NAPLAN online research: Where is it now and where is it heading?
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Presentation outline

► Where is NAPLAN now?

► Where is NAPLAN heading?

► What did we do to drive and support the NAPLAN transition?

An overview of the NASOP 2012—2014 research program and outcomes of key research studies

► What are we doing to ensure the best possible future for NAPLAN?

ACARA’s research program for 2015 and beyond
NAPLAN

- Assesses all Australian students in Years 3, 5, 7 and 9 in reading, writing, language conventions and numeracy – first administered in 2008
- All students sit the same test on the same day – usually during the second week of May
- Current test reflect constructs of numeracy and literacy as described in Statements of Learning for English and Mathematics*
- Rasch models used in scale construction and student performance estimation
- NAPLAN assessment scales are:
  - vertically scaled
  - longitudinally equated

*Ministerial Council on Education, Employment, Training and Youth Affairs, 2006
Federal, state and territory education ministers have agreed that NAPLAN will move online from 2017, over a two to three year period.

Go to www.nap.edu.au for more information.
NAPLAN online

- The Education Council has agreed that NAPLAN online will be implemented from 2017 on an opt-in basis over two to three years.

- Three components in the program to move NAPLAN online:
  1. Development of the national online assessment platform – Education Services Australia (ESA)
  2. Development of the NAPLAN online assessments – ACARA
  3. Readiness by schools, including devices and training – school systems and authorities
NAPLAN online: research and development

In 2012 ACARA was given the following tasks:

1. To develop a design for computer-based NAPLAN tests
2. To develop and conduct a research program to support the decision-making and the transition of NAPLAN from paper and pen tests to computer-based tests

What are the goals of the NAPLAN online test?

1. To deliver more precise information about student performance
2. To broaden the curriculum coverage
3. To provide faster turnaround of information
Computer adaptive testing provide solution for all three requirements!
NAPLAN online: tailored test design (TTD)

A - initial branching

B - branching

C - easy items

D - branching

E - mainstream items

F - challenging items

1:2:3 multistage adaptive test
TTD – testlets targeting:

Year 3 numeracy testlet boundaries
For large-scale assessments, multistage adaptive tests offer several advantages over item level computer adaptive testing including:

- better control over item content and exposure
- better control over structure and administration of the final test
- requiring significantly fewer items to run and maintain the testing program
- more control over vertical scaling

NASOP research program

- As part of NASOP, ACARA developed and implemented a comprehensive research program:
  - 2012: mode effect studies – can we move NAPLAN test online?
  - 2013: tailored test design studies – will TTD work?
  - 2014: further development studies – what else do we need to know?
2012 mode effect studies

- Two key research questions:
  1. Are NAPLAN computer-based tests assessing the same construct as the current paper tests?
  2. How are students interacting and engaging with computer-based items and tests?
- Secure paper tests in reading, numeracy, writing and language conventions were rendered online and delivered to students
- Sample size was approximately 400 students per test domain and year level
- Concurrent and retrospective interviews used to collect information about cognitive and behavioural engagement of students with online numeracy and reading tests
- Sample size was approximately 8 students per year level and test domain
2012 mode effect studies: outcomes

Score – ability conversion curves for Year 3 numeracy computer and paper based tests
2012 mode effect studies: outcomes

- Differential functioning analyses of items and tests indicate that the invariance of the construct has been sufficiently maintained.
- Cognitive interviews revealed students engaged with the test items in the same way as they did in the paper-based tests.
- Invigilator feedback revealed students had no problem in interacting and completing tests online.
2013 research studies

1. Tailored test design field trial in reading and numeracy
2. Cognitive and behavioural engagement of students with the TTD
3. Investigate how online testing can better cater for students with disabilities
4. Investigate the TTD potential to provide more appropriate testing experience for Indigenous students and students in remote communities
5. Investigate the TTD potential to provide more appropriate testing experience for students with socio-educational disadvantage
6. Options for online assessment and marking of writing
7. Investigate the potential to broaden and enhance item and assessment types offered by digital technology
2013 TTD study: method

- Purpose: to collect empirical evidence on the feasibility of the proposed multistage test design for NAPLAN Online
- Testlets presented in either branching or fixed linear test conditions
- Students randomly allocated to one of two conditions:
  - Years 3 and 5 sample N ~ 2,600 students
  - Years 7 and 9 sample N ~ 1,600 students
- Convenience sample – but cross-selection of schools was satisfactory
- Testlets constructed using existing NAPLAN items based on paper-based locations as well as some items developed for online tests
- Simulations used to determine branching cut-scores for newly constructed testlets
2013 TTD study outcomes:

Distribution of students across testlets in TTD condition for Year 5 reading test

N=1641

A

B 45%

C 27%

D 55%

E 50%

F 23%
2013 TTD study outcomes

Observed precision of student ability estimates for Year 5 TTD and fixed reading tests
2013 TTD study outcomes

Distribution of students across testlets in TTD condition for Year 3 numeracy test

- second branching point corrected unexpected initial routing
2013 TTD study: conclusions

- TTD works!
- Two-stage adaptive test design provides a robust solution for correcting initial mis-directing
- More work needs to be done in regard to the testlet boundaries and overlap between testlets
But!

► The measurement argument is not always sufficient
► We need to show that TTD provides a test design that is accessible to all students
► We need to show that TTD is not introducing factors that might hinder performance of some students
► We need to show that TTD has the potential to enhance test motivation and engagement for all students

Cognitive laboratories

► Think-aloud, concurrent and retrospective interviews and structured observations
► These methods provide rich qualitative data about student experiences, insights and interactions with test items and testing situations.
2013 Cognitive interview studies

Research questions

► What is the impact of the TTD on the students' test-taking behaviour?

► How do students interact with the testlets at key branching points of the test:
  - the rising and falling pattern of item difficulty
  - investigating key items in the two adjoining branching testlets.

► What is the impact of staged and branched testing on student test engagement?
2013 Cognitive laboratories study: main study

Participants

<table>
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<tr>
<th>Domain</th>
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<th>grade 5</th>
<th>grade 7</th>
<th>grade 9</th>
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<td>Reading</td>
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<td>21</td>
<td>21</td>
<td>23</td>
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</table>

Procedures

- Students were observed and interviewed while completing either a TTD or a fixed linear test
- Interaction with 12 to 14 key items in each test were subjected to detailed exploration
2013 Cognitive interview studies: students with socio-economic disadvantage

Participants:

<table>
<thead>
<tr>
<th>Domain</th>
<th>grade 3</th>
<th>grade 5</th>
<th>grade 7</th>
<th>grade 9</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numeracy</td>
<td>25</td>
<td>21</td>
<td>35</td>
<td>11</td>
<td>92</td>
</tr>
</tbody>
</table>

Procedures:

- Students completed one of the two fixed pathways; A-B-C and A-C-B.

Results:

- The TTD provides pathways that give students an opportunity to successfully re-engage with the whole test
- The test design increased self-esteem and sense of achievement for these students.
2013 Cognitive interviews: conclusions

► Students regard branching to be a positive enhancement of NAPLAN tests
► Students were not affected by the rising and falling pattern of item difficulty as they move through different stages of the tailored tests
► Tailored tests enabled educationally disadvantaged students to remain positively engaged with the full test
► Tailored tests delivered more motivating assessment to all students – including students who might be struggling to engage with the current NAPLAN tests

TTD and Indigenous students

► ACARA collaborated with NT Department of Education in this study – teachers administered TTD online in several remote and very remote schools
► Teachers’ observations match those reported in cognitive interviews studies – but also reported that some of the easiest items may still be outside of knowledge space for some of their students
2014 Development studies

1. Finalise measurement aspects of the TTD for reading and numeracy

2. Investigate how students, individually and as a class of tests takers, perceive and engage with stage-adaptive online testing

3. In-depth cognitive investigation of student interaction with challenging items in testlet F in reading and numeracy

4. In-depth cognitive investigation of student engagement and interaction with selected technically enhanced item types

5. Trial newly developed testlets for grammar and punctuation tests

6. Trial newly developed testlets for spelling, including spelling items that use auditory stimuli

7. Trial newly developed testlets for reading and numeracy
Directions: Click on the drop down arrows or inside the text boxes to label the bar graph. To complete the bar graph, click and drag the bars located on the x-axis of the graph. To remove all entered data, click the “Reset” button. You may need to scroll down to see the entire item.

The heights, in cm, of the girls that train gymnastics together are shown below.

141, 142, 142, 142, 143, 143, 143, 144, 144, 144, 145, 145, 146, 147, 150, 152, 156, 159

Create a histogram of the data.
TEI: reading

Click on the noun (naming word) in the sign.

Slippery floor when wet
2014 Cognitive interviews: TEI

Research questions and methods

► Are there design considerations that inhibit or enable students to interact with, and process, TEI in a meaningful way?
► What TEI design elements most impact on student access and performance, especially in relation to students’ knowledge and capacity?

Results

► Students across all year groups engaged with TEI and reported that TEI increased their motivation
► However, the level of engagement was influenced by computer literacy and experience
► TEI items provide a feasible solution for enhancing NAPLAN tests, but care needs to be taken to ensure that content and representation of TEI follows best assessment construction advice and practice
2014 Development studies: assessment of spelling

► A new version of spelling test was piloted
► Test consisted of two parts:
  • In the first part students heard the word to spelled via the headphones
  • In the second part students responded to written proofreading items
► Tests were administered to approximately 300 students at each year level
► Cognitive interviews examining student engagement with pilot spelling tests were also conducted

Results:

students have no problem in responding to orally delivered spelling tests
► the cognitive interviews confirmed that students engaged with the tests in the expected way
2014 Development studies: main study outcomes

► The key purpose of the main study was to collect data to support finalisation of the targeting and measurement aspects of the TTD for numeracy and reading
► Grammar and punctuation was assessed as a single testlet following the reading tests
► Schools in the sample volunteered or were nominated by jurisdictions and school authorities – good cross selection, including remote and very remote schools
► 264 school participated in main study which included trialling of newly developed online items – over 39,000 tests were administered
NAPLAN online 2015 research

24 August - 28 September:

1. Item and testlet trialling: 120 schools

2. Device effect study: 74 schools
NAPLAN online 2015 R&D: device effect study

- The impact of computer devices on the performance of test items when tests are administered on tablets and on standard PCs

<table>
<thead>
<tr>
<th>Usual classroom device</th>
<th>Study device</th>
<th>Experimental condition</th>
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<tbody>
<tr>
<td>PC</td>
<td>PC</td>
<td>PC-PC</td>
</tr>
<tr>
<td>PC</td>
<td>tablet</td>
<td>PC-TB</td>
</tr>
<tr>
<td>PC</td>
<td>tablet + keyboard</td>
<td>PC-TBKB</td>
</tr>
<tr>
<td>tablet</td>
<td>PC</td>
<td>TB-PC</td>
</tr>
<tr>
<td>tablet</td>
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<td>TB-TB</td>
</tr>
<tr>
<td>tablet</td>
<td>tablet + keyboard</td>
<td>TB-TBKB</td>
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</tr>
<tr>
<td>tablet + keyboard</td>
<td>tablet + keyboard</td>
<td>TBKB-TBKB</td>
</tr>
</tbody>
</table>

- Systematic observations and structured interviews will be used to collect qualitative data on the interaction and engagement of students with tests administered on different devices
NAPLAN online 2015 and 2016 research:

3. A fonts and readability study, to ensure the best layout for reading test

4. An accessibility study to ensure the test is fair for all students, including students with disabilities

5. An autoscoring study, to demonstrate that computers can score NAPLAN writing as reliably as teachers
THANK YOU
Got questions about NAPLAN moving online?
Go to...

www.nap.edu.au
or email:
naplanonline@acara.edu.au
Back pocket slide: TTD branching rules

- cut scores determined using the approximate maximum information (AMI) method
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