Not just for the kids: Adult skills in the 21st century

- Juliette Mendelovits
- Dave Tout
Outline

- Adult Skills in the 21st century
- Assessments of adult skills
- Results: Assessments of adult skills
- The value of assessments of adult skills
- Q&A
Adult Skills in the 21st century

New Work Smarts: Skills that matter most

- **learn** (be a lifelong learner)
- **solve problems**
- **think critically**
- **use science and mathematics skills**
- **use verbal communication and interpersonal skills**
- **have an entrepreneurial mindset**

Foundation for Young Australians, *The New Work Smarts: Thriving in the New Work Order*, 2017
Adult Skills in the 21st century

- Mathematics was considered extremely important in all of the companies involved.
- Changing work practices are generating new demands for mathematical skills, particularly in areas such as efficiency, innovation and Quality & Continuous Improvement.

AAMT/AiG/OCS, 2014, Identifying and Supporting Quantitative Skills of 21st Century Workers
The application of mathematics in the workplace is not straightforward and goes well beyond a command of ‘core’ mathematical content. Workers perform sophisticated functions which require them to be confident to use mathematical skills in problem-solving situations and to see the consequences of the mathematics related procedures.
Adult Skills in the 21st century

“This is one of the most interesting aspects/concepts of this project. The relationship between workplace mathematical skills and school mathematics could be described as ‘distant’ at best – Teacher observation.”

AAMT/AiG/OCS, 2014, Identifying and Supporting Quantitative Skills of 21st Century Workers
… the demand for information-processing skills and other high-level cognitive and interpersonal skills is growing. In addition to mastering occupation-specific skills, workers in the 21st century must also have a stock of information-processing skills, including literacy, numeracy and problem solving, and “generic” skills, such as interpersonal communication, self-management, and the ability to learn, to help them weather the uncertainties of a rapidly changing labour market.

# Adult Skills in the 21\textsuperscript{st} century

Australian adult standards for LLN & Employability skills

## Australian Core Skills Framework & Core Skills for Work Framework

### Australian Core Skills Framework

- **Reading**
- **Writing**
- **Oral Communication**
- **Numeracy**

### Core Skills for Work Framework

#### Navigate the world of work

- A. Manage career and work life
- B. Work with roles, rights and protocols

#### Interact with others

- A. Communicate for work
- B. Connect and work for others
- C. Recognise and utilise diverse perspectives

#### Get the work done

- A. Plan and organise
- B. Make decisions
- C. Identify and solve problems
- D. Create and innovate
- E. Work in a digital world

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**Learning underpins everything!**
Literacy & Numeracy in the 21st century

- Not just the 3 R’s of basic reading, ‘riting and ‘rithmetic

- Not just low level skills – a continuum from low level (beginning primary school) through to a very high level – up to Diploma/University levels.

- Work and life in the 21st Century demands higher level L&N skills.
Australia participates in a number of international assessments of school-aged children.

- The **Trends in International Mathematics and Science Study (TIMSS)** which occurs every four years in Years 4 and 8 and assesses both Mathematics and Science.
- **Progress in International Reading Literacy Study (PIRLS)** which occurs every five years in Years 4 and 8 and assesses Reading.
- **Programme for International Student Assessment (PISA)** which occurs every three years in Year 9 and assesses Reading Literacy, Mathematical Literacy and Scientific Literacy. Other domains are offered from time to time: for example, problem solving and financial literacy.
Assessments of adult skills

Australia also participates in international assessments of adult skills, and has done so since 1996. These surveys included:

- the **International Adult Literacy Survey (IALS)** conducted in 1996
- the **Adult Literacy and Life Skills Survey (ALLS)** in 2006
- the **Programme for International Assessment of Adult Competencies (PIAAC)**. Cycle 1 was conducted in Australia in 2011/12. Planning is currently underway for Cycle 2 of PIAAC, to be conducted in 2022. PIAAC, like PISA, is conducted under the auspices of the OECD.
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<thead>
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*Prose literacy:* the knowledge and skills needed to understand and use information from texts including editorials, news stories, poems, and fiction. |
| ALLS – 2006     | *Literacy* is using printed and written information to function in society, to achieve one’s goals, and to develop one’s knowledge and potential.  
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*Prose literacy:* the knowledge and skills needed to understand and use information from text, including editorials, news stories, poems and fiction. |
<p>| PIAAC cycle 1 – 2012 | <em>Literacy</em> is the ability to understand, evaluate, use and engage with <em>written texts</em> to participate in society, to achieve one’s goals, and to develop one’s knowledge and potential. |
| PIAAC cycle 2 – 2022 | <em>Literacy</em> is accessing, understanding, evaluating and reflecting on written texts in order to achieve one’s goals, to develop one’s knowledge and potential and to participate in society. |</p>
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## Assessments of adult skills
### Definitions and changes: Literacy/Reading

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SAMPLE ITEMS FROM PIAAC LITERACY
In PIAAC cycle 1, about 97% of Australian adults could succeed on questions at this level of difficulty.
Increased educational attainment is responsible for half of the GDP growth across the OECD over the last 50 years.

In PIAAC cycle 1, about 17% of Australian adults could succeed on questions at this level of difficulty.
Assessments of adult skills
Definitions and changes: Quantitative Literacy to Numeracy

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<td><strong>Quantitative Literacy</strong>: The knowledge and skills required to apply <strong>arithmetic operations</strong>, either alone or sequentially, to numbers embedded in printed materials such as balancing a check book, figuring out a tip, completing an order form, or determining the amount of interest on a loan. <strong>Note</strong>: Quantitative Literacy was assessed in IALS as one of three dimensions of literacy.</td>
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<td><strong>Numeracy</strong> is the knowledge and skills required to effectively manage and respond to the <strong>mathematical</strong> demands of diverse situations.</td>
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ALLS – PIAAC (2006 onwards)
### Assessments of adult skills

#### Definitions and changes: Numeracy

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## Assessments of adult skills

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Assessments of adult skills

SAMPLE ITEMS: NUMERACY
Adults were asked to look at a photograph containing two cartons of coca cola bottles (changed to water bottles for PIAAC) and give the total number of bottles in the two full cases.

This was a **Below Level 1** numeracy item.

In PIAAC cycle 1, 6.5% of Australian adults aged 15-74 years of age were operating at this level - or, at least 93.3% of Australian adults could answer this correctly.
Numeracy item
Level = 2

In PIAAC cycle 1, approx. 60% of Australian adults could succeed on questions at this level of difficulty.

The factory manager checked this graph that had been prepared using the data in this table for 2011. He noticed that two bars were incorrect. Click on the two incorrect bars on the graph.
Results: Assessments of adult skills

PIAAC Cycle 1 (2011-12) was an international survey of adult skills across 34 countries:

- Assessed the cognitive skills of literacy (reading), numeracy and problem solving (in technology-rich environments)
- ABS conducts these surveys in Australia
- Random, representative (almost?) sample of 15 – 74 year olds
- Participants answer a significant number of background questions which, together with the survey data, provide the potential for rich analysis
Results: Assessments of adult skills

- It is important to note that the PIAAC assessment describes a range of capabilities (aspirationally full) in the adult population.
- This covers at one extreme, adults who have university level training and, at the other, adults who have very low levels of education (e.g. who left school at or before the age of 15).
- At the same time, it covers both young adults still in education and adults who completed their formal education 30-50 years prior to undertaking the assessment.
PIAAC Cycle 1 (2011-12) was an international survey of adult skills across 34 countries:

- Household survey methodology - own homes or in some other agreed location under the supervision of trained interviewers. Conducted in Australia by the ABS.
- The assessment was undertaken either as a computer-based assessment (CBA) on a laptop computer or, in the case of adults with little or no familiarity with ICT (or who refused to undertake the test on computer), in a paper and pencil format.
- After the filtering process, what percent of adult Australians (aged 15-74) undertook the assessment on the laptop?
Proportions of persons in Literacy and Numeracy levels 3, 4 and 5 in PIAAC by age. Total Australian population aged 15-74 years.
Research from assessments of adult skills

Performance at Upper Levels by Gender vs age

- Females: Literacy L: 3/4/5
- Males: Literacy L: 3/4/5
Research from assessments of adult skills

Performance at Upper Levels by Gender vs age

Females: Numeracy L: 3/4/5
Males: Numeracy L: 3/4/5
Based on three cycles of international assessments of adult literacy and numeracy skills (IALS, ALLS and PIAAC), the research indicates, amongst a number of other findings, that people with higher LLN skills are significantly more likely to:

- be employed
- participate in their community
- experience better health
- engage in further training
- earn more on average
- each extra year of education improves L&N skills.

Ongoing research on other countries has substantially expanded on this knowledge and understanding of the crucial role that literacy and numeracy play as underpinning skills required for successful lives.
Australian PISA & PIAAC results

**PISA**

- **PISA 2015:** *mathematical literacy* just above the international mean
- **Mathematical literacy** in PISA has significantly declined since 2003
- **PISA 2015:** *reading literacy* significantly above the international mean
- **Reading literacy** in PISA Australia has significantly declined since 2003

**PIAAC**

- In PIAAC: *numeracy* just below the international mean
- In PIAAC: performance in *numeracy* has declined slightly since 2006
- In PIAAC: *reading literacy* significantly above the international mean
- In PIAAC: performance in *reading literacy* has improved slightly since 2006

**Why the difference in relative performance between Reading and Numeracy?**
As an example of the analytic potential of PIAAC, this graph shows that adults with high proficiencies in literacy and in numeracy are much more likely, compared to those with lower skills, to report good health, to be employed, to have higher earnings, and to have positive social dispositions and take part in community life. And that numeracy appears to be a more potent predictor of social and economic outcomes such as health, employment, and high salary, compared with literacy.
The value of assessments of adult skills

- Look at the definitions and frameworks themselves, and what the related research tells us about teaching and learning.
- Build on the empirical and theoretical research emanating from such international assessments e.g., the roles of text and task complexity in reading; interaction between literacy and maths in numeracy.
- The theoretical frameworks, constructs and descriptions of the adult skills assessments develop from cycle to cycle and reflect the demands expected of adults as workers and citizens in the 21st century.
- Utilise and research the rich data set of information about adults’ literacy and numeracy cognitive skills performance, especially in relation to the rich background data set.
- And one specific example: LANTITE
The value of assessing adult skills: Validating literacy and numeracy standards for graduating teachers in Australia

"3.1 All entrants to initial teacher education will successfully demonstrate their capacity to engage effectively with a rigorous higher education program and to carry out the intellectual demands of teaching itself. To achieve this, it is expected that applicants’ levels of personal literacy and numeracy should be broadly equivalent to those of the top 30 per cent of the population."

But how do we know what the top 30% can do?

Standard set by the Ministerial Council for Education, Early Childhood Development and Youth Affairs (MCEEECDYA), April 2011
Standard setting process for graduating teachers’ literacy and numeracy

• Development of literacy and numeracy test began (2013)

• Provisional standards set by expert panels (2014, 2015)

• Introduction of the teacher test (2016)

• Review and modification of standards by expert panels (2016)

But how do we know ... Is this equivalent to the top 30%
PIAAC
to the rescue!!!
to the rescue

• The international adult skills studies are the only robust large-scale measures of the literacy and numeracy of Australian adult population
• The latest survey results - PIAAC cycle 1 - could be used to ascertain the level of literacy and numeracy of the top 30% of Australian adults aged 15 to 74
• How could this be implemented?
Items and test-takers are placed on the same scale

High Achievers

Easy items

Low Achievers

Difficult items
Equating between two assessments

Test A (eg PIAAC cycle 1)

Test B (eg LANTITE)
The PIAAC test design – what each student sees

<table>
<thead>
<tr>
<th>Literacy test</th>
<th>Numeracy test</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 scored items</td>
<td>60 scored items</td>
</tr>
<tr>
<td>5 unscored trial test items</td>
<td>5 unscored trial test items</td>
</tr>
</tbody>
</table>

- Total of 220 literacy and 220 numeracy items
- About 30 trial test clusters for each of literacy and numeracy (in clusters of 5 items)
- For equating with PIAAC: substituted three 5-item clusters of PIAAC items for three of the unscored trial test clusters
What could have happened

PIAAC Cycle 1

Top 30% of Aus adults
What actually happened

<table>
<thead>
<tr>
<th>Students</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
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<tr>
<td>5</td>
<td>6</td>
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PIAAC Cycle 1

LANTITE 2016

Sample Only
to the rescue

- The results from PIAAC cycle 1 were used to find the equivalence on the teacher test of the top 30% of the Australian adult population.
- This validated the standards set by the expert judgement of the LANTITE literacy and numeracy panels.
- Australia’s participation in the adult skills surveys made this possible.
A closer examination of Australia’s performance reveals the following:
• Numeracy represents a particular challenge in Australia.
• Signs of poor numeracy performance can be traced back to initial schooling.
• Women have weaker numeracy skills than men.
• There is a relatively large gap between the most proficient and least proficient adults in literacy and in numeracy.
• Many well-educated adults have low literacy and/or numeracy skills.
• Young women in Australia are much more likely to be not in employment, education or training (NEET) than young men.
Are we prepared for the 21st century?

- Australia’s ALLS and PIAAC results, no matter how you read them, demonstrate unequivocally that a significant number of people aged from 15 to 74 years old in Australia do not have access to sufficient foundation skills in reading and numeracy to be able to cope equitably with life and work in the 21st century.
- Reflect on PIAAC Cycle 2 results from both a policy level in relation to adult education, but also in relation to how school education is preparing young people for the world as adults.
- Australia needs more research and reports like those from the Productivity Commission (Literacy and Numeracy Skills and Labour Market Outcomes in Australia), and the former Industry Skills Councils (No More Excuses).
- Maybe time to address numeracy? See what the UK has done: https://www.nationalnumeracy.org.uk/
Q&A