to drive educational and social reform; identifying and helping low achieving schools and students
- Method used to generate standards or levels

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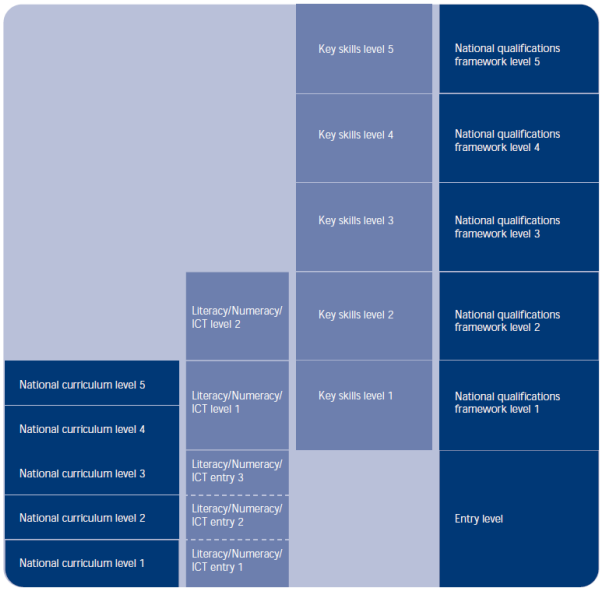
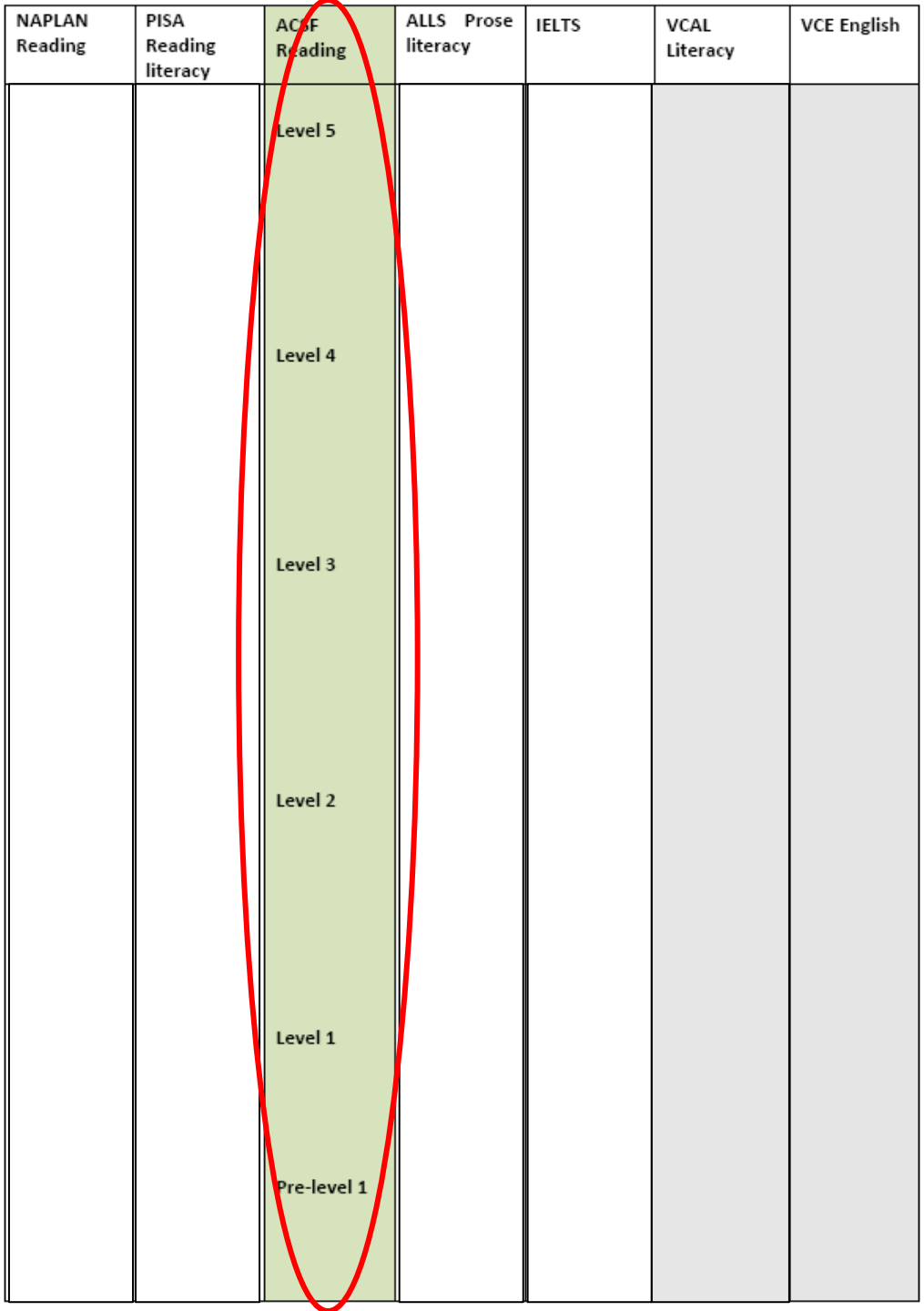




- ACSF – the anchor
- VCAL and VCE – not enough evidence at that stage to attempt comparison

Our findings: Literacy

NAPLAN Year 9 benchmark

PISA international minimum

ALLS minimum

NAPLAN Reading	PISA Reading literacy	ACSF Reading	ALLS Prose literacy (PIAAC)[4]	IELTS
Band 10	Level 6	**Level 5**	Level 5	
	Level 5			Band 9
Band 9			Level 4	
	Level 4			Band 8
Band 8		**Level 4**	Level 3	
	Level 3			
		Level 3	Level 2	
Band 7				
				Band 7
	Level 2			
		Level 2		
Band 6				
	Level 1a		Level 1	Band 6
Band 5				
		Level 1		
	Level 1b			
				Band 5
[Bands 1 to 4 are located below this point.]		**Pre-level 1**		

Our findings: Numeracy

NAPLAN Year 9 benchmark

PISA international minimum

ALLS minimum

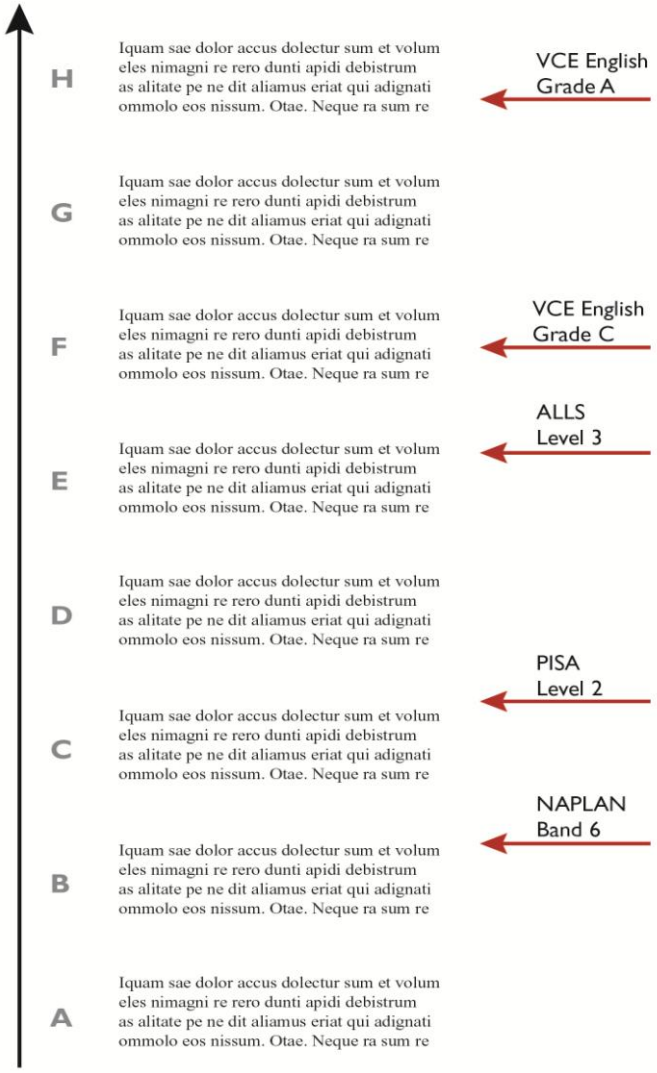
NAPLAN Numeracy	PISA Mathematical literacy	ACSF Numeracy	ALLS Numeracy (& PIAAC)
		Level 5	
	Level 6		Level 5
Band 10			
			Level 4
	Level 5	Level 4	
Band 9			
			Level 3
	Level 4		
Band 8		Level 3	
			Level 2
	Level 3		
Band 7			
		Level 2	
	Level 2		
Band 6			
			Level 1
Band 5	Level 1	Level 1	
[Bands 1 to 4 are located below this point.]	Below Level 1	Pre-level 1	

What could continua of literacy and numeracy look like?

One model would be to construct **omnibus** described scales of literacy and numeracy, comprising:

1. levels accompanied by paragraph-style descriptions of the skills and knowledge associated with each level.
2. locations of benchmarks or other key standards from programs of interest

The continua for literacy and numeracy could be conceived of as overlays: beneath them would lie more detailed, calibrated mappings for individual programs, which different stakeholders and agencies could use for their particular purposes.



What would need to be done to construct and validate an omnibus continuum?

- Approach 1
  Expert deskwork

- Approach 2
  Scaling using professional judgments

- Approach 3
  Psychometric equating

RECENT DEVELOPMENTS

- Another study commissioned by DEECD, to compare VCE and VCAL with other programs
- New perspectives on standards

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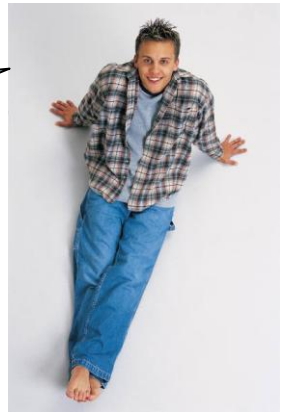

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New defined ~~minimum~~ competency standards

- **NAPLAN's National Minimum Standard at Year 9 is Band 6**

  the level **below which students 'are at risk** of being unable to progress satisfactorily at school without targeted intervention' ; students 'at the National Minimum Standard may also require additional assistance to enable them to achieve their potential'

- **PISA's international baseline level of proficiency is Level 2**
- the level at which students 'begin to demonstrate the (competencies) that will enable them to participate effectively and productively in life'
- **PISA's Australian baseline level of proficiency is Level 3**
- the **Proficient Standard** level at which Australian students **are expected to perform**
- **ALLS (2006) identified its Level 3 as the minimum standard**
- a 'suitable minimum for **coping** with the demands of everyday life and work **in a complex, advanced society**'
- **PIAAC (2011-12) does not identify a minimum standard**

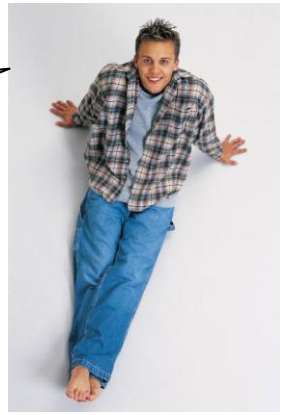
A revised set of figures, as of May 2014

'Proficiency standard' (ACARA)

PISA

40%

About 1~~4~~% of Australian 15-year-olds are below the required standard of reading and maths



PIAAC

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'National Minimum Standard' (ACARA)

Problem solved?