

Accessibility for All Learners in a Computer Adaptive Test

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Partnership

We work in partnership with our clients. This is more than a cliché for us: we care about the services we provide and the impact they have on learners. Experience has shown us that the best impact our work can have is when it is undertaken alongside our clients so we make partnership a key feature of our project approach and management method.



Quality

We manage projects effectively and to the highest quality, freeing up experts to concentrate on their specialism, but ensuring that activities are managed to meet expectations. This means only making promises that we know we can keep, and remembering the promises we have made to make sure we deliver.



Expertise

We ensure our teams consist of genuine sector experts with understanding in breadth and depth of both the theory and the practical complex everyday challenges faced by education providers.



Development

We are committed to the improvement of our staff, both to promote the long-term development of our business and as an end in itself: we believe in the value of education for all.



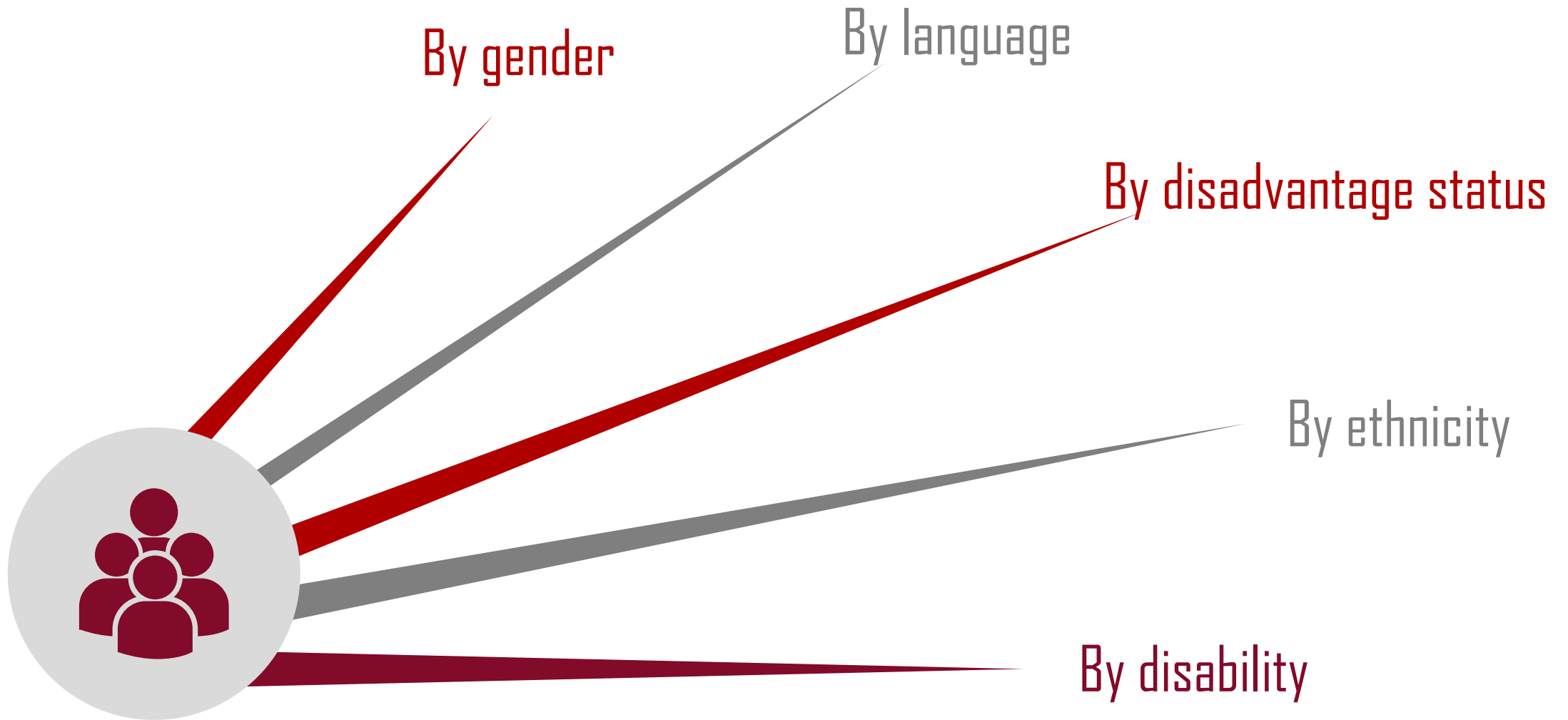
Educationalists

We are educationalists with a strong commitment to improving teaching, learning and assessment, based on intellectual integrity, sound evidence and innovative approaches.

Numeracy and Reading tests for Wales

- Used by learners from years 2 to 9 (age 7 to 14)
- Available in English and Welsh – direct translations for numeracy and developed in parallel in each language for reading
- Currently offered on paper in May each year
- Transitioning to on-screen, adaptive: procedural numeracy in September 2018, reading in September 2019 and numerical reasoning in September 2020
- The adaptive versions will be available for the whole academic year, with maximum of 2 uses
- Formative purpose

Principle of Equal Access



Development principles

- Universal design
- Widely accessible as a requirement
- Considering needs of different groups as part of design process
 - Revision checks
 - Trials and focus groups
 - Statistical analysis
- Lessons learned from previous papers
- Style Guide and Test Specifications
- For on-screen versions: 'at least as accessible as on paper'

Current Available Versions

1

Coloured paper

Or white paper with coloured overlays

2

Enlarged print

Identical to existing paper-based test, but font magnified

3

Modified Large Print

Includes some simplification, generally of diagrams, and the modified version is enlarged

4

Braille version

Text converted into Braille with 3-d versions of diagrams

5

Instructions for HI delivery

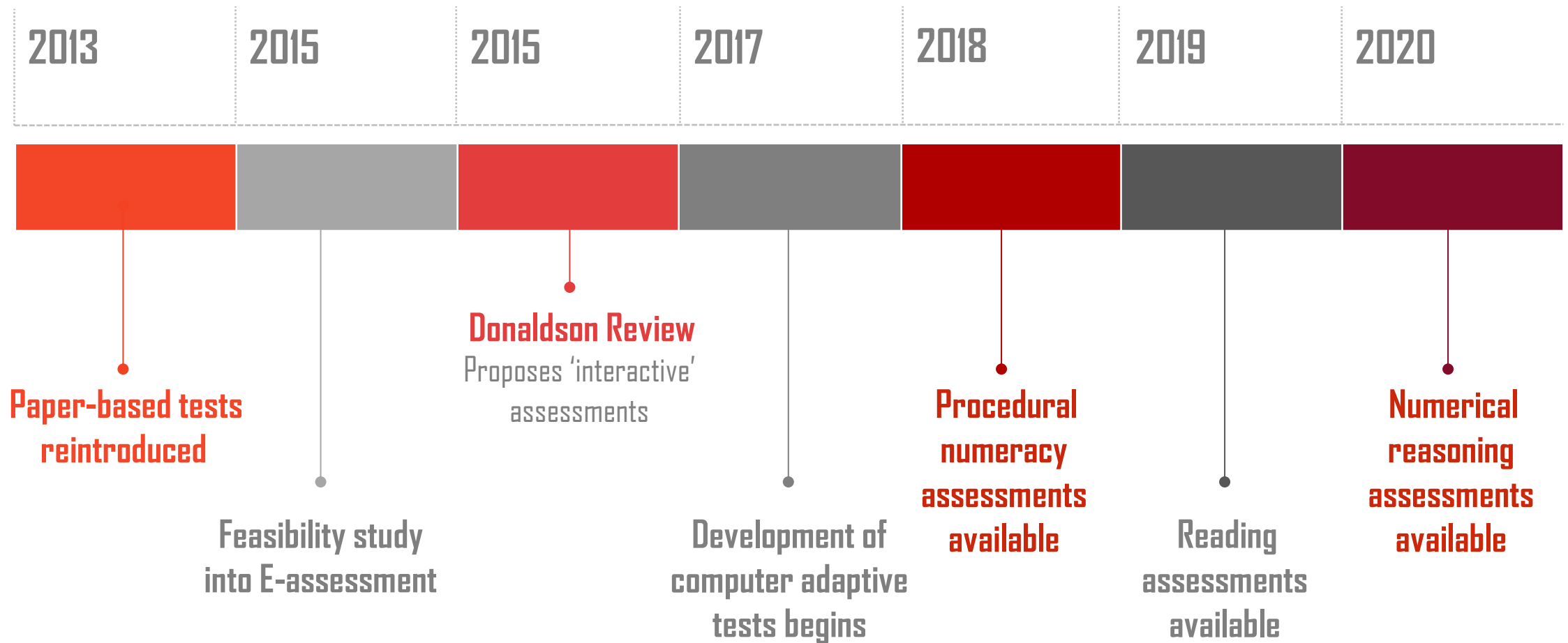
Instructions are provided as to the signing of instructions for learners

6

Special arrangements

Includes extra time and rest breaks for some groups of learners, use of amanuensis, scribe, reader etc.

Development of Tests



'In-built' functionality

- **Magnification** – text size can be increased using browser functionality (prompt included for scrolling where necessary)
- **Colour contrast** – can alter the colour combinations of the text and background from a set of pre-defined, high-contrast colours or alter the opacity of the colours, altering the colour contrast from high to low
- **Keyboard accessibility** – the tests can be completed using simple keystrokes and keyboard interactions (i.e. fully 'tab-able'). This includes dialogue boxes that can be opened and closed, moved and re-sized via the keyboard
- **Screen-reader compatibility** – test items are currently written and tested for compatibility with the Windows JAWS screen reader, as well as tested with the ChromeVox and iOS VoiceOver applications
- **Text alternatives** – Alt text is fully supported for images. Video and audio content will be supported by audio description and subtitles

Research 1: Stakeholder Survey

- Online using Qualtrics
- Sent to special schools and support services in Wales
- 20 respondents, working with 35 to 280 learners
- Learners represented have VI, HI, speech and language difficulties, behavioural difficulties, reading, writing and processing difficulties, autism etc.
- Experience of using all the available modified formats for the paper-based tests

Use of Technology

- Screen readers
- Voice recognition
- Magnifiers
- Braille notetakers
- Eye gaze

Plus

- Readers, Scribes, Practical assistant, Sign language interpreter
- Early opening, additional time, rest breaks

Difficulties with using technology

- Compatibility issues
- Difficulties using a mouse
- Lack of appropriate equipment
- Require an adult for support
- Screen magnification can lead to other issues eg scrolling

Concerns raised in the survey

- Young learners may not have learned to touch type or use Braille devices
- Problems with extreme glare from screens
- Scanning and locating mouse
- Enlargement may take up too much screen space
- Concentration difficulties and stress
- Audio and how this will work in the reading tests
- Equality of access
- Less autonomy

Options suggested:

- Use of paper-based formats
- Adult support

Research 2: Literature Review

- Accessibility issues for computer-based testing (CBT) and computer adaptive testing (CAT)
- Iterative search strategy with different databases being searched and the evolving use of search terms as the search progressed
- 11 articles selected
- The initial search identified an existing literature review on this topic (Stone and Davey, 2011) which summarised the literature up to that date – used this as baseline

Conclusions

- Relatively limited literature on accessibility in terms of how assessment materials and administrative procedures may be modified to support learners, especially those with disabilities, to participate meaningfully in assessments
- While not always conclusive, there is some consensus on aspects such as the need for 'universal design' principles at the design phase of tests
- There are three key areas for consideration identified in the literature to inform the wider discussion on accessibility issues :
 - content,
 - technology and
 - situational considerations

Content issues

- Modifications may impact on the level of difficulty of a test, eg:
 - The introduction of different item types
 - A different number of items
 - Change in the combination of items
- If an assessment is required to contain 'on-grade-level' items, learners may not receive an accurate score estimate if proficiency is below this level
 - Stone and Davey (2011) suggested CAT to overcome this
 - A further suggestion is the use of scaffolds
- Concerns about the modification of CAT items, including that the range of item difficulties may be limited or the items may be 'different'
- Combining modified and non-modified items may not be advisable within certain contexts

Technological issues

- Idiosyncratic or divergent knowledge patterns in learners affecting item calibrations
- Use 'universal design' principles, where options for alternative forms of test materials can be accessed by all users, for example, changing font size or background contrast, should be built into the platform
- Changing test administration conditions such as read-aloud accommodations can also be offered as an option via the online platform and can be turned on and off as required

Situational issues

- Such as school, teacher and learner familiarity with, and access to, technology – both hardware and software
- Such as computer infrastructure in classrooms, internet access ('digital equity' gaps) and whether learners regularly use computers for learning, and teacher and learners' expertise to use accessibility accommodations
- Requirements of the technology, for example, scrolling when the text is larger can take more time and can require additional working memory if all required information is not visible on the screen

Research 3: Expert Interviews

- 6 interviews with experts in computer-based and computer adaptive tests
- International sample:
 - Scotland
 - England
 - France
 - The Netherlands
 - Denmark
 - US
- Interview schedule with overall themes and detailed prompts
- 35 to 45 minutes on phone or Skype and recorded with permission
- All work in school context, covering primary and secondary education

Built-in vs. compatible modifications

- In most cases, the tests relied predominantly or entirely on compatible assistive technology and end-user modifications rather than built-in accessibility functions
- Read-aloud accommodations were the most commonly cited built-in modifications
- Other 'standard' accommodations were usually permitted such as human assistance and extra time
- Accessibility features were often an integral part of the item design stage, rather than being reliant on modifications at the point of use

The purposes and content of the tests

- The impact of modifications on the validity of the items and the comparability of test results is an important consideration when designing computerised tests for learners with disabilities
- The purpose of the testing programme should be a key driver in decisions as to which modifications are appropriate

The challenges

- The IT infrastructure in schools
- Keeping the items technically simple and avoiding the temptation to use all of the various functions and embellishments a computerised platform offers
- Diversity of learners needs and decisions about what can and cannot be done, based on a range of factors including resources, expert advice and the potential demand for specific modifications
- Retaining a test that is appropriately modified but still 'fit for purpose', particularly for certain modifications and test/ item types

Benefits and Drawbacks

Benefits

- Has the potential to offer a more positive experience than paper tests
- Can offer a more independent, personalised and/or equalising experience
- The ability to obtain an accurate measure of performance and ability using a minimal number of items

Drawbacks

- It is not possible to accommodate for every disability and decisions must be made as to what can and cannot be achieved in terms of such modifications
- Other accommodations must sometimes be accepted as the best option for some learners, for example, exemption from the test or paper-based alternatives

Key Advice

- Consult with users and relevant professionals at multiple stages and where possible act upon their suggestions and recommendations
- Collect and analyse data on which accommodations are used and by whom, and monitor the individual functioning of items
- Keep the item types as simple as possible
- Accept that you cannot do everything for everyone
- Try to make use of existing adaptive technologies rather than building in 'new' accessibility functions
- Be wary of assuming that paper-based items will convert directly to computer-based items
- In item-level adaptive testing, ensure the algorithm is multi-layered, i.e. that it does not just indiscriminately present easier or more difficult items without taking into account the test-taker's age
- Ensure that the IT infrastructure in schools can cope with the system
- Make the administration process as simple as possible.

Design decisions

<p>Use existing features:</p> <ul style="list-style-type: none"> Screen reading software Screen magnifier Colour and contrast preferences Keyboard accessibility 	<p>Set by teacher rather than learner and remembered in learner ID</p>
<p>School autonomy</p>	<p>Administration – as is usually used by the learner – adult support, rest breaks etc.</p>

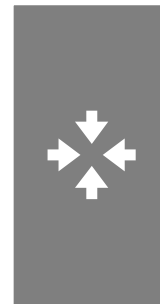
Will make the assessments accessible for the majority of learners, but...

Modification of Images

How do we make images accessible (appear in about 40% procedural numeracy items)



Remove images where possible



Provide alt text where appropriate



Simplify images and produce alt text
- Tag item as suitable for VI learners only



Not modifiable

Not Modifiable

- Currently considering options
- Non-modifiable appears to be a systematic bias, ie it is predominantly in the data area of the numeracy framework, so omission may affect validity

Options:

- Write different items to assess the construct (we are not sure this is possible in all cases, eg reading a scale)
- Accept that we can't assess this for VI learners, supplement with TA
- Provide booklet of 3-d diagrams (likely to be complex to use in an adaptive test)
- Produce short, paper-based tests in this curriculum area

Thank you

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