NATIONAL ASSESSMENT PROGRAM – LITERACY AND NUMERACY

Online Assessment Research

Accessibility Options
for Students with Disability

2014

Online Assessment Research
Accessibility Options for Students with Disability

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National Assessment and Surveys Online Program
The National Assessment and Surveys Online Program, funded by the Australian Government, is designed to deliver national assessments and surveys online. ACARA is responsible for planning and implementing a clearly defined assessment and reporting research agenda that will allow reporting to the Education Council on issues and options for delivering NAPLAN online. A key aspect of the program is ACARA's expanded assessment and reporting research agenda, incorporating a comprehensive investigation into assessment instruments and programs using online technology.

NASOP Research Study:

NAPLAN Online accessibility adjustments for students with disability

ACER

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1. Executive Summary

In 2013 ACER reported to ACARA on research conducted to investigate options for adjustments to provide access to students with disability to the National Assessment Program — Literacy and Numeracy (NAPLAN) in the move from existing paper based assessment methods with allowable adjustments to computer-based assessment with allowable adjustments.

Further to ACER's recommendation that ACARA consider which options should be adopted for NAPLAN Online, ACARA identified the need for additional information about the implications of some of the options identified in the 2013 report, and framed a number of specific questions for further research. (These are detailed at 2.1, Research questions.) We have responded to these with reference to the relevant research literature, to expert opinion and to the experiences of teachers, support persons and students. (The research methodology is described at 2.2, Methodology.)

Most discussion concerned the issues that the proposed adjustments might raise for practical deployment, and whether they would be satisfactory replacements for allowable adjustments currently used with the paper-and-pen version of the test. The identification of research bases that demonstrated effectiveness of certain adjustments and isolated their effect was also of significant interest to ACARA in some instances. While this was generally not evident, we found almost nothing from any information sources that would suggest any of the proposed adjustments could violate the test construct by conferring disproportionate advantage on students with disability. (We relied on the commonly accepted concept of the differential boost, in which adjustments that lead to greater score improvements for students with disability than for students without disability are considered to appropriately enable access for students with disability, without disproportionately advantaging them.)

Alternate and Adjusted Items

ACARA intends that the test delivery system for NAPLAN Online will be developed to interoperate with both magnification assistive technology and motor assistive technology. ACARA therefore sought information about possible implications for item development, and in particular whether there were particular item types or characteristics that do not lend themselves to access via these technologies.

Experts consulted found that in general, in the process of item development, consultation with stakeholders and discipline specialists helped to avoid problems that may be associated with the introduction of adjustments.

It is important to note that it can take low vision students longer to absorb material that has been magnified to the requisite size (particularly graphics and maths questions which rely on setting out) because the magnified content often cannot be viewed in its entirety, necessitating scrolling, and recollection and/or revisiting of the non-visible components of the material. These additional processing and navigation requirements do not arise for students who are able to view material in its entirety, unmagnified. Therefore where a magnification adjustment is allowed, an extra time adjustment may often also be appropriate. With specific reference to magnification technologies, the experts consulted indicated that, while some items could be more difficult to navigate under magnification, and could require more time, none were inaccessible.

Some students with motor control difficulties may well benefit from the onscreen delivery, given the availability of keyboards. There was no indication from experts consulted that any particular item type of characteristic was inaccessible to users of motor assistive technology.

Large Format Tests

The test administration protocols for NAPLAN in the current pen-and-paper context make provision for delivery of specifically formatted large format tests. These tests include a more simplified layout and presentation, and larger font, than the standard test papers. ACARA sought information about whether an onscreen equivalent specially formatted large format test or tests would be required, in light of the zoom and magnification adjustments that would be available to students.

The research did not find evidence of onscreen provision of specifically-generated large format tests with simplified formatting and larger font for low vision students. Other types of adjustments for low vision students are preferred and widely offered. In general, experts reported that zoom functions were difficult to master and/or operate for low vision students, and that magnification is preferred on that ground. There is a report of limited trialling of magnification against large format, which found the former preferable.

One case in which online enlargement is offered is the ESSAonline test. A representative of Essential Secondary Science Assessment (ESSA), a state-wide science assessment program based on the NSW Science Years 7-10 syllabus, reported that adjustments are offered as part of the ESSAonline software if possible, and that students are also free to use whatever other adjustments they use in classroom work. Since the test is delivered online, normal internet browser accessibility tools are compatible. These include zooming in and out, a magnifier and facility to increase screen resolution. ESSA have not produced separate large print versions since moving online. There is provision for adjustments to be reported to ESSA. Reporting is required in the case of students using Braille to respond to the test (as this has logistical implications for delivery by ESSA). Schools that provide special provisions to students complete the test are required to record this on the test site. This allows this fact to be printed on the student's report.

In the United States, the preparations for moving the National Assessment of Educational Progress (NAEP) to technology-based content and delivery are continuing, and include investigations of adjustments (including magnification) for students with disability. The latest information on the status of the preparations can be found at http://nces.ed.gov/nationsreportcard/tba/ and an account of adjustments at http://nces.ed.gov/nationsreportcard/about/accom_table.aspx

Electronic Tests

Students who had used the interactive PDF format of the test were in the minority, but of those who had used it, most found it had advantages over the pen-and-paper test; they found typing easier than handwriting, and liked being able to click multiple-choice item answers. Of those who had preferences for online functionality, those preferences were for formats which were like computer games, or which offered corrective suggestions. It was clearly noted that for students with motor disability, onscreen delivery was not a panacea, as longer responses (for example as required in writing tests) were beyond the capability of many, and computer users were required to support such students to input their responses. ESSAonline specifically (in the special provisions detailed in its administration manual) supports the use of computer users.

Oral/sign support

Oral/sign support[1] by human signers for any kind of assessment undertaken by deaf or hard of hearing students is regularly available in Australia and in the United States. The planned NAPLAN Online functionality is restricted to captioning of in-system audio/video (or embedding sign video where captioning is incompatible with the test construct). Consideration needs to be given to signing for teachers giving test instructions as well, and (where applicable) to signing for clarification of items. Further research is needed in this area, specifically in the context of national testing and some regional differences in signing. If embedded videoed or avatar-based signing is envisaged for the online test consideration needs to be given to these regional differences in AUSLAN, and varieties of AUSLAN use (key signing, and admixture of, for example, Indigenous sign systems). These functionalities (embedded avatar or video recorded signing systems) could be added to the online test without affecting test performance. There is a slight concern in the research literature regarding the lack of expressiveness in avatar signing systems.

Spelling

An alternative mode for delivery of audio Spelling tests for students who are deaf or hard of hearing is problematic; finger spelling is not an option for obvious reasons, there are limitations to whole-word signs in AUSLAN, and regional differences would have to be taken into account. The use of graphics is impractical, since pictured objects can accurately be given a variety of names. Even with single-sign words, signed words do not contain the same clues for spelling as oral renditions. As well, it may be a violation of construct validity if spelling words for the test were to be limited to those capable of single-sign AUSLAN rendition.

Scribe

Given that ACARA intends that the NAPLAN Online test delivery system will interoperate with motor assistive technology, they sought clarification whether an equivalent to scribes currently available in the pen and paper environment would be required for onscreen delivery of assessments.

Some research suggests that students with disability prefer digital platforms to scribes (assuming they were able to use keyboards) because they give independence. However, where students with disability are unable to use (or access) motor assistive technology (or indeed Braille assistive technology), they will still require the support of a scribe / computer-user.

In Australia the ESSA test is delivered online, and the use of any adjustments used in the classroom is allowed by ESSA (see Large Format Tests above, which also refers to the USA's NAEP). Research literature and expert opinion deem the use of scribes to be appropriate adjustments per se; no research or expert opinion suggests that they would be inconsistent with test validity in the online environment where motor assistive technology is supported.

The most commonly used functionality which would be an alternative to a human scribe is speech recognition technology. Expert opinion concluded that so long as the object of testing was to produce written composition (as opposed to testing the mechanics of writing), then the use of speech recognition technology made no difference to the quality of writing when compared to handwriting

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[1] 'Oral' in this context refers to lip-reading (or speech-reading), which is a means of understanding speech by deciphering the movements of the speaker's lips, face and tongue and any other visual clues to what is being said.

and human scribes. Students need to use more care in speaking and checking their work when using speech recognition technology.

Support Person

Students who have had a support person (other than scribes and oral/sign support persons) generally reported that the person was of practical use – reminding them when they should take breaks, telling them how much time they had left – and importantly offered emotional support – keeping their moods even in a stressful environment, making sure they stayed on task. Staff members were firmly of the same opinion. It should be noted that there is no provision in the NAPLAN test administration protocols for access to support persons for this purpose. The 'support person' referred to in the protocols is intended to be an equivalent to a scribe in the Writing domain, for Reading and Numeracy tests (i.e. they are intended to shade the bubbles selected by a student responding to multiple-choice/enter short constructed responses, where the student is unable to do so him- or herself). However, since ACARA wanted to know specifically in what ways support persons (other than scribes and oral/sign support persons) are currently utilised in the pen-and-paper NAPLAN context, it seems important to take note of their widespread function in the broader sense; if their function as defined in the protocols is no longer considered necessary in the online environment, their removal may have unintended consequences.

Assistive Technology/Computers

The main focus in the staff/student responses was around the use of keyboards. If students have reasonable keyboard skills (and clearly not all do) then it is a distinct advantage to be able to type responses. Those who have not achieved facility with the keyboard, and have trouble handwriting, would continue to need scribes. A viable alternative to keyboard use is the use of speech recognition technology, which is discussed under 3.6 Scribe. While this technology was not specifically the subject of a research question from ACARA, it is suggested in response to the research question 'Would additional functionality other than support of scribes / computer users best meet these needs, and if so, is this functionality compatible with standardised testing and the NAPLAN test construct?' at 3.6.1c. Expert opinion suggests that so long as what is being tested is composition (as opposed to the mechanics of writing), then there is no violation of the construct involved in the use of speech recognition technology, and it is consistent with the differential boost principle.

Black-and-white print format/Coloured Overlays

Research conclusively rejects the efficacy of coloured paper or overlays to ameliorate conditions associated with dyslexia. In those schools where coloured overlays and/or coloured paper are used in the pen and paper context, staff and students are firmly of the belief that they help in stopping the apparent movement of text, or for anchoring a student's attention to a particular part of a text. The majority of interviewees felt that contrast and brightness controls that will be available in the onscreen environment would not be enough in the online version of the test; students would continue to benefit from functionality which would allow them to control background colours, or to highlight words.

Masking

Limited research suggests 'that limiting the visual display of text-based information [on hand-held mobile devices] does have a disproportionately [when compared with a control group] positive effect

for students with reading disabilities, a finding that can be equated to the visual masking of text-based content.' That is, differential boost is observed in performance of students with reading disabilities when they are provided with a masking-type functionality.

Measurement invariance

Separating the pure access effects of adjustments from potential performance effects (i.e. ascertaining whether a non-standardised test experience creates for a student with disability a level playing field or an advantage over others) for students with disability is not entirely possible (although the concept of differential boost may also be useful here). This is attributable to the (necessarily) small sample sizes of students with disability who participate in empirical studies, the range of specific needs of students with disability across similar classifications, and the variability among the specific characteristics of adjustments even if they appear superficially to be functioning in the same way.

Research has reached an on-balance judgement that it may be preferable to entertain a small risk of invariance violation than to deny students with disability access to testing. Further, one meta-analysis (Cawthon, S. and Leppo, R. (2013)) concluded that it was not possible to make specific determinations about the effects of adjustments, because it was not possible to extract those effects from other complex contextual factors, across student-level factors, test-level factors, and larger policy contexts.

Circumstances in which test scores for students with disability were lowered by the use of assistive technology-based adjustments were associated with poor matches between the technologies and the students, and student unfamiliarity with the assistive technologies provided during testing. The lesson from this research is that students with disability benefit most from technologies that they have used during instruction, and if they are required to use new technologies in assessment situations, they should be given ample time to familiarize themselves with those supports.

2.   Introduction

The purpose of the research project is to investigate the impact on access to the National Assessment Program — Literacy and Numeracy (NAPLAN) assessments for students with disability that will be created in the move from existing paper based assessment methods (with existing eligible adjustments)[2] to computer-based assessment methods with adjustments that are built into the system. In order to achieve this purpose, ten adjustment-related areas with a number of associated research questions were agreed as the basis for the research.

For the purpose of this research, the intended purpose of adjustments specified in the 2014 NAPLAN National protocols for test administration has been adopted which is that 'adjustments are intended to enable access to the tests on an equivalent basis to students without disability' (ACARA, 2014, p. 14).

During the course of the research a further area of interest, test/measurement invariance, was identified and research literature was reviewed and reported. This was regarded as relevant to the assumption of test equivalence underpinning the use of adjustments in NAPLAN.

The research adopted a mixed-methods approach including a literature review and interviews with experts in and users of adjustments in NAPLAN in Australia. There is little Australia-specific research literature which addresses itself to adjustments for students with disability in the context of large-scale testing in general, or to NAPLAN in particular. One recent study (Elliott, S. N., Davies, M., et al. (2012)), however, seeks to provide an overview, and importantly for this review describe a generally agreed standard for the desired and valid effects of testing adjustments.

> Most accommodation researchers now use the concept of differential boost (Fuchs & Fuchs, 2001; Fuchs, Fuchs, Eaton, Hamlett, & Karns, 2000) to characterise the desired and valid effects of testing accommodations. That is, testing accommodations, "will lead to greater score improvements for students with disabilities than for students without disabilities" (Sireci et al., 2005, p. 481). Sireci et al. differentiated the concept of differential boost from the traditional definition of the *interaction hypothesis*, which states that:
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> (a) when test accommodations are given to the SWD who need them, their test scores will improve, related to the scores they would attain when taking the test under standard conditions; and (b) students without disabilities will not exhibit higher scores when taking the test with those accommodations. (p. 458)

That is to say that current thinking among adjustment researchers is that it is acceptable for adjustments to improve the scores of students without disabilities, so long as they improve the scores of students with disability to a greater extent. The concept of the differential boost underpins this review's assessment of desirable and valid effects of testing adjustments.

Accepting this proposition does, however, not resolve the question of whether the implementation of adjustments leads to a violation of the assumption of measurement invariance, as it is not possible empirically to determine the degree to which any observable differential boost can be attributed to the removal of obstacles for students with disability to complete an assessment, resulting in a 'purer' measurement of the trait of interest in students with disability, rather than the addition of a

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[2] While the term 'adjustment' has been adopted by ACARA, much of the research literature uses the term 'accommodation' with the same meaning. As a consequence, in this paper the terms 'adjustment/s' and 'accommodation/s' have been used synonymously. In each case in this paper, the choice of term reflects the referential context in which it has been.

differential advantage resulting in the scores of students with disability to be overestimated relative to other students. The challenges to empirical research in this are described in detail by Pitoniak and Royer and include:

- small sample sizes of students with disabilities to participate in empirical studies;
- variability among the specific needs of students with disabilities within groups with similar classifications of need;
- variability among the specific characteristics of adjustments even if they appear superficially to be functioning in the same way. [See p. 68]

When considering the notion of measurement invariance in the context of the use of adjustments in large-scale testing, Pitoniaik and Royer conclude that 'given that psychometric evidence establishing the comparability of test scores may be lacking, particularly regarding the provision of extra time to candidates with learning disabilities … The question may be whether it is worth the risk of granting certain accommodations that may not, strictly speaking, create an exactly level playing field, in order to make sure that the players actually get a chance to run onto the field and throw the ball' (Pitoniak & Royer, 2001, p. 98).

2.1   Research questions

This research was conducted with reference to a set of research questions that were initially specified by ACARA and subsequently confirmed with ACER. The questions relate to the use of specific adjustments in testing with a view to how they could be implemented in the context of NAPLAN online.

Alternate and Adjusted Items

What is the experience with other online assessment platforms in use in Australia or elsewhere, in relation to item development where motor and magnification assistive technology is supported by the assessment delivery platform?

Are there any types of items that are not accessible to users of these technologies? If yes, why (i.e., what should not be included)?

Large Format Tests

In online assessment systems in use in Australia and/or elsewhere, with similar functionality, are large format onscreen tests offered as a discrete additional option? If so, on what basis?

Is there research-based evidence that the provision of adjustments that allow a student to enlarge the online assessment is of benefit to students with disability? If so, what are the relative advantages of large format tests, device-based zoom functionality and support of magnification assistive technology?

Electronic Tests

What accessibility functionality do students with disability who currently take NAPLAN via electronic test (interactive PDF) derive from that format?

Are there any online assessment platforms in use in Australia or elsewhere that offer students interactive PDFs as a discrete accessibility option?

If yes:

In what ways is the functionality similar to / different from the planned NAPLAN Online functionality?

What specific user needs do the interactive PDFs meet, that cannot be met by the planned NAPLAN Online functionality?

Would additional functionality other than interactive PDFs best meet these needs?

If so, is this functionality compatible with standardised testing and the NAPLAN test construct?

Oral/sign support

Are oral and/or sign support used in conjunction with assessment delivery platforms in Australia and/or elsewhere?

If so:

To what extent is the functionality of the system/s similar to or different from the planned NAPLAN Online functionality?

Are there any user needs that could not be met by the planned NAPLAN Online functionality if oral and/or sign support is not offered in addition?

Could these needs be met by additional system functionality (rather than a physical support person) and if so, what additional functionality would be required? Would this functionality be compatible with standardised testing within the NAPLAN test construct?

Spelling

What non-text alternative/s to audio files are available for hearing impaired students?

What are the pros and cons of each method, and which alternative or combination of alternatives would be best suited to the onscreen testing of Spelling for NAPLAN?

Scribe

Are there any online assessment systems in use which support motor assistive technology and also support the use of scribes / computer-users?

If yes:

In what ways is the functionality similar to / different from the planned NAPLAN Online functionality?

What specific user needs are met by use of a scribe / computer-user, that cannot be met by the planned NAPLAN Online functionality (and is there an evidence base demonstrating the effectiveness of the use of scribes for particular needs, and isolating the effect)?

Would additional functionality other than support of scribes / computer users best meet these needs, and if so, is this functionality compatible with standardised testing and the NAPLAN test construct?

Support Person

In what ways are support persons (other than scribes and oral/sign support persons) currently utilised in the pen and paper NAPLAN context?

Will the planned NAPLAN Online functionality replace the need for these support persons?

If it not:

In what ways does it fall short?

What additional functionality or other features would be required to meet the needs of these students?

Would there still be a need for support persons for some students?

Assistive Technology/Computers

To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online?

If it does not adequately meet their needs:

In what ways does it fall short?

What additional functionality or other features would be required to meet the needs of these students?

2.2   Methodology

We used a mixed-method approach to answer the questions in which we employed literature scanning, expert opinion, questionnaires and interviews to gain multiple perspectives and data from which to formulate answers. We used a complementary combination of quantitative and qualitative analysis methods to triangulate among the data collected. Not all data sources were relevant or available for each research question. In consultation with ACARA we determined the data sources that were most likely to be relevant and useful for each question. These formed the basis of the research and the mapping of data sources to the research questions is included in Appendix 1.

Literature scanning

The literature scanning took place at ACER in Australia and in the USA at the Center for Applied Special Technology (CAST).

The ACER literature scan began with an extensive ACER library database search. The full set of search terms is too large to include in the body of this report and has been included in Appendix 2.

We contracted CAST to complete a targeted environmental scan and literature review in order to broaden the base of the review and because CAST is an organization with extensive connections and involvement in the application of adjustments in education and testing in the US. We asked CAST to provide findings in the research literature in response to the following broad search questions:

1. Can you provide us with details of large scale (NAPLAN-like) assessment programs that are delivered on computer and include adjustments for students with disabilities that correspond to the set of adjustments ACARA have pre-determined? If so can they provide some details of the adjustments that are used and how this is done (policies, who decides, who supervises etc)?

2. Do you know of literature that focuses on the use and impact of using any of the listed adjustments in NAPLAN style testing?

3. Do you know of any literature that tests the notion of measurement invariance when adjustments are implemented in such contexts (both by the different adjustments and by literacy and numeracy)?

The results of both the ACER and CAST investigation are included in this review.

Interviews

A summary table of the participants interviewed by ACER is included at Appendix 4.

Interviews were undertaken with experts on the use of adjustments for students with disability in testing in Australia, students with students with disability in Australian schools who had used some form of available adjustment when completing NAPLAN in 2014 and teachers and other support people for those students.

In total, nine experts were interviewed from the NSW Department of Education and Community, the Northern Territory Department of Education, the Essential Secondary Science Assessment (ESSA) New South Wales, the Statewide Vision Resource Centre (SVRC) (A DEECD facility) Victoria, and St Patrick's College, Strathfield NSW. These interviews were conducted by telephone. Interview transcripts were checked with all contributing experts and modifications made where necessary to the final versions.

20 students from 23 schools were interviewed. The students were selected from schools in New South Wales, Victoria, South Australia, Queensland, the Northern Territory and Western Australia.

Typically each student had experience of using a small number of (one or two) adjustments. Across all schools students were selected to ensure that it was possible to collect information about experiences with all adjustments. Most interviews (18) in schools were conducted face-to-face with a small number of interviews (5) conducted by phone.

Interview protocol

We established an interview protocol in consultation with ACARA. The protocol included information for participants about the research, a consent to be interviewed (and recorded) form and the complete set of questions that could be asked of participants. Students, teachers and support people were only asked those questions relevant to the adjustments they had experience of using. Experts were asked about all adjustments on the assumption that they had experience relevant to them all. The interview protocol is included as Appendix 3.

Conducting the interviews

The interviews were conducted using a semi-structured format. The interview questions were used as starting points for discussion with participants who had the opportunity to provide additional relevant information as they saw fit. The time taken for the interviews depended according the participants, the range of adjustments being discussed and the amount of information participants felt qualified and interested to provide. Typically interviews lasted between 20 and 40 minutes.

All interviews with students were conducted in the presence of a support person (teacher or otherwise) for the student.

3. Responses to Research Questions

3.1 Alternate and Adjusted Items

3.1.1 What is the experience with other online assessment platforms in use in Australia or elsewhere, in relation to item development where motor and magnification assistive technology is supported by the assessment delivery platform?

3.1.2 Are there any types of items that are not accessible to users of these technologies? If yes, why (i.e., what should not be included)?

Literature review

The closest analogous test to NAPLAN in the USA is the National Assessment of Educational Progress (NAEP). Preparations for moving to technology-based content and delivery are continuing, and include investigations of adjustments (including magnification) for students with disability. The latest information on the status of these preparations can be found at http://nces.ed.gov/nationsreportcard/tba/ and an account of adjustments (including magnification) at http://nces.ed.gov/nationsreportcard/about/accom_table.aspx For a review of the process, including the issues concerning adjustments, see Jenkins, J. (2011). In Australia, an analogous test is the ESSAonline – see below in Expert advice.

The literature in this area is yet to be augmented by the important conclusions and observations which will come from the NAEP investigations; however, we can say generally that the process of decision-making in the USA is influenced by organisations[3] which advocate and conduct research on behalf of people with disability on a broad range of issues. Where they believe it is warranted, these bodies will engage in litigation on behalf of their constituencies; in educational matters this often concerns issues of access. This gives a particular character to the procedure of deciding on adjustments in national testing. We found in undertaking this study that all stakeholders, expert bodies, school staff and students, were without exception enthusiastic about the chance to have input into the provision of adjustments for the proposed NAPLAN Online test, and would similarly enthusiastically provide feedback during trialling.

Expert advice

A representative of the ESSA[4] was asked about the approach taken in designing the ESSAonline test, in which the use of any assistive technology, including motor and magnification assistive technology, which students use in classroom work is permitted. She reported that ESSA initially surveyed teachers, and in the first years they also surveyed students and parents. A number of academic mentors have been involved in test development. She said that the items in ESSAonline all function successfully. A representative of Statewide Vision Resource Centre (SVRC) (a DEECD facility) reported that in general the time taken by low-vision students to read items with magnification technology is a

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[3] The National Association of the Deaf and The American Foundation for the Blind are examples.

[4] ESSAonline is an interactive multimedia assessment. ESSAonline is for students who have completed two years of secondary schooling and learning in science. It is mandatory for all Year 8 students in NSW government schools. Non-government schools inside and outside NSW and home schools are welcome to register for ESSAonline. http://www.schools.nsw.edu.au/learning/7-12assessments/essa/ http://www.schools.nsw.edu.au/media/downloads/schoolsweb/learning/yr7_12assessments/essa/etestinfo.pdf

consideration. If they need very large magnification, time will be a problem because it will take them proportionately longer to cover the same material. This presents a significant issue with timed test items. Additionally, if the student experiences visual fatigue as a result of their vision conditions, their ability to view information visually will be compromised if required to do so over long periods of time.

She reported that graphics are a problem for low vision students; they can't get the 'whole picture' at the same time and (like users of magnification in general), and will need more time and often direct assistance to digest the information. Representations of three-dimensional objects are very difficult – they may need to be provided as objects.

She also reported that Braille maths items, where they rely on setting out across a whole piece of paper in the correct format (which is very precise), can present problems.

Conclusion

Experts consulted reported that in their experience wide consultation during the process of item development with stakeholders – teachers, students, parents and discipline specialists – was useful in the production of items which functioned successfully in tests. For low vision students, for example, it needs to be remembered that, even with magnification, it can take them longer to absorb material, particularly graphics and maths questions which rely on setting out.

3.2 Large Format Tests

3.2.1 In online assessment systems in use in Australia and/or elsewhere, with similar functionality, are large format onscreen tests offered as a discrete additional option? If so, on what basis?

Literature review

[See discussion under 3.1.1 Literature review for discussion of adjustments offered in NAEP; currently NAEP offers a large print version of the test and magnification.]

Expert advice

ESSA reported that adjustments are offered as part of the ESSAonline software if possible, and that students are free to use whatever other adjustments they use in classroom work. There is provision for adjustments to be reported to ESSA. Students using Braille to respond to the test are required to be notified. Schools that provide special provisions to students complete the test are required to record this on the test site. This allows this fact to be printed on the student's report.

Conclusion

[See above.]

3.2.2 Is there research-based evidence that the provision of adjustments that allow a student to enlarge the online assessment is of benefit to students with disability?

Literature review

A study by Kamei-Hannan (2008) examined the accessibility barriers to a computerized adapted test called the Measure of Academic Performance. The results showed that as magnification increased, time on the test increased and students required visual efficiency skills.

CAST advises that in the cases of either zoom or magnification functions, research clearly indicates that that the student's preference, comfort and facility with this adjustment are the primary mitigating factors. (Lusk, K. M. E. (2007)). They found that research on the impact of zoom or magnification adjustments on test validity is extremely limited, but that there is little indication that these adjustments result in violation of construct invariance.

Research by Farmer and Morse (2007), although not conducted on computer-based adjustments, does make a comparison between magnification and large print. The paper

> presents the results of Project Magnify, which was designed to increase visual reading skills in students with low vision through intensive training and practice with prescribed low vision devices for near vision. Sixteen students with low vision were enrolled in the study. The magnifier group consisted of 9 students who used low vision devices that were prescribed by a low vision clinician and who read standard grade-level-sized print with their magnifiers, and the large-print group consisted of 7 students who received large-print reading materials. All the participants took oral reading tests at the beginning and end of the school year, and their reading rates and comprehension levels were recorded. Results indicated that that the reading abilities of the magnification group improved more than did that of the large-print group. Students in the magnifier group made significant improvements not only in reading speed, but also in comprehension.

Expert advice

All experts consulted indicated that for low-vision students, the ability to enlarge the online assessment is fundamental to their being able to access the assessment.

A panel of experts from the Northern Territory Department of Education advised that simple magnification is beneficial, so long as the student has extra time to complete the text. As previously noted, it takes longer to navigate text with magnification, and it is more difficult to find a particular place.

Conclusion

On balance, and with the proviso that extra time is required, the provision of adjustments that allow a student to enlarge the online assessment is of benefit to students with disability, and in the case of low-vision students, is fundamental to their being able to access the assessment.

If so,

3.2.3 what are the relative advantages of large format tests, device-based zoom functionality and support of magnification assistive technology?

Literature review

CAST reports that approaches to increasing the clarity of visually presented information for students with low vision generally fall into two categories: Zoom (moving from a complete, long-angle image to a narrower, short-angle image) and magnification (enlargement). Both are designed to increase the saliency of the item being viewed, and both are affected by the demands of physical movement that may be required for their use. (Bohan et al. (2010)) In the Zoom condition, access to the entire visual display is sacrificed to facilitate a focus on one or more of its discrete parts; with magnification, and depending upon the size of the visual display, the entire content may be presented in an enlarged form.

As observed above, the important determinant in the extent of the advantage is how comfortable the individual student is with using the adjustment.

Expert advice

The panel of Northern Territory Department of Education experts advised that the effectiveness of zoom functions will depend on the particular technology used. They currently use a program called Zoom Text[5] which they report is quite difficult to use, and requires a lot of practice to enable users to move around the screen. It also takes a lot of time. It enlarges a small part of the screen, and the low-vision student has to be able to navigate what other students see in one screen. In the experience of the departmental Vision team member, children in Year 3 prefer to struggle with the general enlargements they can get, as part of universal computer functionality, than use Zoom Text, because of its difficulty to master. In her opinion, Year 3 children would be disadvantaged by having to use a program like Zoom Text.

They also have students in the classroom using Onyx,[6] which is basically a camera which enlarges what it's pointed at – whiteboards or text on the desk. It can be used easily by anybody.

(See also the discussion of the research by Farmer and Morse (2007) – above, 3.2.2 Literature review.)

Conclusion

In general, experts found that the most difficult technology to master was zoom function, and that magnification is preferred on that ground. There is a report of limited trialling of magnification against large format, which found the former preferable.

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[5] http://www.aisquared.com/zoomtext
[6] http://www.freedomscientific.com/About/News/News2014OnyxDesksetHDPR

3.3   Electronic Tests

3.3.1   What accessibility functionality do students with disability who currently take NAPLAN via electronic test (interactive PDF) derive from that format?

Student interviews

The responses from the five students interviewed who reported having taken NAPLAN via electronic test (interactive PDF) are below. In general, they found that taking the test on computer allowed them to operate in a familiar environment, where they felt more capable. In particular taking the test on computer eliminated problems with handwriting, which are clearly a cause of anxiety and contribute to the difficulty of taking the test.

School 11:

Student A, Year 7, autism spectrum disorder as well as dysphasia; slow ability to learn; has difficulty with abstract thinking, however if interested picks up things quickly.
How does this format help you to do things that you would otherwise find hard to manage?
Helps me with the writing, teachers can see my work.
Is there anything else you use or know of that can do this better?
Chromebook - this helps me.

Student B, Year 7, complex needs; borderline intellectual disability; dyslexic; fine motor difficulties.
How does this format help you to do things that you would otherwise find hard to manage?
Helps me with my handwriting spelling and reading.
Is there anything else you use or know of that can do this better?
No - computers are the best option these days. Chromebooks, I use these daily, they help me with handwriting spelling and reading.

School 19:

Grade 5 student with autism
How does this format help you to do things that you would otherwise find hard to manage?
I can type quickly and I liked using the computer. My writing is very bad. I like reading and could read the screen easily. I liked to be able to scroll down and concentrate on each paragraph. I use a lap top all the time and find computer easy to use.
Is there anything else you use or know of that can do this better?
The scrolling is good and I can concentrate on one paragraph at a time. Using the mouse is easy.
If the tests were on computer in future, would you still need interactive PDFs or are there other things that you'd prefer to use?
I like the idea of a game format so that the test is fun to do. I think that playing games is the best way to learn. I like learning through games and I learn faster. I prefer to click on things – multiple-choice and pick the right answer.

I like to be able to type a story onto the computer but the extended story was difficult. I had trouble thinking of what to write and I was under pressure and became anxious.

School 21:

Grade 3 student with no formal diagnosis, but who needs regular support in class every day

How does this format help you to do things that you would otherwise find hard to manage?

It was a bit complicated. The tasks were hard; there were tasks I've never done before.

I know how to answer the questions on the computer; I could answer the questions more easily on pen and paper.

I like using the computer a lot.

School 22:

Grade 7 student with dyslexia

How does this format help you to do things that you would otherwise find hard to manage?

Working on the computer makes my work neater and easier for markers to read. I have poor pencil control and my handwriting is messy and often illegible. I often run out of space to write answers because of my large handwriting. I find it easier using the computer to add or delete information; it turns out very messy on pen and paper. I don't like the way it looks on the paper.

Is there anything else you use or know of that can do this better?

In Junior School, I used a software program called U-Word or Q-Word [she wasn't sure; it was WordQ7]. It is unavailable in the Senior School [where she is now] but I still use it at home.

When using this software it recognises when I make a spelling error and gives me some alternative spellings. I don't have to recognise that I have made a spelling error.

It also helps me when I want to do descriptions. I can click on the word and it will offer adjectives (dark, light etc).

If the tests were on computer in future, would you still need interactive PDFs or are there other things that you'd prefer to use?

PDF was easy to understand and use and it made it easier for me to fix spelling and add grammar. [However she feels the WordQ software is much better and she would prefer that to be incorporated into NAPLAN tests.]

Student responses to the use of digital test formats are also canvassed in the Literature review at 3.6.1, where interviews found that '[m]ost students reported a preference for using the digital paper to a scribe because they appreciated the independence that it offered.'

Conclusion

Students who had used the interactive PDF format of the test were in the minority, but of those who had used it, most found it had advantages over the pen-and-paper test; they found typing easier than handwriting, and liked being able to click multiple-choice item answers. Of those who had preferences

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[7] http://www.goqsoftware.com/

for online functionality, those preferences were for formats which were like computer games, or which offered corrective suggestions.

3.3.2 Are there any online assessment platforms in use in Australia or elsewhere, that offer students interactive PDFs as a discrete accessibility option?

   If Yes,

3.3.3 in what ways is the functionality similar to / different from the planned NAPLAN Online functionality?

3.3.4 what specific user needs do the interactive PDFs meet, that cannot be met by the planned NAPLAN Online functionality?

3.3.5 would additional functionality other than interactive PDFs best meet these needs?

3.3.6 is this functionality compatible with standardised testing and the NAPLAN test construct?

Literature review

No research literature was found which specifically concerned the availability of interactive PDFs as a discrete accessibility option.

Expert advice

None of the expert panel from the Northern Territory Department of Education (the Manager, Disability Services, the Coordinator, Vision Team or the Coordinator, Hearing Team) was aware of the availability of the interactive PDF format of the test, or knew of other tests which offered as a discrete accessibility option. The expert panellists from the New South Wales Department of Education and Community knew of the PDF version of the test, but were not aware of others.

Conclusion

Neither the research literature nor expert interviews revealed anything about online assessment platforms which offer PDFs as a discrete accessibility option. As a result, we were unable to make comparisons with the planned NAPLAN Online functionality.

3.4   Oral/sign support

3.4.1 Are oral and/or sign support used in conjunction with assessment delivery platforms in Australia and/or elsewhere?

Literature review

A recent study (Cawthon et al, 2011) aimed to measure the effects of an American Sign Language (ASL) adjustment on standardised test scores for students who are deaf or hard of hearing in reading and mathematics. The reason that students who are deaf or hard of hearing may be tested using ASL is that they

> often need accommodations to participate in large-scale standardized assessments. One way to bridge the gap between the language of the test (English) and a student's linguistic background (often including American Sign Language [ASL]) is to present test items in ASL.

Although the trial testing was delivered on a DVD, it may be instructive for this review's purposes. 'The study was administered via a DVD that was shown to students either on individual computers or as a group with an LCD projector screen … Only one site (three students) completed the study on individual computers.'

The issue that prompted the study is described as follows:

> There is concern that changing the language of a test item, such as with an ASL accommodation, may invalidate the accommodated test score by changing the meaning of the test content (Crawford & Tindal, 2004). Language translations are rarely exact, and the translation from English to ASL involves different grammatical structures and ways of representing information. As a result, an ASL-translated item may be harder, easier, or simply measure a different construct than the original item. Although there is a tremendous need for such research, the field has not yet systematically measured the effects of an ASL accommodation on standardized test scores, particularly those used in high-stakes decision making within accountability reforms (e.g., No Child Left Behind Act of 2001 [NCLB]). Furthermore, we do not know how test item and student characteristics may interact with the effects of an ASL accommodation (Cawthon, Ho, Patel, Potvin, & Trundt, 2009; Sireci, Scarpati, & Li, 2005).

The authors note that while research on assessment adjustments in general continues to grow, it 'offers few conclusive findings on whether they facilitate fair and accurate measurement of student knowledge and skill. Findings differ depending on the type of adjustment, the nature of the student's disabilities, and the test content.'[8]

They conclude:

> State assessment polices that restrict the use of ASL accommodations for test items are based on the assumption that changing the language of the assessment changes the construct being measured by the test item. In a broad sense, the results of this study suggest that inflated test scores of students who have test items administered via ASL may not be a real concern. (Although there may be related issues of familiarity with the interpreter and variability in different interpreters that continue to be central to policy decisions.)

But

> although language certainly plays an essential role in assessment, what we found in this study is that translating test items into ASL may not address the needs SDHH have when they participate in standardized assessments.

CAST report that this study did not find that sign language adjustments on reading and maths assessments increased or decreased the achievement of students who are deaf or hard of hearing. The discussion of this study also noted that, for this 64 student sample of fifth-eighth grade students, the provision of both the text (print) version of the test along with sign language support appeared to

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[8] For the purposes of this review their finding that 'read-aloud accommodations, where test items are presented orally to the student (instead of the student reading the test items)' are most subject to variable research findings is relevant. 'Results range from demonstrating that accommodations are valid and beneficial (e.g., Fletcher et al., 2006; Schulte, Elliott, & Kratochwill, 2001), that they have no effect (e.g., Fuchs, Fuchs, Eaton, Hamlett, & Karns, 2000), or that they may even create an unfair advantage for students who use them (Sireci et al., 2005).'

yield the most accurate measure of student achievement. In summary, the results of this study found no indication of construct invariance of student achievement inflation as the result of sign language support.

CAST advise that since physical and sensory capabilities are not relevant constructs on large-scale academic assessments, students who are deaf or hard of hearing are routinely provided with adjustments for any testing materials or instructions delivered orally.

CAST report that the literature on sign language adjustments for students who are deaf or hard of hearing is sparse. As with any other disability, those classified as students who are deaf or hard of hearing may be those with congenital hearing impairments, cochlear implants, deaf parents (thus the use of sign as a primary language); recently disabled, etc. Further, within these populations facility with sign language may vary widely. Factors influencing the use of sign language on an assessment include the student's academic level, the test subject matter, the student's preferred language and that used in the classroom for instruction. (Cawthon, S., and the Online Research Lab. (2008)) Teachers of these students and other experts recommended that students whose academic performance was within two years of the achievement standards participate in the large scale assessment with sign language adjustments (if appropriate) rather than an alternate assessment with modified achievement standards.

Expert advice

The Northern Territory Department of Education Coordinator, Hearing Team advised that a sign support person for students who are deaf or hard of hearing is ideal. In terms of whether an embedded signer would be satisfactory, she would defer to people from other states who have more knowledge: 'In the NT there is a mixture of people from other states, and so we need to have a mixture of AUSLAN sign dialects (North and South). In other states it's much more one or the other (either Northern or Southern AUSLAN signs).' She believed that having a person signing if the student is doing the test in the same room could be quite an issue – it can make them feel that they stand out and can cause embarrassment.

The NSW Department of Education and Community Complex Support Sensory Advisor reported as follows:

> For the audio components of video stimulus in the test you would need closed captioning, but also AUSLAN signing, and for students with vision impairment, for the video component, audio description.

She points out that there is a slight variation in signing from what is called 'Northern AUSLAN', which is from the north coast of New South Wales up to Queensland, and 'Southern AUSLAN', which is in Victoria, Tasmania, South Australia and Western Australia. It would be difficult to judge whether the regional variations would make a significant difference to the translation for it to become an issue without seeing the video. She would need to know what level of language would be used; it would depend very much on what was being interpreted.

Conclusion

Oral/sign support for any kind of assessment undertaken by deaf or hard of hearing students is often given in Australia and in the United States. Although further research is needed in this area, indications at present are that that this support is necessary for students who are deaf or hard of hearing.

If so,

3.4.2 to what extent is the functionality of the system/s similar to or different from the planned NAPLAN Online functionality?

Literature review

No research literature was found which specifically concerned the extent to which the functionality of the system/s similar to or different from the planned NAPLAN Online functionality.

Expert advice

If embedded or avatar-based signing is envisaged for the online test, the Expert advice at 3.4.1c will need to be considered.

Conclusion

[See Expert advice above.]

3.4.3 Are there any user needs that could not be met by the planned NAPLAN Online functionality if oral and/or sign support is not offered in addition?

Literature review

See expert advice below.

Expert advice

If the planned NAPLAN Online functionality for deaf or hard of hearing students is restricted to captioning of in-system video and embedded video or avatar-based signing, then there needs to be provision made for other situations during the test administration in which oral language is used. Consideration needs to be given to signing for teacher instructions and (where applicable) to signing for support person clarification of items. Consideration needs also to be given to regional differences in AUSLAN, and varieties of AUSLAN use (key signing, and admixture of, for example, Indigenous sign systems).

Conclusion

See Expert advice above.

3.4.4 Could these needs be met by additional system functionality (rather than a physical support person) and if so, what additional functionality would be required? Would this functionality be compatible with standardised testing within the NAPLAN test construct?

Literature review

Russell, Kavanaugh, et al. (2009) investigated the use of integrating video recordings of signed presentation of test content into tests for students who are deaf or hard of hearing, and of developing recordings of signed presentation by using avatars rather than humans. The advantage of recorded human signed presentations is that it would standardise the presentation (as opposed to the use of live human signed presentations of test material) and for the avatar-based version there would be decreases in cost. They note, however, that 'because avatars are relatively new and are not as expressive or lifelike as humans, they may not be as effective as humans in presenting content in a clear and interpretable manner'.

The study

employed a randomized trial to compare the effect that a computer-based provision of the signed accommodation using a recorded human versus a signing avatar had on students' attitudes about performing a mathematics test and on their actual test performance. This study found that students generally reported that it was easy to perform a mathematics test on computer, and that both the recorded human and the signing avatar tools were easy to use and to understand. Students also reported a strong preference for performing future tests on computer, and generally preferred using the recorded human and the avatar for future tests rather than a DVD. While students also reported that they preferred the recorded human rather than the signing avatar, this preference did not affect test performance. The use of the recorded human and the avatar did not have effects on either the amount of time required to complete the test items or on students' performance on the test items. Implications for future research are discussed in light of these findings and the shortcomings of this study.

Expert advice

Embedded AUSLAN or avatar sign video may require consideration of the regional differences in AUSLAN and variations such as key signing and/or Indigenous sign systems used in instruction.

Conclusion

These functionalities (embedded avatar or video recorded signing systems) could be added to the online test without affecting test performance; see the caveat in Expert advice (above) regarding differences in sign systems, and in the Literature review regarding the lack of expressiveness in avatar signing systems.

3.5   Spelling

3.5.1   What non-text alternative/s to audio files are available for hearing impaired students?

3.5.2   What are the pros and cons of each method, and which alternative or combination of alternatives would be best suited to the onscreen testing of Spelling for NAPLAN?

Literature review

No research literature was found which specifically concerned the availability of non-text alternatives to audio files for students who are deaf or hard of hearing. CAST did not report on alternatives.

Expert advice

Northern Territory Department of Education Coordinator, Hearing Team advises that signing spelling is an issue – if a word doesn't have its own sign, then it has to be spelled. She reports that 'Years ago I interpreted for a student in spelling. He didn't recognise the word signs, and he dropped out early while the others were continuing with the test. It was embarrassing for him.' She believes that spelling words need to be checked to make sure there is at least an acceptable AUSLAN sign, generic enough to be used across Australia 'not Northern or Southern specific'. That would eliminate the need for finger spelling.

She points out that there is also the problem that if a student who can hear isn't absolutely sure how to spell a word, they can make an attempt when they hear the word from clues in its sound; deaf children who are presented with a sign do not have the same clues.

Conclusion

Spelling tests for students who are deaf or hard of hearing are problematic; finger spelling is not an option for obvious reasons, and there are limitations to whole-word signs in AUSLAN, and regional differences would have to be taken into account. The use of graphics is impractical, since pictures can accurately be given a variety of names. Even with single-sign words, signed words do not contain the same clues for spelling as oral renditions. It may be a violation of construct validity if spelling words were to be limited to those capable of single-sign AUSLAN rendition.

3.6   Scribe

3.6.1   Are there any online assessment systems in use which support motor assistive technology and also support the use of scribes / computer users?

Literature review

[See the discussion of NAEP in the Literature review at 3.1.1.]

CAST reported on research (MacArthur, C. A., & Cavalier, A. R. (2004)) which investigated whether dictation is an appropriate adjustment for tests of writing. The researchers used Tindal & Fuchs' (Tindal, G., & Fuchs, L. (2000)) description of appropriate adjustment as 'a change in testing conditions to remove barrier to valid assessment based on student's disability without changing the nature of the construct assessed.' In maths and reading comprehension assessments the goal is to evaluate students' content knowledge and skills, and thus dictation is perceived as an appropriate adjustment that improves the accuracy of the assessment since it removes a construct irrelevant barrier – decoding text. Similarly, in writing, the goal of assessment is to evaluate students own writing. If students difficulty with writing mechanics – putting letters together to form a word – and reading text – decoding what they wrote when editing - interfere with their ability to write a composition, then dictation which removes both barriers may be an appropriate adjustment.

MacArthur and Cavalier studied the effects of dictation on the writing performance of high school students with and without learning disability. A total of 31 students, 21 of whom were learning disabled (LD) took three writing tests under 3 different conditions – handwritten composition, dictating to a human scribe, and dictating via speech recognition software. Prior to the test, all students were trained to use the speech recognition software at an acceptable accuracy rate. Each essay was scored for overall quality and for length, vocabulary, and word error. LD students who used speech recognition to compose showed a statistically significant improvement[9] in quality of writing (.41) using speech recognition compared to their handwritten composition. Compositions completed with a human scribe showed even larger effect size (1.31) compared to handwritten ones. There was no statistically significant differences in quality of writing for non-learning disabled (NLD) students

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[9] Elliott, Davies et al. (2012) say that while effect sizes in testing accommodations may appear small, the literature suggests that overall

effect sizes of 0.40 or higher for students with disabilities may reflect a meaningful impact from testing accommodations. Indeed, the differential boost reported by Kettler and Elliott provides evidence of an interaction that may heretofore have been underestimated. As applied to the accommodations literature, these results suggest that, for some students, appropriate accommodations may indeed reduce barriers and yield more accurate measures of achievement.

across all three conditions. The best compositions were achieved when dictating to a scribe because students were free to concentrate on the content, organization, and wording of the essay without concern for text production. The compositions completed via speech recognition didn't yield as high a score as those under the scribe condition because the speech recognition technology may have introduced additional burdens. Students had to speak clearly and monitor their own writing errors.

With respect to construct validity, this study and others conclude that if the purpose of the written assessment is to measure content knowledge (history, social studies, science, etc.) then the use of dictation, computer-supported or human scribe, does not result in invariance. Similarly, if the construct is written composition, then neither form of this adjustment was found to invalidate that goal. If, however, the construct was to assess the mechanics of writing specifically, then computer or human support would not be appropriate.

Regarding other uses of human or computer-supported reading and writing support, the Scottish Qualifications Authority's (SQA) 2005 report of students with disability' request for reading and writing access adjustments on the national assessment, a slight difference was noted between the number of requests for readers (15,740) and request for scribes (14,505). (Nisbet, P. (2012)) It was hypothesized that if paper-based exams were available in an accessible digital format, then students with reading disabilities would be able to access the text as well as enter their responses to test items independently without readers and scribes. Staff and students who used accessible digital papers were interviewed to determine which adjustment was preferred. Subsequently a series of user trials were conducted to test the feasibility of producing accessible assessments and their usability as test adjustments for students with reading disabilities. In 2004, a user trial of 31 students was conducted comparing the use of text-to-speech with digital papers to readers and scribes with paper versions of the same exams. Most students reported a preference for using the digital paper to a scribe because they appreciated the independence that it offered. Student preference for text-to-speech or human reader was variable, with some students finding it more difficult to use text-to-speech than a human reader.

Expert advice

The Northern Territory Department of Education Coordinator, Vision Team believes that scribes would still be necessary, because blind students would not be able to type as well as they can Braille, in Year 3 in particular. 'One thing we say, as vision teachers, to schools, is that they need to teach the students we support to type; some take it on, and some don't.'

The Northern Territory Department of Education believes firmly that students who are physically unable to write will still need scribes.

They have students whose main mode of communication is signing.

> Some students may also have physical difficulties, and with limited time the use of a scribe may get a more accurate picture of the student's expressive language. Some students use a community sign language (not AUSLAN) as their first language and so the selection of who the scribe should be is very important.

NSW Department of Education and Community Manager, Braille and Large Print Services advised that in her experience, from the vision impaired point of view there may not be many if any students requiring a scribe. Those who did were either unable to Braille the answer, or were severe low vision and were not able to write it. She says that generally the writing is either very big, but sometimes

quite small even though the print size of the test might be very big. Again, this might be linked to whether they are able to adjust the screen font size themselves; if they are, then their responses may be big enough for them to see and read.

The Leader, Support and Development, Learning and Engagement pointed out that the need for scribes would depend on what the student is using outside the test environment; even if the adjustment was an effective means of allowing the student to write, but they weren't used to operating like that in class, then they may still need a scribe.

Conclusion

In Australia the ESSA test is delivered online, and the use of any adjustments used in the classroom is allowed by ESSA. Research literature and expert opinion deem the use of scribes or speech recognition technology to be an appropriate adjustment per se; no research or expert opinion suggests that it would be inconsistent in the online environment where motor assistive technology is supported. Some research suggests that students with disability preferred digital platforms to scribes (assuming they were able to use keyboards) because they give independence. (For the current situation with NAEP, see the discussion under Literature review at 3.1.1.)

If yes,

3.6.2 in what ways is the functionality similar to / different from the planned NAPLAN Online functionality?

No research literature was found which specifically concerned the similarity or difference of the functionality of online assessment systems which support motor assistive technology and also support the use of scribes / computer users. However, we have advice from an expert from ESSAonline, which is an interactive multimedia assessment which supports video and audio, and is also available in a Braille version, that ESSAOnline supports a range of functionalities, including the adjustments proposed for students with disability taking the NAPLAN Online test.

3.6.3 what specific user needs are met by use of a scribe / computer-user, that cannot be met by the planned NAPLAN Online functionality (and is there an evidence base demonstrating the effectiveness of the use of scribes for particular needs, and isolating the effect)?

Literature review

See the discussion under Literature review at 3.6.1.

Expert advice

If NAPLAN Online functionality analogous to a scribe / computer-user is limited to keyboard access, then there are still circumstances under which students will need a scribe / computer user. Those circumstances are detailed in 3.6.1 under Expert advice.

Conclusion

Where students with disability are unable to handwrite or use computer keyboards or Braille, they will still require the support of a scribe / computer-user, unless they are able to use speech recognition technology.

3.6.4   would additional functionality other than support of scribes / computer users best meet these needs, and if so, is this functionality compatible with standardised testing and the NAPLAN test construct?

Literature review

See the discussion of speech recognition functionality (MacArthur and Cavalier (2004)) under 3.6.1 Literature review.

Expert advice

Discussions with experts did not raise any suggestions of additional functionality other than the support of scribes / computer users.

Conclusion

CAST's conclusion from surveying the literature about speech recognition functionality is as follows: 'if the construct is written composition, then neither [they also considered physical scribes] form of this adjustment was found to invalidate that goal. If, however, the construct was to assess the mechanics of writing specifically, then computer or human support would not be appropriate.' The research (MacArthur and Cavalier (2004)) they cite found statistically significant improvements over handwritten essays for LD students using either human scribes or speech recognition technology (the students having been trained in the use of the technology) with the larger effect sizes for human scribes, because students were freed from the necessity to speak clearly and to monitor their own work for errors, and could concentrate on content. There were no statistically significant differences in quality of writing for non-learning disabled (NLD) students across all three conditions (handwriting, speech recognition technology and human scribes).

3.7   Support Person

3.7.1   In what ways are support persons (other than scribes and oral/sign support persons) currently utilised in the pen and paper NAPLAN context?

Staff and student interviews

The responses from students and staff interviewed who reported having a support person (other than scribes and oral/sign support persons) are below. Of note is the fact that none of them discuss the functions of the support person as they are designated in the test protocols, and instead consistently describe a much broader role, which includes emotional support and ensuring that practical matters are taken care of.[10] Both staff and students are of the opinion that taking the test would be at least more difficult, and perhaps impossible without this kind of support. The emotional and practical support which students and staff felt was necessary is not necessarily directly connected to the student's disability; a dyslexic student,[11] for example, may suffer from anxiety and frustration during a test. There was a common belief that what for these students and staff were the 'real' functions of a support person could not be reproduced in the online version of the test. This is in spite of the fact that the functions designated in the protocols ('shading bubbles indicated by the student, or writing

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[10] One student at School 9 had a narrower view of what the support person could do: 'they are not allowed to read the work or even the questions. They are only there to read the instructions'.

[11] For example the Year 7 student at School 16.

short responses or answers dictated by the student for the tests') could likely be accomplished by at least some students in a computer-based assessment without support.

Reviewers formed the impression that the broader understanding of the support person function had a practical and beneficial effect on students with disability taking the test; test conditions are stressful in many cases and to varying degrees for students without disability.

School 7:

Grade 5 student with chromosomal damage, hearing impairment, delayed growth, poor muscle strength.
I am used to working with someone as I get tired easily. I need someone to make sure I take my breaks, who knows when I am tired and I can rely on. I need the instructions read to me. I read the booklet.
Staff: The student has an issue with muscle tiredness and strength and needs extra time. The support person is with the student to make sure she is comfortable, be enthusiastic, make sure she is on track and able to finish. The student often gives up if things are too hard and needs someone to make sure she can do the work at her own pace. A support person knows the student and when they need a break.

School 8:

Year 9 student with autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD).
Only to give me breaks and let me know how much extra time I have. I can work independently with technology.
Staff: To offer encouragement, provide support. Students with disability often need breaks and emotional support and encouragement. The teaching assistant offers emotional support and is there to make sure that the students are comfortable, they are not disturbing others and in an environment that is calm.

School 9:

Year 7 student with learning difficulties.
The support person jogs my memory and keeps me going, wakes me up and encourages me. He can read my moods and he uses a quiet space.

Year 7 student with mild cerebral palsy (CP) and attention deficit disorder (ADD).
There is always someone in the room to help but with NAPLAN they are not allowed to read the work or even the questions. They are only there to read the instructions. I did not need extra time and had no breaks.

Staff:

They are there to offer support and encourage, to make sure the students take breaks. They recognise the emotional state of the students. They make sure the students use their extra time. Students need to be supervised as they are separated from the others.

School 10:

Year 5 student with heart difficulties hearing aid; autism; short term memory loss; low muscle tone which gives him coordination and spatial difficulties.

They know my needs, sometimes I can play in the playground for a short time (gives me a break).

[In the future, on the computer] Will help me read out the questions and help me to understand the questions. They will get special equipment for me, for example, my chair.

Staff:

[The support person assists by] Knowing the student. Directing the student to main aspects of the task. Knowing when to take a break, taking a drink, and know the curriculum needs.

The support person can prevent the student from becoming stressed/fatigued, can provide the breaks and positive encouragement.

[Will online delivery replace this person?] No. There are students who will always need extra help to support them in understanding and responding to NAPLAN.

This student cannot work independently with any online program. Students with disability will always need extra support from a person.

School 15:

Grade 3 student with an intellectual disability.

She helps me to take a break when I need one.

Staff:

The support person knows the child and can deal with the child's emotional distress, the support person keeps them on track, encourages them to finish. Support for emotional needs is not something that a computer can do. The student with ID needs to be encouraged and supported to get him to the end.

The support person understands the student, their family history and background and can work with the day to day issues that impact on the student.

The student gives up easily and needs encouragement and reminding. Testing is stressful and he has to concentrate in a way that he usually doesn't. He needs support to be able to manage his breaks and time. He requires a quiet environment as he makes noises that disturb the other students and he is too distracted by others around him.

School 16:

Year 7 student with dyslexia.

It's really good when the support person is someone you know well and trust. The assistant teacher relaxes me, makes me laugh, gets me back on track, makes sure I'm not angry or stressed.
Staff:
He gets anxious, and it's made worse because his handwriting isn't quick.

School 17:

Grade 5 deaf student.
Gave me confidence and breaks when I needed them. Helped me with time.
Staff:
As a support person she assists the students to have breaks and to just be generally supportive and give them confidence in what they are doing. The physical adjustments might be suitable on the computer but the support person provides the emotional support that students with disability need. For the deaf they need extra time and perhaps a screen interpreter - the human touch.

Conclusion

Students who have had a support person (other than scribes and oral/sign support persons) generally reported that the person was of practical use (reminding them when they should take breaks, telling them how much time they had left) and offered emotional support – keeping their moods even, making sure they stayed on task). Staff members were firmly of the opinion that these functions were invaluable.

> **3.7.2 Will the planned NAPLAN Online functionality replace the need for these support persons?**
> **If not,**

> **3.7.3 In what ways does it fall short?**

> **3.7.4 What additional functionality or other features would be required to meet the needs of these students?**

> **3.7.5 Would there still be a need for support persons for some students?**

Student interviews

School 7:

Grade 5 student with chromosomal damage, hearing impairment, delayed growth, poor muscle strength.
The test would be a bit trickier for me; it is hard to type so much all at once and I need the confidence to keep going.

School 8:

Year 9 student with ASD, ADHD:
Could manage without the break and time reminders.

School 9:

Year 7 student with mild CP and ADD
Believes that there is always someone in the room when he does NAPLAN, so this would not be a problem.

School 15:

Grade 3 student with an intellectual disability.
Needs to be reminded when to take breaks.

School 16:

Year 7 student with dyslexia
Would still need the support described above.

School 17:

Grade 5 deaf student
The teacher of the deaf could explain in English and translate into AUSLAN. The teacher of the deaf would always be needed to help clarify some of the language.

Expert advice

NSW Department of Education and Community

Manager, Braille and Large Print Services: People using Braille don't use bubbles – up until now. There has been another mechanism for allowing Braille students to access multiple-choice questions.

Leader, Support and Development, Learning and Engagement: I would imagine that it has the potential to remove the need for that sort of support. [Agreed that a support person may still be needed for students with motor disabilities.]

Northern Territory Department of Education Coordinator, Vision Team: Multiple-choice is even harder for a blind child to do. They couldn't move a mouse around, so they would still need someone to shade the bubbles.

Coordinator, Hearing Team: For deaf or hard of hearing kids, I don't think it would completely eliminate the need. The whole thing is about their ability with [literacy and numeracy], not so much the technology. You want to give students a chance to show what they can do [in literacy and numeracy] rather than whether they can use the technology – most of them are pretty good at the technology, but are not necessarily equivalent language users to their hearing peers.

Conclusion

The expert advice focused on the motor assistive support, and most thought some mechanical functions in a support person could be replaced by the technology. One person thought that blind students (and presumably they meant those who could not Braille) would still need help to shade bubbles.

Students thought the technology would remove the need for mechanical tasks, but some thought other supports (especially emotional) would still be necessary. One thought that there would still be a staff member in the room, so there would be no need to worry about other support.

3.8   Assistive Technology/Computers

3.8.1   To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online?

Staff and student interviews

Responses from staff and students with disability who currently NAPLAN using assistive technology/computers on the extent to which the needs of the students will be met by the functionality that will be supported in NAPLAN Online are below. A clear theme emerging in these responses is that the ability to type written responses, for those who have a degree of facility with computers and keyboards, is of assistance in undertaking the test. They are apt to tire less easily than when they handwrite and they are likely to be less anxious about producing an acceptable written product. Students will need to be familiar and comfortable with any assistive and computer-based technology before using them in tests. For some students, those who are younger and have not yet acquired keyboard skills, and those for whom their disability means that a desk top computer is difficult to use,[12] a scribe may still be necessary.

Some of the technologies currently used by students in the classroom, and suggested as ways of addressing perceived shortfalls in the NAPLAN Online proposed adjustments,[13] would either be

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[12] For example the Year 3 student in School 18 who has cerebral palsy.

[13] Dragon voice recognition program, Siri, Snap Type, DynaVox, Predictable, WordQ

outside the current test protocols, or require tablets or other devices to be used. Some staff brought up the question of the hardware being contemplated by ACARA; in some schools, for example, tablets are provided to students, and they are familiar with them and the apps they use on them, and in other cases (see above) the student's disability makes a tablet preferable. On the other hand, some students find it easier to type on laptops or desktops than on tablets.

The reviewers found that in schools, students, staff and disability experts have found, among commercially available products, a range of adjustments which make teaching and learning more accessible for students with disability. This process is like those used in the USA, where support teams work out individual adjustments for each student, and those are also available to the students during testing. In part this reflects a more litigious culture, but it is also demonstrates an approach which generally values access above considerations of unfair advantage or measurement invariance. NAPLAN Online will need to consider a uniform national approach to allowing adjustments, but we feel that over time consideration should be given to a more flexible approach to the allowance of particular adjustments.

School 4:

Staff:

Have you supported students to use assistive technology, computers to complete NAPLAN (other than interactive PDFs)?

Yes – have used computers, but only for the writing task section of the test. We turn the spelling and grammar checking functions off, they type up their responses and we print them out. We do this for students with cerebral palsy or who have fine motor skill deficits – i.e. if their handwriting is so terrible it can't be read.

To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online?

It will support a lot of kids (as well as learning support kids).

Do you think that the online version of NAPLAN will be as accessible for students with disabilities as their current experience for the pen and paper version?

My concern is particularly for younger kids who aren't familiar with keyboards, particularly with the writing task, and in the short answers to some extent. If they're not familiar with the keyboard – I don't know how the timing works with the online [version], whether it cuts out after a certain time. For students who are familiar with keyboards, the online test will be the same.

If it does not adequately meet their needs, in what ways does it fall short?

[See above.] Also, if the online version offers stimulus, will it be visible while students are typing, or will they have to toggle between screens?

Are you aware of assistive technologies/computers that have such functionality or other features?

No. We do have iPads for kids in Years 7 and 9, but not for the lower grades.

School 7:

Grade 5 student with chromosomal damage, hearing impairment, delayed growth, poor muscle strength.

What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?

I used a laptop and a scribe who typed my story. I am a faster typist than a writer and my writing is very hard to read. I often have trouble reading it back to myself. My handwriting is poor and a computer makes it easier to read and to check over my work. My stories are written down by a scribe but when I check I am able to zoom in and out.

Staff:

To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online? Do you think that the online version of NAPLAN will be as accessible for students with disability as their current experience for the pen and paper version?

It depends on the individual student. One student is happy with the pen and paper. She is comfortable with this and enjoys reading. Writing is difficult and very tiring for her.

As long as their typing skills are good, there would not be a problem with the online version. Slow typists would find it hard.

School 8:

Year 9 student with ASD, ADHD

What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?

It was very useful to be able to use the computer; I type better than I write and I concentrate better when I am not worried about my handwriting.

Staff:

To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online? Do you think that the online version of NAPLAN will be as accessible for students with disability as their current experience for the pen and paper version?

Being able to type answers when their handwriting is poor, or they are very slow when writing.

School 9:

Student A, diagnosed with learning difficulties
What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?
I used a laptop and used Word to produce a story, then printed it and then handed it in. I was not allowed to have spell check or grammar check.

Student B, diagnosed with mild cerebral palsy and ADD
What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?
I use a computer in class, but did not use it for NAPLAN.
Thinking about your other experiences of using computers for school work (especially tests) if NAPLAN was a computer-based test in future, what would you need the people making the tests to do or provide, so that you could access the test?
It would be good to type answers onto a computer, I can type quickly. I would prefer a computer to do the work as my handwriting is poor.
Staff:
To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online? Do you think that the online version of NAPLAN will be as accessible for students with disability as their current experience for the pen and paper version?
The students are often slower on the computer as their typing skills are not very good. They do not want to appear different to the others. They usually use a quiet room so that they can take breaks, have support when needed and can have the questions read aloud. Using the computers for some did not help. It would be better for some - those who have good typing skills.

School 10:

Staff:
To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online? Do you think that the online version of NAPLAN will be as accessible for students with disabilities as their current experience for the pen and paper version?
The future functions of NAPLAN will assist more students. Some students will continue to require one-to-one support. The functions of the proposed online NAPLAN will enable more students with difficulties to access the tasks.   **If it does not adequately meet their needs, in what ways does it fall short?**

I find this difficult to respond to. There will always be students who need one-to-one support even with the added functions of the future NAPLAN. Some students need physical support breaks, drinks, special equipment e.g. a special chair and some students will get very tired by sitting at a computer for long periods.

What additional functionality or other features would be required to meet the needs of these students?

Reading would need to be assisted, voice computer. Needs to provide clear instructions. Having words - text read to the student in a clear and slow way will assist comprehension and hence responses to questions.

Are you aware of assistive technologies/computers that have such functionality or other features?

Have used different technologies to work with students e.g. iPad, fingerprint[14] to play games.

School 11:

Student A, Year 7, age 12, autism spectrum disorder as well as dysphasia; slow ability to learn; has difficulty with abstract thinking, however if interested picks up things quickly.

What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?

When I am writing I find it is much easier for me to type than to write.

Thinking about your other experiences of using computers for school work (especially tests) if NAPLAN was a computer-based test in future, what would you need the people making the tests to do or provide, so that you could access the test?

Make the procedures easy to follow for students - make the boxes clear and the graphic context of the text, how it was on the PDFs.

Student B, Year 7, complex needs; borderline intellectual disability; dyslexic; fine motor difficulties.

What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?

Computers make reading, handwriting, and spelling easier for me; if I make a mistake I can backspace and correct it.

School 13:

Staff:

To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN

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[14] http://www.fingerprintplay.com/about/

Online? Do you think that the online version of NAPLAN will be as accessible for students with disabilities as their current experience for the pen and paper version?

All students in Year 8 have iPads; our supported students also have iPads. Yes, the proposed functions will assist this student.

If it does not adequately meet their needs, in what ways does it fall short?

Voice recognition program that is effective, needs to have an audio file to record own voice, e.g. the essay that they need to write, so they can read it back to themselves and then listen to it, and for some of them it makes more sense. This audio file is available with some programs when using the iPad.

Are you aware of assistive technologies/computers that have such functionality or other features?

iPad version of Dragon - voice recognition program.[15] Students are using the Dragon program and it provides with them with voice recognition.

School 14:

Student Year 7, low muscle tone in hands.

What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?

I use iPad, school computers and notebooks, these help me with my writing and I don't need help with anything else.

School 15:

Staff:

To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online?

A voice over for the vision impaired would be good.

Do you think that the online version of NAPLAN will be as accessible for students with disabilities as their current experience for the pen and paper version?

The student needs a support person and has to be told when to take a break. Any adjustment would not replace the need for a person who can identify the emotional needs of the student.

If it does not adequately meet their needs, in what ways does it fall short?

Students with anxiety disorders get overwhelmed very quickly. The whole paper on the screen would be too much; the ability to scroll down would be good.

The student couldn't follow the words on screen as he has a spatial problem.

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[15] http://www.nuance.com/dragon/index.htm

> **Are you aware of assistive technologies/computers that have such functionality or other features?**
>
> *The school accesses various apps to help students with their writing and reading. They use various modalities to write and listen to stories. They use an iPad spelling app. The student is able to pull letters down and put them in the right order.*

School 16:

> Student, diagnosed with dyslexia
>
> **What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?**
>
> *I use a laptop for the writing task. My keyboarding skills are not great, but it's easier for me to type. The physical effort of handwriting [given his condition] can become very tiring. This is particularly so at the end of a day, and if there has been stress: concentrating on words and writing them correctly is difficult.*
>
> Staff:
>
> **To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online? Do you think that the online version of NAPLAN will be as accessible for students with disability as their current experience for the pen and paper version?**
>
> *We have had some students who have motor dyspraxia. We get an occupational therapy report. They use keyboards because it's harder for them to formulate handwriting accurately and fast enough to express their ideas. Those who can use computer keyboards do, otherwise they use a scribe. Yes [the online version will be as accessible as the current version].*

School 18

> Staff:
>
> **To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online?**
>
> *The Year 3 student has cerebral palsy and uses apps on an iPad to assist him in communicating his answers to the support person. He uses an app called 'Snap Type'[16] which takes a photo of a document and he can answer each question. The scribe then writes his answers onto the paper.*
>
> **Do you think that the online version of NAPLAN will be as accessible for students with disabilities as their current experience for the pen and paper version?**
>
> *The student would still need access to an iPad to be able to communicate, take notes etc. A desk top computer is not the best technology for him to use. He finds the iPad more accessible.*

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[16] https://itunes.apple.com/us/app/snaptype-for-occupational/id866842989?mt=8

> **If it does not adequately meet their needs, in what ways does it fall short?**
>
> *Using a desk top computer has disadvantages for the student. He tires easily when sitting at a computer. He needs a special chair to anchor his feet so that he is still, he tires easily from having to sit upright for long periods at a time.*
>
> **What additional functionality or other features would be required to meet the needs of these students?**
>
> *Extra time that is spread out over the week. Being restricted to the same day means that he fatigues easily and there is less time for breaks between papers.*
>
> **Are you aware of assistive technologies/computers that have such functionality or other features?**
>
> *They have used 'DynaVox'[17] which is a machine for word processing and acts as a communication device; all words can be accessed.*
>
> *The student uses apps on the iPad to help his communication: 'Snap Type' mentioned above; 'Predictable';[18] this can be pre-programmed with phrases that he uses, it helps other children and his support people understand him, gives him a list of words to choose from, has a speaker function.*

Conclusion

The main focus in the staff/student responses was around the use of keyboards. If students have reasonable keyboard skills (and clearly not all do) then it is a distinct advantage to be able to type responses. Those who have not achieved facility with the keyboard, and have trouble handwriting, would continue to need scribes, unless they were able to use to speech recognition technology.

If it does not adequately meet their needs,

3.8.2 In what ways does it fall short?

Staff and student interviews
School 7

> Student, with chromosomal damage, hearing impairment, delayed growth, poor muscle strength
>
> **Thinking about your other experiences of using computers for school work (especially tests) if NAPLAN was a computer-based test in future, what would you need the people making the tests to do or provide, so that you could access the test?**
>
> *I would like to be able to enlarge the boxes provided for my answers.*
>
> Staff:
>
> *Having audio to support the students would be a good idea. Head phones would be ideal so that students can listen to the instructions.*

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[17] http://au.dynavoxtech.com/default.aspx
[18] https://itunes.apple.com/au/app/predictable/id404445007?mt=8

School 8

Staff:
Extra time is needed.

School 9

Student A, Year 7, diagnosed with learning difficulties
Thinking about your other experiences of using computers for school work (especially tests) if NAPLAN was a computer-based test in future, what would you need the people making the tests to do or provide, so that you could access the test?
I use the computer for all of my writing. I am faster on the computer. I am less anxious and I am good at typing. I sometimes need to have things explained and access to a dictionary or a clarifier would be good for a test.
Student B, Year 7 diagnosed with mild CP, ADD
It would be good to type answers onto a computer, as I can type quickly. I would prefer a computer to do the work as my handwriting is poor.
Staff:
They would benefit from having a voice to read out the questions and the instructions. A voice over or a speaking function would be good.

School 16

Staff:
If students with dyslexia were able to have screen readers, they could do the test with the mainstream students, using earplugs. As it is, they have all to sit in a room on their own, and each one potentially will need a scribe and a reader. That is sometimes hard to arrange; on one occasion the teacher had to make arrangements for four students at the same time.
The proposed adaptations specifically rule out font and font size selection – some students at this school would find that ability helpful.
Dyslexic students by definition have trouble reading, so if there will be no screen reader, they can't be tested even on their comprehension.

School 22:

Student, Year 7, diagnosed with dyslexia
Thinking about your other experiences of using computers for school work (especially tests) if NAPLAN was a computer-based test in future, what would you need the people making the tests to do or provide, so that you could access the test?
I would like to be able to access the WordQ software program for NAPLAN.

> *I would like more time to complete the tests.*
>
> *Some instructions were hard to understand and I didn't know what to do.*

Conclusion

Issues raised were having the ability to enlarge the boxes provided for answer and audio with headphones for instructions. Teachers were not clear about what screen readers would be available for.

3.8.3 What additional functionality or other features would be required to meet the needs of these students?

Staff and student interviews

School 7:

> Staff:
>
> *The ability to expand and magnify images and words and shadow the background to block out unnecessary information.*
>
> *Dragon would help some students; they often think and speak faster than they can type or write. Time is an issue. They need more time to process the information. A laptop to complete the writing task would be good.*

School 8:

> Staff:
>
> *Using an iPad would be useful as well. They already do "Maths online", they have apps on iPads and PDFs could be used on iPads as well.*

School 9

> Student A, Year 7, diagnosed with learning difficulties
>
> *Laptops are better; you can still use the icons. Too hard to type on iPads.*

> Staff:
>
> *Having headphones to block out the noise. A speaking function. Having a choice of iPad or laptop. There is an issue of compatibility. 90% of the students at the school have Macs, and they have BYOD, [http://technet.microsoft.com/en-us/library/dn656905.aspx] so every student has a personalised laptop. How would ACARA deal with the issue of making sure there was no spell-check, grammar, access to the internet, life of batteries, access to power etc.?*

School 16

Student, Year 7, diagnosed with dyslexia
I use Siri19 to listen to text in class. I use earplugs to hear the application [giving an oral form of the text], so as not to disturb other students in class, and because it cuts down background noise.
Staff:
There are apps like Siri that are readers which dyslexic students find useful.

Conclusion

Possible functionality and hardware requirements: speech recognition and text-to-speech functionality; the choice of using laptops or iPads [BYOD?].

3.9 Black-and-white Print format/Coloured Overlays

3.9.1 What identifiable student needs are currently being addressed by use of black-and-white print format, and/or coloured overlays, in pen and paper?

While research is unequivocal that these adjustments are not effective in addressing conditions such as dyslexia (although their proponents continue to argue resolutely for them), and doubt has even been cast on the independent existence of the conditions which they are proposed to address, their use is common in schools. This is the case even in some cases in which teachers and support persons agree with the research conclusions. State authority based experts feel that removal of the adjustments would be resisted by some stakeholders. Analogous computer-based adjustments are commonly available. There has been no suggestion that providing these adjustments disadvantages users, although one paper (Ritchie, Della Sala & McIntosh 2011) concluded that 'that parents, schools, health care professionals, and government bodies carefully consider the totality of the evidence before expending time, resources, and hope on this controversial treatment'. (p. e937) The reviewers formed the impression that removing the possibility for students to adjust the background colour of texts would serve no purpose, and might cause anxiety to students, parents and teaching and other staff.

Staff and student interviews

School 6:

Staff:
When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?
A student diagnosed as having Irlen Syndrome was sent to Melbourne for testing, and it was recommended that the student would benefit from having text on a coloured background. The school photocopied the student's class work and the NAPLAN test on coloured paper.

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[19] [http://www.apple.com/ios/siri/]

> **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?**
>
> *Yes, so long as the online functionality included the possibility of colouring the text background appropriately.*

School 9:

> Staff:
>
> **When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?**
>
> *We have a student who has scotopic sensitivity – he uses yellow paper when doing a pen and paper test. Another student uses a blue background.*
>
> **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?**
>
> *If the function provided the option of different coloured backgrounds, contrasts and brightness.*

School 10:

> Student, Year 5, heart problems; hearing aid; autism; short term memory loss; low muscle tone which causes coordination and spatial difficulties.
>
> *When reading. Helps me so that I don't jump lines and can follow the print better.*
>
> Staff
>
> **When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?**
>
> *There are colour codes for particular students. This student requires multi-colours to follow grids or tables, otherwise he loses himself in the graphs and text.*
>
> **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?**
>
> *Will assist - but will not overcome all problems experienced by some students.*

School 16:

> Staff:
>
> **When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?**
>
> *We have applied for and been granted permission to use coloured paper copies of the test – yellow, mauve and blue. NAPLAN sends us the black-and-white copy, and we make the coloured copies*

ourselves. These make a difference for dyslexic students and those (often also with dyslexia) who have Irlen Syndrome.

With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?

Yes, if they are also able to change the background colour.

School 11:

Student B, Year 7, complex needs; borderline intellectual disability; dyslexic; fine motor difficulties.
Do you ever use coloured overlays when you read? *Yes.* **How do they help you with your work?** *No, not on the computer.* **If no, why not? (e.g. Are they unnecessary when using a computer? Or is there something better available?)** *I don't seem to need it on computers.*
Staff: **When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?** *On paper when students are reading, and on some computer programs depending on the text that they are reading, to change background colour and default brightness.* **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?** *Not for all students: it will assist the majority, however some still need the colour background.*

School 12:

Staff:
When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)? *They reduce visual stress. The student feedback states that it is easier to read the text, the print is clearer.* **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?** *On iPads, you can change the background. The online functionality should be able to change the background.*

> **Are you aware of any alternatives available in the online environment other than those outlined above?**
>
> *iPads can change size of font and the background.*

School 13:

> Student, Year 10, wheelchair; cerebral palsy; movement in legs and body; speech sometimes not clear; eyes operate independently and focus independently; no visual problems; when reading print, it seems to shift and it becomes frustrating for the student; no intellectual disabilities; copes with mainstream curriculum; some delays in learning and has missed a bit of school.

> **How do they help you with your work?**
>
> *Highlighted text in different colours helps me to read the text and understand it better.*

> Staff:
>
> **When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?**
>
> *For students who find it difficult to follow print/text, and who they lose their place.*
>
> *Computers – highlight the text. Improves their spelling and students take more notice of what they are reading.*
>
> **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?**
>
> *Yes - still needed for some students.*
>
> **Are you aware of any alternatives available in the online environment other than those outlined above?**
>
> *'Read and Write Gold' program.[20] This has many functions. Students control the functions and it can highlight the words.*

School 15:

> Staff:
>
> **When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)?**
>
> *We don't use coloured overlays, but we photocopy the black-and-white test on to coloured paper. We do this for kids who are dyslexic and have trouble with the black-and-white contrast, or who have Irlen Syndrome – it stops the words moving on the paper.*
>
> **With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed?**

> *For some of our students yes, they would still need to be able to change the background colour, or have an overlay on the screen. The background colour would be ideal – it would help with kids who forget their overlays.*

Conclusion

In those schools where coloured overlays and/or coloured paper are used, staff and students are firmly of the belief that they help in stopping the apparent movement of text, or for anchoring a student's attention to a particular part of a text. The majority of interviewees felt that contrast and brightness controls would not be enough in the online version of the test; students would continue to benefit from functionality which would allow them to control background colours, or to highlight words.

3.9.2 Are there onscreen options addressing these needs, in use in existing assessment delivery platforms, and are they different from the options currently proposed for NAPLAN Online?

Literature review

No research literature was found which specifically concerned the availability of onscreen options addressing these needs, in use in existing assessment delivery platforms, or whether they are different from the options currently proposed for NAPLAN Online.

Expert advice

There are a number of commercially available options for highlighting and tinting screens.

Conclusion

There are no technical impediments to providing options for highlighting and/or tinting screens. If the current proposal allows for text and background colour as well as contrast and brightness controls, then there will be no difference between the proposed adaptations and currently available options for addressing these needs.

If yes,

3.9.3 Is there an evidence base demonstrating the effectiveness of these options for these particular needs, and isolating the effect of these options, for each set of needs?

3.9.4 Will these needs be met by the transition to onscreen testing (with the implied access to brightness and contrast controls as well as WCAG compliance)?

Staff and student interviews

Students, particularly those with dyslexia or who are thought to have, for example Irlen Syndrome, believe that overlays and/or coloured paper make a difference to their reading, and that they would find the proposed adjustments in NAPLAN Online useful only if screen tinting and/or highlighting are also available.

Expert advice

Experts report that while research does not support the use of coloured paper or overlays to help students with dyslexia or associated syndromes, students and parents believe they do and there is very strong resistance to removing the option.

Conclusion

While research conclusively rejects the efficacy of coloured paper or overlays to ameliorate conditions associated with dyslexia, (Joint Statement on Learning Disabilities, Dyslexia, and Vision, 2009) staff and students (and, staff and experts report) students' parents universally believe that they are effective.

3.10   Masking

3.10.1   Is there research-based evidence of the effectiveness of masking for students with particular accessibility needs?

If yes,

3.10.2   Does the evidence isolate the effect/s of masking, for particular sets of accessibility needs?

3.10.3   What is the optimum masking solution to be employed, within the parameters affecting delivery of NAPLAN Online?

Student interviews

No students commented on masking.

Expert advice

CAST reports that with respect to masking, the research on this adjustment is nearly non-existent, but masking, where "portions of the content and interface may be covered to reduce the amount of stimulus provided to the student during testing" is a component of the Accessible Portable Item Profile (APIP) standard of the IMS Global Consortium and incorporated into the PARRC and SBAC assessments in the United States. Students with attentional disabilities are reported to benefit from content and/or answer masking, but there is little research to support this claim.

Recent research on the impact of small-screen (mobile device) reading with students with reading disabilities found a reading speed increase of 27%, a reduction in the number of fixations (over-focusing) by 11%, and a reduction the number of regressive eye movements by more than a factor of 2, with no loss in comprehension. (Schneps MH, et al. (2013)) These findings indicate that limiting the visual display of text-based information does have a disproportionately positive effect for students with reading disabilities, a finding that can be equated to the visual masking of text-based content.

Conclusion

There is limited evidence to suggest that masking is effective in addressing reading disabilities.

3.11   Measurement invariance

Literature review

Randall and Engelhard (2010) assessed the psychometric properties and multigroup measurement invariance of scores across subgroups, items, and persons on the "Reading for Meaning" items from the Georgia Criterion Referenced Competency Test (CRCT) in a sample of 778 seventh-grade students.

> Specifically, we sought to determine the extent to which score-based inferences on a high stakes state assessment hold across several subgroups within the population of students. To that end, both confirmatory factor analysis (CFA) and Rasch (1980) models were used to assess measurement invariance. Results revealed a unidimensional construct with factorial-level measurement invariance across disability status (students with and without specific learning disabilities), but not across test accommodations (resource guide, read-aloud, and standard administrations). Item-level analysis using the Rasch Model also revealed minimal differential item functioning across disability status, but not accommodation status.

The advice given by Pitoniak and Royer, concerning necessarily small numbers sample sizes in research, variations in needs from individual to individual and the variability possible within the same types of adjustment should also be taken into account when considering invariance, as well as their recommendation that the larger benefit lies in giving students access.

Conclusion

No evidence was found that indicated that the use of adjustments for students with disability conferred a disproportionate advantage over students without disabilities in testing. Research suggests that it may be preferable to entertain a small risk of invariance violation than to deny students with disability access to testing. One meta-analysis concluded that it was not possible to make specific determinations about the effects of adjustments, because it was not possible to extract those effects from other complex contextual factors, across student-level factors, test-level factors, and larger policy contexts.

Circumstances in which test scores for students with disability were lowered by the use of assistive technology-based adjustments were associated with poor matches between the technologies and the students, and student unfamiliarity with the assistive technologies provided during testing. The lesson from this research is that students with disability benefit most from technologies that they have used during instruction, and if they are required to use new technologies in assessment situations, they should be given ample time to familiarize themselves with those supports.

Given the factors militating against definitive statements about measurement invariance, it seems wiser to pay more heed to students' ability to access testing.

4.   Conclusions

1. Alternate and Adjusted Items

Experts consulted found that consultation with stakeholders and discipline specialists ensured the avoidance of problems in item development. From the standpoint of low vision students, it needs to be remembered that, while magnification allows access, it can take them longer to absorb material, particularly graphics and maths questions which rely on setting out.

2. Large Format Tests

ESSA reported that adjustments are offered as part of the ESSAonline software if possible, and that students are free to use whatever other adjustments they use in classroom work. There is provision for adjustments to be reported to ESSA. Students using Braille to respond to the test are required to be notified. Schools that provide special provisions to students to complete the test are required to record this on the test site. This allows this fact to be printed on the student's report.

On balance, and with the proviso that extra time is required, the provision of adjustments that allow a student to enlarge the online assessment is of benefit to students with disability, and in the case of low-vision students, is fundamental to their being able to access the assessment.

In general, experts found that the most difficult technology to master was zoom function, and that magnification is preferred on that ground. There is a report of limited trialling of magnification against large format, which found the former preferable.

3. Electronic Tests

The delivery of NAPLAN Online will remove the need for the interactive PDF version, which was piloted for a restricted range of students with disability;[21] the interactive PDF version's radio buttons for multiple-choice items will be available in the online version.

4. Oral/sign support

Oral/sign support by human signers is regularly available for any kind of assessment undertaken by deaf or hard of hearing students in Australia and in the United States, and this support – or an online equivalent – will continue to be necessary. The issue of national testing and some regional differences in signing will require further research, and it would also be considerations for possible online equivalents - embedded videoed or avatar signing. Otherwise, these functionalities could be added to the online test without affecting test performance.

5. Spelling

Some individual access issues continue to prove difficult. Spelling for students who are deaf or hard of hearing, given all the variations with oral and signing systems, and the limitations inherent in sign systems' ability to sign whole words, will need consideration.

6. Scribe

Research literature and expert opinion deem the use of scribes or speech recognition technology to be an appropriate adjustment per se; no research or expert opinion suggests that it would be inconsistent in the online environment where motor assistive technology is supported. Where students with disability are unable to handwrite or use computer keyboards or Braille, they will still

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[21] See National protocols for test administration 2014, 6.8.

require the support of a scribe / computer-user, unless they are able to use speech recognition technology.

A number of students, their teachers and support persons and experts consulted reported the successful use of speech recognition technology as a viable alternative to typing responses to, for example, the writing test. Technology is commercially available and used in classrooms where students have, for a range of reasons, difficulty in using pen and paper and keyboards. The literature suggests that so long as it is accepted that what is being tested is not the mechanics of writing, but rather the ability to compose, then there is no violation of the test construct, and research suggests improvements in performance for students with learning difficulties who used speech recognition technology over their handwritten responses. These results were also consistent with the differential boost principle. While it may be more difficult to use speech recognition technology, because it needs careful input and has to be checked for accuracy, some students preferred it to using a scribe, because it allowed independence. Motor assistive technology is also preferable to students who are accustomed to using it; as is the case with any assistive technology, students will need to be familiar with anything they are called upon to use in the test, and probably through exposure to it in class work. The corollary of that is that teachers and support persons will also need to be well versed in any technology available in the online test.

A major issue for students taking the online version of the test will be their ability to use keyboards efficiently and effectively. There are differences at year levels; some students are more willing and/or more able to come to grips with the skills, but it was observed often that much less, in general, could be expected of students in Year 3 than in Year 9.

7. Support person

The strict function of the support person is, for those students who need it, to fill in multiple-choice bubbles, and to write short responses or answers dictated by the student for the tests. One expert commented that blind students might still require support in indicating their choice in multiple-choice questions. Students who have had a support person (other than scribes and oral/sign support persons) generally reported that the person was also of practical use (reminding them when they should take breaks, telling them how much time they had left) and offered emotional support – keeping their moods even, making sure they stayed on task). Staff members were firmly of the opinion that these functions were invaluable. They are, though, outside the functions described in the test protocols.

8. Assistive Technology/Computers

As noted above under Conclusion 5, the main focus in the staff/student responses was around the use of keyboards. If students have reasonable keyboard skills (and clearly not all do) then it is a distinct advantage to be able to type responses. Those who have not achieved facility with the keyboard, and have trouble handwriting, would continue to need scribes, unless they were able to use to speech recognition technology, which was the subject of a number of responses. Otherwise, staff and students thought that a number of the applications and functionalities they use in the classroom would be helpful, though most were outside the ambit of this review, and would not be consistent with the current construct. They also had preferences for the kind of machine they found most useful, some, for example, preferring tablets, and some PCs.

9. Black-and-White Print Format/Coloured Overlays

Overlays and coloured paper, or their equivalent in computer monitor background colours, have no support as effective adjustments from experts or in the research literature, but support for them among students, their families, and support people remains strong.

10. Measurement invariance

No evidence was found that indicated that the use of adjustments for students with disability conferred a disproportionate advantage over students without disabilities in testing. Research suggests that it may be preferable to entertain a small risk of invariance violation than to deny students with disability access to testing. One meta-analysis concluded that it was not possible to make specific determinations about the effects of adjustments, because it was not possible to extract those effects from other complex contextual factors, across student-level factors, test-level factors, and larger policy contexts.

Circumstances in which test scores for students with disability were lowered by the use of assistive technology-based adjustments were associated with poor matches between the technologies and the students, and student unfamiliarity with the assistive technologies provided during testing. The lesson from this research is that students with disability benefit most from technologies that they have used during instruction, and if they are required to use new technologies in assessment situations, they should be given ample time to familiarize themselves with those supports.

Given the factors militating against definitive statements about measurement invariance, it seems wiser to pay more heed to students' ability to access testing.

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The complex range of circumstances that affect each student with a disability means that it would be ineffective to try to develop a one-size-fits-all approach to adjustments. Research on developing practice in the United States and advice from experts, support people and students interviewed in this study suggests that decisions about use of allowable adjustments for individual students are best made by their individual education program teams, rather than mandating them based in disability or disabilities.

A general observation about those interviewed for this study is that they were uniformly enthusiastic about change and hopeful that online adjustments would prove beneficial to students' ability to access and perform to their ability in a more equitable way than at present.

5.   Recommendations for further research/investigation

Once decisions have been reached about the adjustments which are the subjects of this report, further trialling and investigation will need to be carried out. One common theme across the relatively small research literature into the use of adjustments is that the individual contexts relating to the nature of the construct being measured, the characteristics of test-takers using adjustments, the characteristics of the test items and the specific mechanics of the adjustments all affect the way data on the use of adjustments can be interpreted. As such, the findings from individual studies are hard to generalise to other contexts - even those in which nominally the 'same' adjustment is being used by test-takers with 'similar' needs. We therefore recommend that the functionality of the planned adjustments for use in NAPLAN online be conducted, to ascertain how they work under test protocols. There are also questions of the hardware on which the online version will be delivered and the varying situations of schools – geographic location, SES status, ethnicity and the like – in which it will be delivered. As noted in the report, students using them will have to have become familiar with whatever technologies will be trialled in advance. Some specific examples are the use of videoed signing, or avatars for students who are deaf or hard of hearing.

Research literature concerning adjustments is not comprehensive, especially in the Australian context – numbers are by definition small, and technology is undergoing constant change. The general sense across the research literature, and expressed by testing authorities is that the use of adjustments in most cases leads to a violation of measurement invariance and that data collected from test-takers using adjustments should be interpreted with this in mind. While the concept of *differential boost* is used as a basis for determining whether the application of an adjustment serves to provide students with disability with equivalent access to a test, the psychometric consequences of applying adjustments cannot be interpreted in the same way. In most contexts, researchers and testing authorities have prioritised access to testing over quality of measurement and, when combined with the methodological research challenges previously described in this paper, there has been very little research conducted into understanding the nature or quantum of mode effects when adjustments have been used. It may be feasible for ACARA to conduct some form of mode effect studies relating to the application of adjustments in NAPLAN online. If this is desirable then we recommend that such studies focus on very clearly specified adjustments (without variation in their application such as may occur if students use a broad range of assistive technologies) in an area where numbers are large enough to warrant it.

The various studies currently being conducted around computer delivery of the NAEP test in the United States will be concluded in the near future, and will be of interest in the delivery of NAPLAN online, and need to be taken into account when reviewing it. An analysis of the conclusions reached in the NAEP study, and their applicability to questions raised about NAPLAN adjustments for students with disability is recommended.

Debate continues around the use of screen readers for reading test texts. The issue concerns what is being tested when students access a reading test using a screen reader, or read a text, and then respond to a test item – and these questions are unresolved. Further research should be conducted relating to the fundamental question of whether access by screen reader would violate the NAPLAN test construct as it presently stands. A study is also recommended into the measurable effects of the use of screen readers on test performance.

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7.   Appendices

Appendix 1: Research Questions and Primary Data Sources

RQ No.		Methods				
		Search	Literature scan	Expert Advice	**Student** Semi-structured interview	Scribes/Support Persons interviews
1.1	Alternate and Adjusted Items					
	What is the experience with other online assessment platforms in use in Australia or elsewhere, in relation to item development where motor and magnification assistive technology is supported by the assessment delivery platform?	✔	✔	✔		
1.2	Are there any types of items that are not accessible to users of these technologies? If yes, why (i.e., what should not be included)?		✔	✔		
2	Large Format Tests					
2.1	In online assessment systems in use in Australia and/or elsewhere, with similar functionality, are large format onscreen tests offered as a discrete additional option?	✔	✔	✔		
	If so, on what basis?	✔	✔	✔		
3	Electronic Tests					
3.1	What accessibility functionality do students with disability who currently take NAPLAN via electronic test (interactive PDF) derive from that format?					✔

RQ No.		Search	Literature scan	Expert Advice	**Student** Semi-structured interview	Scribes/Support Persons interviews
					Methods	
3.2	Are there any online assessment platforms in use in Australia or elsewhere, that offer students interactive PDFs as a discrete accessibility option?	✔	✔	✔		
	If Yes,					
3.2a	in what ways is the functionality similar to / different from the planned NAPLAN Online functionality?	✔	✔	✔		
3.2b	what specific user needs do the interactive PDFs meet, that cannot be met by the planned NAPLAN Online functionality?				✔	
3.2c	would additional functionality other than interactive PDFs best meet these needs?					✔
	If so, is this functionality compatible with standardised testing and the NAPLAN test construct?			✔		
4	Oral/sign support					
4	Are oral and/or sign support used in conjunction with assessment delivery platforms in Australia and/or elsewhere?	✔	✔	✔		
	If so,					
4a	to what extent is the functionality of the system/s similar to or different from the planned NAPLAN Online functionality?	✔	✔	✔		

RQ No.		Search	Literature scan	Expert Advice	**Student** Semi-structured interview	Scribes/Support Persons interviews
4b	Are there any user needs that could not be met by the planned NAPLAN Online functionality if oral and/or sign support is not offered in addition?		✔	✔		✔
4c	Could these needs be met by additional system functionality (rather than a physical support person) and if so, what additional functionality would be required? Would this functionality be compatible with standardised testing within the NAPLAN test construct?		✔	✔		
5	Spelling					
5.1	What onscreen non-text alternative/s to audio files are available for hearing impaired students? (Eg embedded AUSLAN videos.)		✔	✔		
5.2	Which alternative or combination of alternatives would be best suited to the onscreen testing of Spelling for NAPLAN? Are there any implications for the types of words that could be tested?		✔	✔		
6	Scribe					
6	Are there any online assessment systems in use which support motor assistive technology and also support the use of scribes / compuer-users? If yes,	✔	✔	✔		

		Methods			
RQ No.		Search	Literature scan	Expert Advice	**Student** Semi-structured interview	Scribes/Support Persons interviews
6a	in what ways is the functionality similar to / different from the planned NAPLAN Online functionality?	✔	✔	✔		
6b	what specific user needs are met by use of a scribe / computer-user, that cannot be met by the planned NAPLAN Online functionality (and is there an evidence base demonstrating the effectiveness of the use of scribes for particular needs, and isolating the effect)?		✔	✔		
6c	would additional functionality other than support of scribes / computer users best meet these needs, and if so, is this functionality compatible with standardised testing and the NAPLAN test construct?		✔	✔		
7	Support Person					
7.1	In what ways are support persons (other than scribes and oral/sign support persons) currently utilised in the pen and paper NAPLAN context?					✔
7.2	Will the planned NAPLAN Online functionality replace the need for these support persons?			✔		✔
	If not,					
7.2a	In what ways does it fall short?					✔

				Methods	
RQ No.		Search	Literature scan	Expert Advice	**Student** Semi-structured interview	Scribes/Support Persons interviews
7.2b	What additional functionality or other features would be required to meet the needs of these students?					✔
7.2c	Would there still be a need for support persons for some students?					✔
8	Assistive Technology/Computers					
8	To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online?				✔	✔
	If it does not adequately meet their needs,					
8a	In what ways does it fall short?				✔	✔
8b	What additional functionality or other features would be required to meet the needs of these students?				✔	✔
9	B/W Print format/Coloured Overlays					
9.1	What identifiable student needs are currently being addressed by use of black and white print format, and/or coloured overlays, in pen and paper?	✔	✔	✔		
9.2	Are there onscreen options addressing these needs, in use in existing assessment delivery platforms, and are they different from the options	✔	✔	✔		

RQ No.			Methods		**Student** Semi-structured interview	Scribes/Support Persons interviews
		Search	Literature scan	Expert Advice		
	currently proposed for NAPLAN Online?					
	If yes,					
9.2a	is there an evidence base demonstrating the effectiveness of these options for these particular needs, and isolating the effect of these options, for each set of needs?	✔	✔	✔		
9.2b	Will these needs be met by the transition to onscreen testing (with the implied access to brightness and contrast controls as well as WCAG compliance)?			✔		✔
10	Masking					
10	Is there research-based evidence of the effectiveness of masking for students with particular accessibility needs?	✔	✔	✔		
	If yes,					
10a	a) does the evidence isolate the effect/s of masking, for particular sets of accessibility needs?	✔	✔	✔		
	If yes,					
10b	b) what is the optimum masking solution to be employed, within the parameters affecting delivery of NAPLAN Online?	✔	✔	✔		

Appendix 2: ACER Library Search Statements and Databases

NOTE: All searches were limited to publication dates between 2008 and 2014

Australian Education Index

Search 1 (point 1)

(("item development") OR (SUBJECT:"test construction")) AND ((SUBJECT:Assistive OR SUBJECT:disabilities) OR (SUBJECT:"Universal Design for Learning") OR (SUBJECT:"special needs students")) AND (SUBJECT:evaluation OR SUBJECT:assessment OR SUBJECT:test* OR SUBJECT:naplan OR SUBJECT:pisa OR SUBJECT:timss OR SUBJECT:pirls)

Search 2 (point 2)

(format OR zoom OR magnify OR magnification) AND ((SUBJECT:Assistive OR SUBJECT:disabilities) OR (SUBJECT:"Universal Design for Learning") OR (SUBJECT:"special needs students"))

Search 3 (point 3)

(electronic OR online) AND (((SUBJECT:Assistive OR SUBJECT:disabilities) OR (SUBJECT:"Universal Design for Learning") OR (SUBJECT:"special needs students")) AND (SUBJECT:evaluation OR SUBJECT:assessment OR SUBJECT:test* OR SUBJECT:naplan OR SUBJECT:pisa OR SUBJECT:timss OR SUBJECT:pirls))

Search 4 (point 4)

AND (SUBJECT:evaluation OR SUBJECT:assessment OR SUBJECT:test* OR SUBJECT:naplan OR SUBJECT:pisa OR SUBJECT:timss OR SUBJECT:pirls))

(oral OR sign) AND ((evaluation OR assessment OR test* OR naplan OR pisa OR timss OR pirls) AND ((SUBJECT:Assistive OR SUBJECT:disabilities) OR (SUBJECT:"special needs students") OR (SUBJECT:Universal SUBJECT:Design SUBJECT:for SUBJECT:Learning)))

Search 5 (point 5)

((SUBJECT:"Hearing impairments") OR (spelling OR audio OR WCAG) OR ("text alternatives") OR ("text alternative")) AND ((evaluation OR assessment OR test* OR naplan OR pisa OR timss OR pirls) AND ((SUBJECT:Assistive OR SUBJECT:disabilities) OR (SUBJECT:"special needs students") OR (SUBJECT:Universal SUBJECT:Design SUBJECT:for SUBJECT:Learning)))

Search 6 (point 6)

((Motor OR scribe OR scribes) OR ("computer user")) AND (evaluation OR assessment OR test* OR naplan OR pisa OR timss OR pirls)

Search 7 (point 7)

(Print OR ("coloured overlays")) AND ((evaluation OR assessment OR test* OR naplan OR pisa OR timss OR pirls) AND ((SUBJECT:Assistive OR SUBJECT:disabilities) OR (SUBJECT:"special needs students") OR (SUBJECT:Universal SUBJECT:Design SUBJECT:for SUBJECT:Learning)))

General Search

((NAPLAN OR PISA OR TIMSS OR PIRLS) OR ("national competency tests")) AND ((SUBJECT:Assistive OR SUBJECT:disabilities OR SUBJECT:impairment) OR ("Universal Design for Learning") OR (SUBJECT:"special needs students") OR (SUBJECT:"special education"))

Additional Search for specific accommodations or assistive technologies

(pdf OR support OR scribe OR screen OR reader OR overlay* OR sign OR oral OR masking OR magnification OR contrast) OR ("read aloud")

AND (SUBJECT:assistive OR SUBJECT:accommodations) AND (evaluation OR assessment OR test* OR naplan OR pisa OR timss OR pirls)

ERIC

Search 1

(SU Disabilities OR Impairments OR Accommodations OR Special Education or Special Schools OR Special Needs OR Reading Difficulties OR Dyslexia OR Communication disorders OR Writing Difficulties OR Accessibility)

AND (SU "student evaluation" OR SU "national competency tests" OR SU "High Stakes Tests" OR SU Achievement Tests OR SU Educational Testing OR (pisa or timss or pirls) or **National** Assessment of **Educational** Progress)

AND (MOTOR OR MAGNIFY OR MAGNIFICATION OR "ZOOM FUNCTIONALITY" OR "LARGE FORMAT" OR ONSCREEN OR ENLARGE OR ADJUSTMENTS OR PDF OR Computer Assisted Testing OR ORAL OR SIGN OR SPELLING OR "AUDIO FILE" OR WCAG OR "ALTERNATIVE TEXT" OR SCRIBES OR READERS OR "COMPUTER USER" OR FUNCTIONALITY OR TEST CONSTRUCTION OR TEST FORMAT)

Search 2- General Search

(SU "student evaluation" OR "national competency tests" OR "High Stakes Tests" OR Educational Testing OR (pisa or timss or pirls) or National Assessment of Educational Progress

AND (SU computer)

AND SU Disabilities OR Impairments OR Accommodations OR Special Education or Special Schools OR Special Needs OR Reading Difficulties OR Dyslexia OR Communication disorders OR Writing Difficulties OR Accessibility)

Search 3 – General Search

(SU "student evaluation" OR "national competency tests" OR "High Stakes Tests" OR Educational Testing OR (pisa or timss or pirls) or National Assessment of Educational Progress

AND (SU assistive technology)

Additional Search - Search 1

SU ("assistive technology" or "assistive technologies" or "assistive devices") AND (electronic or interactive or pdf or support or scribe* or screen or overlay* or sign or support* or oral or masking) AND SU (test* or assessment or measurement or evaluation or survey)

 Additional Search - Search 2

SU ACCOMMODATIONS AND (COMPUTER* OR TECHNOLOG* OR SCREEN OR READERS OR MAGNIFICATION OR "SELF VOICE" OR "READ ALOUD" OR CONTRAST)

British Education Index

Search 1

(assessment OR timss OR pirls OR pisa OR "computer assisted testing") AND (disabilit* OR impairment* OR "special needs" OR accommodations OR "item development" OR "special needs" OR accessibility OR dyslexia OR "special educational needs" OR "reading difficulties") AND (MOTOR OR MAGNIFY OR MAGNIFICATION OR "ZOOM FUNCTIONALITY" OR "LARGE FORMAT" OR ONSCREEN OR ENLARGE OR ADJUSTMENTS OR PDF OR Computer Assisted Testing OR ORAL OR SIGN OR SPELLING OR "AUDIO FILE" OR WCAG OR "ALTERNATIVE TEXT" OR SCRIBES OR READERS OR "COMPUTER USER" OR FUNCTIONALITY OR TEST CONSTRUCTION OR TEST FORMAT OR "item development" OR "test items")

Additional Search-Search 1

("electronic interactive" or pdf or support or scribe* or "screen reader" or "coloured overlays" or sign or oral or masking) AND (computer* or technology or technologies) AND (disabilit* or "special need" or "special needs" or "special education")

Additional Search-Search 2

(screen or "self voice" or magnification or "read aloud" or contrast) AND accommodation*

SCOPUS

Note – no additional searching in this database because of huge number of irrelevant results in initial search.

(TITLE-ABS-KEY(motor OR magnification OR "ZOOM FUNCTIONALITY" OR "LARGE FORMAT" OR enlargement OR adjustments OR pdf OR oral OR sign OR spelling OR "AUDIO FILE" OR wcag OR "ALTERNATIVE TEXT" OR scribes OR readers) AND TITLE-ABS-KEY(assessment OR timss OR pirls OR pisa OR naep) AND TITLE-ABS-KEY(disabilit* OR impairment* OR accommodations OR "Special Education" OR "Special Schools" OR "Special Needs" OR "Reading Difficulties" OR dyslexia OR "Communication disorders" OR "Writing Difficulties" OR accessibility))

AND SUBAREA(mult OR arts OR busi OR deci OR econ OR psyc OR soci) AND PUBYEAR > 2007 AND (LIMIT-TO(DOCTYPE, "ar") OR LIMIT-TO(DOCTYPE, "ch") OR LIMIT-TO(DOCTYPE, "ip") OR LIMIT-TO(DOCTYPE, "cp")) AND (LIMIT-TO(SUBAREA, "SOCI")) AND (LIMIT-TO(SUBAREA, "SOCI")) AND (LIMIT-TO(EXACTSRCTITLE, "Journal of Communication Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Learning Disabilities") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Deaf Studies and Deaf Education") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Speech Language and Hearing Research") OR LIMIT-TO(EXACTSRCTITLE, "Dyslexia") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Communication Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Learning Disabilities") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Deaf Studies and Deaf Education") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Speech Language and Hearing Research") OR LIMIT-TO(EXACTSRCTITLE, "Dyslexia") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Fluency Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Brain and Language") OR LIMIT-TO(EXACTSRCTITLE, "Language Speech and Hearing Services in Schools") OR LIMIT-TO(EXACTSRCTITLE, "Communication Disorders Quarterly") OR LIMIT-TO(EXACTSRCTITLE, "International Journal of Language and Communication Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Reading and Writing") OR LIMIT-TO(EXACTSRCTITLE, "Intellectual and Developmental Disabilities") OR LIMIT-TO(EXACTSRCTITLE, "American Annals of the Deaf") OR LIMIT-TO(EXACTSRCTITLE, "British Journal of Special Education") OR LIMIT-TO(EXACTSRCTITLE, "Testing Deaf Students in an Age of

Accountability") OR LIMIT-TO(EXACTSRCTITLE, "International Journal of Disability Development and Education") OR LIMIT-TO(EXACTSRCTITLE, "European Journal of Special Needs Education") OR LIMIT-TO(EXACTSRCTITLE, "Annals of Dyslexia") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Intellectual and Developmental Disability") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Communication Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Learning Disabilities") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Deaf Studies and Deaf Education") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Speech Language and Hearing Research") OR LIMIT-TO(EXACTSRCTITLE, "Dyslexia") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Fluency Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Brain and Language") OR LIMIT-TO(EXACTSRCTITLE, "Language Speech and Hearing Services in Schools") OR LIMIT-TO(EXACTSRCTITLE, "Communication Disorders Quarterly") OR LIMIT-TO(EXACTSRCTITLE, "International Journal of Language and Communication Disorders") OR LIMIT-TO(EXACTSRCTITLE, "Reading and Writing") OR LIMIT-TO(EXACTSRCTITLE, "Intellectual and Developmental Disabilities") OR LIMIT-TO(EXACTSRCTITLE, "American Annals of the Deaf") OR LIMIT-TO(EXACTSRCTITLE, "British Journal of Special Education") OR LIMIT-TO(EXACTSRCTITLE, "Testing Deaf Students in an Age of Accountability") OR LIMIT-TO(EXACTSRCTITLE, "International Journal of Disability Development and Education") OR LIMIT-TO(EXACTSRCTITLE, "European Journal of Special Needs Education") OR LIMIT-TO(EXACTSRCTITLE, "Annals of Dyslexia") OR LIMIT-TO(EXACTSRCTITLE, "Journal of Intellectual and Developmental Disability"))

(TITLE-ABS-KEY(assessment or test or testing or tests) AND TITLE-ABS-KEY(computer* or online) AND TITLE-ABS-KEY(disbility or disabilities or accessibility or accommodations or "special need" or "special education") AND SUBJAREA(MULT OR ARTS OR BUSI OR DECI OR ECON OR PSYC OR SOCI) AND PUBYEAR > 2007) AND (education) AND (LIMIT-TO(SUBJAREA,"SOCI") OR LIMIT-TO(SUBJAREA,"PSYC") OR LIMIT-TO(SUBJAREA,"COMP"))

Education Research Complete

Search 1

SU (Disabilit* OR Impairments OR Accommodations OR Special Education or Special Schools OR Special Needs OR Reading Difficulties OR Dyslexia OR Communication disorders OR Writing Difficulties OR Accessibility or assistive) AND (MOTOR OR MAGNIFY OR MAGNIFICATION OR "ZOOM FUNCTIONALITY" OR "LARGE FORMAT" OR ONSCREEN OR ENLARGE OR ADJUSTMENTS OR PDF OR Computer Assisted Testing OR ORAL OR SIGN OR SPELLING OR "AUDIO FILE" OR WCAG OR "ALTERNATIVE TEXT" OR SCRIBES OR READERS OR "COMPUTER USER OR FUNCTIONALITY OR TEST CONSTRUCTION OR TEST FORMAT) AND ("student evaluation" OR "national competency tests" OR "High Stakes Tests" OR Achievement Tests OR Educational Testing OR (pisa or timss or pirls) or National Assessment of Educational Progress)

Additional Searching

(SU Accommodations or Assistive) AND (SUPPORT OR SCRIBE OR SCREEN OR READER OR OVERLAYS OR MASKING OR "SELF VOICING" OR "READ ALOUD" OR CONTRAST)

AND ("student evaluation" OR "national competency tests" OR "High Stakes Tests" OR Achievement Tests OR Educational Testing OR (pisa or timss or pirls) or **National** Assessment of **Educational** Progress)

PsycInfo

Search 1

SU (Disabilit* OR Impairments OR Accommodations OR Special Education or Special Schools OR Special Needs OR Reading Difficulties OR Dyslexia OR Communication disorders OR Writing Difficulties OR Accessibility or assistive) AND TX ((MOTOR OR MAGNIFY OR MAGNIFICATION OR "ZOOM FUNCTIONALITY" OR "LARGE FORMAT" OR ONSCREEN OR ENLARGE OR ADJUSTMENTS OR PDF OR Computer Assisted Testing OR ORAL OR SIGN OR SPELLING OR "AUDIO FILE" OR WCAG OR "ALTERNATIVE TEXT" OR SCRIBES OR READERS OR "COMPUTER USER OR FUNCTIONALITY OR TEST CONSTRUCTION OR TEST FORMAT) AND Restricted to 'educational measurement' classification

Additional Searching

SU (Accommodations OR or assistive) AND TX (SUPPORT OR SCRIBE OR SCREEN OR READER OR OVERLAYS OR MASKING OR "SELF VOICING" OR "READ ALOUD" OR CONTRAST)

AND Restricted to 'educational measurement' classification

Appendix 3: Research Protocols

NASOP Research Study
NAPLAN Online accessibility adjustments for students with disability
Protocols for collecting data from students and staff in schools

The purpose of the research project is to investigate the implications of the implementation of in-principle decisions regarding accessibility options that will be supported in the new online delivery mode for NAPLAN.

The project includes desk-based research relating to the use of adjustments and support for students with disability to complete large scale standardised assessments (like NAPLAN) on computer as well as semi-structured interviews with students and staff with experience of having used or supported the use of adjustments for students to complete assessments.

These protocols relate to the collection of data from students and staff in schools. They include:

- The method for identifying and making contact with students and schools;

- The method for collecting data from students and school staff including

    o a description of the interview process

    o the questions that will be asked of students and/or staff; and

- The treatment of data collected from students and schools.

Identifying and making contact with schools and students

The Australian Curriculum and Assessment Authority (ACARA) has access to information regarding requests by schools (on behalf of students) for adjustments to be made available for students with disability who complete NAPLAN. ACARA will work with ACER to identify a list of schools that have made requests for adjustments that fall within the scope of this research activity and ACARA will seek authorisation for ACER to contact the schools directly to request that staff and/or students participate in the semi-structured interviews. Where a school expresses willingness for any of their staff/and or students to participate, ACER will work with the school to identify staff and/or students who could participate. Schools and participants will be informed that participation is voluntary and participants have the right to withdraw at any time..

Collecting data from students and school staff
The interview processes

Semi-structured interviews with students

When observations and/or interviews are necessary we will design a research protocol for obtaining data that will enable us to answer the research question. We anticipate that research instruments will take the form of a questionnaire that a researcher will use in a semi-structured interview. The questionnaire will combine closed questions (with yes/no or Likert-style response options) and open ended questions.

Semi-structured interviews combine the advantages of obtaining standardised and comparable responses from the closed questions across interviewees while allowing the researcher to expand upon open-ended responses with follow up, probing questions that allow the interviewee to add information and opinions that range beyond the structured questionnaire components.

The semi-structured interviews will be conducted in person by ACER staff with students in their schools. Students and schools can choose for the interviews to be one-to-one or in small groups (where there are students who use similar adjustments and feel comfortable together). Adult support people (such as school staff or parents) can also be present for the semi-structured interviews as required or requested. The interviews will take a maximum of 30 minutes.

Structured interviews with school staff

In addition to the interviews with students, we will conduct interviews with the teachers and other adults assigned to support the students in accessing NAPLAN assessments (such as scribes or support persons). These interviews will be conducted when we visit the schools to interview students although some additional interviews may be conducted by telephone in schools where only adults are to be interviewed. The interviews will take a maximum of 30 minutes.

Interview questions for staff and students

The interviewer will complete a record sheet for each interview. Following is the record sheet that includes an introductory page and the questions that will be asked of students and staff. This sheet includes the full set of questions. Where it is known in advance that particular questions are not relevant to a given individual (such as those relating to a form of adjustment that it is known the individual does not and will not need to use or support) these questions will be skipped during the interview. The interview questions will be provided to schools, staff and students (as appropriate) before the interviews.

NASOP online accessibility adjustments for students with disability interview record sheet

School _____

Student/School representative name _____

Interviewer name _____

Date _____ Start time _____ End time _____

Instructions for interviewers

- Complete this cover sheet at the start of the session and the end time at the conclusion. You should spend a maximum of 30 minutes with the participant. If the participant becomes tired or distressed, finish the session.
- Read the following script to the participants as shown below.

[IF THE PARTICIPANT IS A STUDENT]

"I am going to ask you some questions about the types of ways you have used support when completing NAPLAN tests or other similar school work. Your answers will help the people who make NAPLAN think of the best types of help that can be provided to students to have access to the tests once they are being delivered by computer. No one except me and the other people in this room will know that the answers have come from you. We will speak together for about half an hour. If you decide that you have had enough we can stop whenever you want. I will make notes of your answers. I may also ask you to show me some of the things you use on the computer to help you with your work.

Do you have any questions before we go on?"

[Answer any questions that the student has.]

"Are you happy for us to start?"

[IF THE PARTICIPANT IS AN ADULT]

"The purpose of the research project is to find out more about how adjustments are currently being used for NAPLAN pen and paper, and find out whether what is being planned for NAPLAN Online will make the tests accessible to students who have used adjustments in the past.

As well as conducting a range of desk-based research, we are interviewing a small number of students who have used adjustments or support when completing NAPLAN or similar tests and staff who have supported students to do this.

The questions relate to the different types of adjustments and support available to students in the pen and paper context, in particular the way in which students used the adjustments. There are some follow-up questions about how students' needs might be met in similar or alternative ways, once NAPLAN tests are delivered online. This printout "Possible NAPLAN Online functionality" printout *[Provide printout to interviewee now]* sets out what is planned for NAPLAN Online, and you can refer to it throughout the interview to help inform your answers. Would you like some time to read through the document now?"

[Provide a few minutes for this to happen.]

"The interview will last no longer than 30 minutes. Do you have any questions before we go on?"

[Answer any questions that the adult participant has.]

"Are you happy for us to start?"

Interview questions for staff

Question 1: Use of electronic tests (such as NAPLAN interactive PDF)	
Have you supported students to take NAPLAN using the electronic interactive PDF format?	
	Yes
	No
If Yes	
Thinking back to you most recent experiences of supporting students to access NAPLAN using interactive PDFs, can you describe how this helped them to complete NAPLAN, compared to if they needed to do it on paper? **i.e**. Was the test easier to complete in the PDF version than with pen and paper? If so, how was it easier? Please have a look at the "Possible NAPLAN Online functionality" document. It describes what is planned for NAPLAN Online. When you think about the ways that students use the interactive PDFs to access NAPLAN at the moment, do you think the move to online delivery will mean that interactive PDFs will no longer be needed? Why? / Why not? What functionality other than / in addition to the interactive PDF would be required to meet the needs of the students you have most recently supported to access NAPLAN via interactive PDF?	

Question 2: Use of assistive technology/computers	
Have you supported students to use assistive technology, computers to complete NAPLAN (other than interactive PDFs)?	
	Yes
	No
If Yes	
To what extent will the needs of students with disability who currently take NAPLAN using assistive technology/computers be met by the functionality that will be supported in NAPLAN Online? i.e. Do you think that the online version of NAPLAN will be as accessible for students with disabilities as their current experience for the pen and paper version? If it does not adequately meet their needs, in what ways does it fall short? What additional functionality or other features would be required to meet the needs of these students? Are you aware of assistive technologies/computers that have such functionality or other features?	

Question 3: Use of scribes	
Have you supported students to use scribes to access NAPLAN pen and paper?	
	Yes
	No
If Yes	

Thinking back to your experience of providing this support, and having another look at the "Planned NAPLAN Online functionality" printout, do you think that the move to the online environment will remove the need for scribes (or rather, "computer users")?

Why? / Why not?

What additional functionality or other features would be required to meet the needs of these students?

Are you aware of assistive technologies/computers that have such functionality or other features?

Question 4: Sign support	
Have you supported students to have sign support (such as AUSLAN) to complete work at school?	
	Yes
	No
If Yes	

NAPLAN Online will include a spelling component in which words are read to the students and they need to write the words.

Do you think that providing embedded sign videos for students to be able to respond to the words signed, would allow students with profound hearing impairment to access the tests this way?

If sign support was provided via embedded sign video, which language should be used?

What challenges can you foresee if embedded sign videos were provided as part of the online test? How could these challenges be addressed?

[Interviewer please note that any text-based alternative will not work for Spelling because that would effectively provide the student with the answer.]

Question 5: Oral support
Have you supported students to have oral support to access NAPLAN?

	Yes
	No

If Yes
What was the purpose of providing oral support?

Would oral support still be necessary in the online environment, if the functionality described was available?

Why? / Why not?

Are you aware of any functionality available in the online environment that would remove the need for oral support?

Question 6: Support person (other than scribes and people providing oral/sign support)
Have you been involved in arranging (or acting as) a support person **other than** a scribe or oral/sign support person, to help complete NAPLAN (or a similar assessment)?

	Yes
	No

If Yes
In what ways are support persons (other than scribes and oral/sign support persons) currently used in the pen and paper NAPLAN context?

Referring back to the "Possible NAPLAN Online functionality" printout, do you think that the planned NAPLAN Online functionality would be able to replace the need for support persons in this context?

If no, in what ways would students still need the assistance of support people? And/or, is there any additional functionality that could be offered to meet the needs of students currently accessing NAPLAN with the assistance of this type of support person?

Question 7: Use of coloured overlays	
Have you supported students to complete reading text and/or numbers by using coloured overlays?	
	Yes
	No
If Yes	
When do you use coloured overlays with students and for what purpose (both on paper and/or on computer)? With the planned functionality for NAPLAN Online, and the default brightness and contrast adjustments available to all students on their devices as a matter of course, will the need for coloured overlays be removed? Are you aware of any alternatives available in the online environment other than those outlined above?	

Interview questions for students

Question 1: Use of interactive PDF	
Have you done NAPLAN tests using the electronic interactive PDF format?	
	Yes
	No
If Yes	
For students	How does this format help you to do things that you would otherwise find hard to manage?
	Is there anything else you use or know of that can do this better?
	If the tests were on computer in future, would you still need interactive PDFs or are there other things that you'd prefer to use?
If applicable	
	Ask the student to show you examples of what they use and how.

Question 2: Use of assistive technology/computers other than interactive PDFs	
Have you used assistive technology or computers to complete NAPLAN other than interactive PDFs?	
	Yes
	No
If Yes	
What did you use the assistive technology/computer to help you with when you were doing the NAPLAN tests?	
Thinking about your other experiences of using computers for school work (especially tests) if NAPLAN was a computer-based test in future, what would you need the people making the tests to do or provide, so that you could access the test?	
If applicable	
	Ask the student to show you examples of what they use and how.

Question 3: Support person

Have you worked with a support person to help complete NAPLAN?

	Yes
	No

If Yes

Thinking about NAPLAN specifically:

- Did you work with a scribe?

If yes, what sorts of things did the scribe help you to do? If the tests were on computer in future, would you still need a scribe? Why? / Why not?

- Did you work with someone who provided oral support (like reading things out / saying things)?

If yes, what sorts of things did the support person help you to do? If the tests were on computer in future, would you still need a support person like this? Why? / Why not?

- Did you work with someone who provided signed support?

If yes, what sorts of things did the support person help you to do? If the tests were on computer in future, would you still need a support person like this? Why? / Why not?

- Did you have any other type of support person (ie someone who gave you support but was not a scribe, oral or sign support)?

If yes, what sorts of things did the support person help you to do? If the tests were on computer in future, would you still need a support person like this? Why? / Why not?

Think of when you use computers. Do you think you would need some additional help from a support person if you were completing NAPLAN on a computer?

If yes, what sort of help might you need?

Do you use any software or hardware devices when doing other work that you think could replace the help you have from a support person for NAPLAN?

If applicable

	Ask the student to show you examples of what they use and how.

Question 4: Use of coloured overlays	
Do you ever use coloured overlays when you read?	
	Yes
	No
If Yes	
For students	Do you use coloured overlays when you use a computer?
	If yes, How do they help you with your work?
	If no, why not? (e.g. Are they unnecessary when using a computer? Or is there something better available?)
If applicable	
	Ask the student to show you examples of what they use in the onscreen environment, and how.

Interview Participants

NASOP interviews

Interviews were conducted over two weeks. ACER staff in each state visited schools where possible. Phone interviews were conducted with NT schools and two schools in NSW.

Total number of schools: 23	Participating staff: 33
Telephone interviews: 5 (PC = phone call)	
Face-to-face interviews: 18	

State	Code	School name	Position held by participant
NSW 3	1	Strathfield Girls High School (PC)	Assistant Principal; Special Needs Coordinator
	2	Canterbury South Public School (PC)	Assistant Principal
	3	Mater Maria College	Classroom teacher; support teacher
NT 3	4	Good Shepherd Lutheran College (PC)	Learning Support; NAPLAN Coordinator
	5	Nemarluk School (PC)	Senior Teacher
	6	St Francis of Assisi (PC)	Acting Deputy Principal
QLD 3	7	Broadbeach State School	Classroom teacher; Teacher Aide (Assistant)
	8	Palm Beach-Currumbin State High School	Special Ed Coordinator
	9	The Southport School	Classroom teacher; Special Needs Coordinator
SA 5	10	Henley Beach Primary School	Support staff
	11	Sacred Heart College	Classroom teacher
	12	St Brigid's Catholic Primary School	Principal; Coordinator; Support Staff Member
	13	Unley High School	Coordinator
	14	Paringa Park Primary School	(unavailable to interview)
VIC 6	15	Blackburn Primary School	Special Needs coordinator; classroom teacher
	16	De La Salle College	Special Needs coordinator
	17	Eastwood Primary School	Teacher of the Deaf
	18	Heathmont Primary School	Classroom teacher; Teacher Aide
	19	St Damian's Primary School	Assistant Principal
	20	Lynall Hall	NAPLAN Coordinator
WA 3	21	Kapinara Primary School	Education Assistant; support staff
	22	St Hilda's Anglican School for Girls	Education Assistant; Tutoring Centre Coordinator Literacy Support Teacher
	23	Carey Baptist College	

Participating students: 20

(Two NSW and three NT interviews were conducted by phone and students were not interviewed.)

State	YEAR 3	YEAR 5	YEAR 7	YEAR 9	Total
NSW	-	-	1	-	1
NT	-	-	-	-	-
QLD	-	1	2	2	5
SA	1	1	2	1	5
VIC	2	2	1	-	5
WA	-	1	3	-	4
Total	3	5	9	3	20

Disability by state and year level

State	Year	Disability	School Name
NSW	7	Cerebral palsy; autism spectrum disorder (ASD)	Mater Maria Catholic College
QLD	5	Chromosomal damage; hearing impairment; delayed growth; poor muscle strength	Broadbeach Primary School
QLD	7	Learning difficulties	The Southport School
QLD	7	Mild cerebral palsy; ADD	The Southport School
QLD	9	Autism spectrum disorder (ASD); ADHD	Palm Beach-Currumbin State High School
QLD	9	Dysgraphia (writing disability)	The Southport School
SA	3	Fine and gross motor difficulties; in a wheel chair; spina bifida	St Brigid's catholic Primary School
SA	5	Heart difficulties; hearing aid; autism; short term memory loss; low muscle tone which gives him coordination and spatial difficulties.	Henley Beach Primary School
SA	7	Autism spectrum disorder (ASD); dysphasia (language disorder marked by deficiency in the generation of speech); slow ability to learn	Sacred Heart College
SA	7	Complex needs; borderline intellectual disability; dyslexia; fine motor difficulties.	Sacred Heart College

State	Year	Disability	School Name
SA	9	Wheelchair; cerebral palsy; movement in legs and body; poor speech; eyes operate and focus independently	Unley High School
VIC	3	Cerebral palsy; in a wheelchair; intellectual and physical disabilities; communicates with an ipad	Heathmont East Primary School
VIC	3	Autism spectrum disorder (ASD)	Blackburn Primary School
VIC	5	Profoundly deaf; first language is AUSLAN	Eastwood Primary School
VIC	5	Autism spectrum disorder (ASD); learning difficulties; ADHD	St Damian's Primary School
VIC	7	Dyslexia	De La Salle College
WA	5	Cerebral palsy	St Hilda's Anglican School for Girls
WA	7	Physical disability; learning difficulties	Carey Baptist College
WA	7	Learning difficulties	Kapinara Primary School
WA	7	Dyslexia	St Hilda's Anglican School for Girls

Experts interviewed: 9

Joanne Sim, Assessment and Development Advisor, High Performance, Essential Secondary Science Assessment (ESSA) New South Wales

Emily White, Professional Development and Educational Programs Coordinator, Statewide Vision Resource Centre (A DEECD facility) Victoria

Jane Cotes, Learning Support Coordinator, St Patrick's College, Strathfield NSW

Northern Territory Department of Education:

- Kath Midgley (Manager Disability Service),
- Inge Carter (Coordinator, Vision Team) and
- Denise Bainbridge (Coordinator, Hearing Team)

NSW Department of Education and Community:

- Neale Waddy, Leader, Support and Development, Learning and Engagement;
- Josie Howse, Manager, Braille and Large Print Services and
- Louise Cullen, Complex Support Sensory Advisor