Assistive Technology Inventory Research Summary

NCEA Online Programme

November 2020

NZQA
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Introduction

"AT is very often seen as a gimmick and this needs to be tackled straight off as assistive technology is important for us. It is part of our autonomy, it is part of what we are and it makes us what we are."[1]

(Martin Naughton 2016)

Assistive technology (AT) is considered *"any item, piece of equipment or product system whether acquired commercially, modified or customised that is used to increase, maintain or improve functional capabilities of individuals with disabilities".*[2]

Use of assistive technology in education supports students with additional learning needs and/or disabilities to increase their ability to learn and engage in the school curriculum in a meaningful way.

Assessment candidates can apply for special assessment conditions (SAC). SAC are designed so students have access to assessments, both external and internal. Special assessment conditions include the student being provided with a reader and/or writer, additional time to complete the assessment, breaks to rest during the assessment or larger print papers or papers in braille.

SAC are designed for paper-based assessments. Digital assessment provides wider opportunities for candidates who are eligible for SAC to use assistive technologies. The use of assistive technologies in assessments also supports the accessibility principle for NCEA Online to support 'bring your own app' [3].

We have identified assistive technologies used by NCEA candidates and compiled an inventory showing assistive technologies commonly used by New Zealand students and appropriate for use in assessments. Further work is required to trial the compatibility of these assistive technologies with the digital assessment software used by the NCEA Online platform.

Ultimately, assistive technologies approved by NZQA will be available to students to use as required. Use of assistive technology should not necessarily be approved only as a SAC, allowing NZQA to also support those students who are not eligible for special assessment conditions but would find being able to use assistive technologies in assessment beneficial.

[1] Enable Ireland and Disability Federation Ireland (DFI), 'Assistive Technology for People with Disabilities and Older People: A Discussion Paper'. Available from https://freedomtech.ie/assistivetechnologypaper/. Accessed 26 May 2020

[2] World Health Organisation & World Bank (2011) 'World Report on Disability'. Geneva,CH;WHO, p.101

[3] Assistive technologies (e.g. text to speech) will be available to students where this reflects how they learn. "Bring your own app" (e.g. for assistive technologies) will be supported.' Available from https://www.nzqa.govt.nz/about-us/future-state/digital-assessment-vision/

Aims

This research was undertaken as part of the NCEA Online Research and Innovation Trials to support students who require additional support in assessments.

The aims of the research were to:

- identify those assistive technology tools that are being used by New Zealand students and the appropriateness of each tool in an assessment setting
- establish who is using the tools, school demographic information, costs and accessibility of the tool
- identify the advantages and disadvantages of using assistive technology to support assessments
- consider the impact on equity of making assistive technology available in assessments
- make recommendations for assistive technologies for NZQA to trial with the NCEA Online platform
- understand what areas of assistive technology require further research and analysis before a decision can be made if and how NZQA will approve that assistive technology for use in assessments.

Methodology

The primary method of gathering information was interviews with organisations who are:

- involved in funding of assistive technology for students who require learning support
- providers of support and services to students who require support
- assessors of needs of, and provision of technology to, students who require support
- assistive technology vendors.

Organisation	Function
Blind and Low Vision Education Network of New Zealand (BLENNZ)	Support / Services to learners who are blind or have low vision.
Ministry of Education (MoE)	Funding of assistive technology Setting policy for provision of support to learners
Accident Compensation Corporation (ACC)	Funding of assistive technology to learners with support needs that have resulted from injuries
TalkLink	Providing assessments and tools to learners who require support. Works with Health, ACC and Education (tier 2 – higher needs)

Organisation	Function
Desktop Technology Services Limited (DTSL) – Assistive Technology branch	Assistive technology vendors
DTSL – Assistive Technology branch	Product expert
Kelston Deaf Education Centre	School and provider of support to hearing impaired students

An informal discussion was held with interviewees who were asked to provide the following information:

- students they supported
- assistive technology tools
- advantages and disadvantages of assistive technology tools
- challenges faced.

Discussions were also held with NZQA staff. Feedback on individual tools was also sought.

Each interviewee was asked if they could provide data on frequency of purchase of assistive technologies by school. The following organisations provided data:

- MoE
- DTSL
- BLENNZ.

Information from interviews and data was compiled and used to create a list of the most commonly used assistive technologies. This was analysed by:

- numbers of instances of the assistive technology tool being used by students and schools
- deciles and locations of schools using the technology
- appropriateness for use in an assessment
- cost
- appropriateness for the NZ education setting
- compatibility with NCEA Online platform
- whether the functions provided by the assistive technology would be met by the new NCEA Online platform design
- whether changes made to NCEA Online platform may clash with the assistive technology
- whether any assistive technology tools were preferable to others with similar features that used the same operating system (OS).

Not all of the above information was available.

It was also not possible to complete in-depth research into the assistive technology used by students who are deaf or hard of hearing without surveying schools. Only a handful of students at Van Asch and Kelson deaf education centres sat NCEA in 2019. Students who are deaf or hard of hearing in mainstream schools may also sit assessments and further research is needed.

Results

Results include quantitative evidence from data and qualitative data from interviews. Both are summarised below.

1.1 Summary of findings from interviews

1.1.1 Ministry of Education (MoE)

The assistive technology supplied to schools is dependent upon school choice and the platform the school is using. MoE reported that for the last two years PC laptops were the most funded item, followed by Chromebooks, iPads and MacBooks.

Trends may be regional. One Auckland Resource Teachers: Learning and Behaviour (RTLB) cluster has purchased an annual subscription for Texthelp Read&Write. Schools in this cluster have requested MoE fund the subscription. All schools funded for Microsoft are provided with anti-virus software and Google is free although Google extensions may incur a cost.

Students will sometimes move between schools which may involve moving between platforms. This can create complexities as the student has familiarised themselves with a new platform and functionality, or the school needs to work with the student to support the platform they have been using.

Built-in accessibility tools are also widely used. Apple, Microsoft and Android platforms now provide these tools. Some are more popular than others. Providing accessibility tools are turned on before the assessment is launched, it should be possible to use these during the assessment. This needs to be confirmed by testing. Built-in accessibility tools include features like magnification, and options to change screen colours. Chromebooks are often not powerful enough to manage assistive technology applications.

MoE most often provides students with additional learning needs with WordQ or a C-Pen Reader and a device to run the application on.

Schools sometimes provide MoE recommendations as to what assistive technology the student should receive to support their learning.

School are responsible for requesting upgrades to software. MoE will fund upgrades.

1.1.1.1 Funding

There are approximately 300 students in the Ongoing Resourcing Scheme (ORS) and this is the largest funding group. In addition to this, there are approximately 150 students in the Additional Learning Needs group.

MoE does not tend to fund students who apply for funding in year 13 as any need for additional support should have been identified earlier. The early intervention policy aims to identify students who require support at primary school and provide them with the assistive technology they need to support their learning. This enables the student to arrive at secondary school familiar and confident in using the tools and assistive technology they have been provided with.

When additional needs are identified the school works with specialists to find the best tools to support the student. The technology is supplied by the school's provider and then added to the school's asset register. This will change with the appointment of Learning Support Coordinators who will have central management of assistive technology and are likely to be responsible for updating software as students progress through primary and secondary school.

MoE funding is based on the assessment of the students' learning needs, rather than on the diagnosis. Most applications are accepted, and any declines are usually because the Accident Compensation Corporation (ACC) or Ministry of Health (MOH) are responsible for the funding.

ACC fund any learning needs that are the result of an injury and MOH fund any learning needs that are the result of an illness or medical condition.

1.1.2 ACC

The funding model used by ACC is different to MoE. ACC doesn't have a prescribed list of equipment they fund. ACC's needs assessments are completed by TalkLink whose assessors observe clients in a variety of settings including school, work and home, as appropriate. They then prescribe assistive technology to support the client in each setting. This may be equipment or technology. Often voice to text technology is funded.

1.1.3 TalkLink

TalkLink works directly with schools to understand the client's needs and working with the relevant people in the school. Schools may recommend certain technologies.

TalkLink also provides assessments for health funding and some assessments for MoE for higher tier learning needs.

There are instances with MoE funding where schools do not have enough devices for one per student or a class may have a set of devices and the student can't take the device home as the school has responsibility for the device. ACC and the MOH are both responsible for funded devices and the repair of those devices.

Schools that don't have a Special Education Needs Coordinator (SENCO) can experience difficulties with provision and support of assistive technology. Teachers often do not have the time to support students using assistive technology and teacher aides need to provide support.

1.2 Data

1.2.1 Assistive technology sales and funding data

The research gathered data on sales and funding of assistive technology for the 2019 year.

A breakdown of data by schools and assistive technology types can be viewed in the attached spreadsheet.

The following should be noted:

1. Data is both qualitative (anecdotal and reported by interviewees as being used or useful) or quantitative (reflected in data of assistive technology supplied or purchased).

2. Data was supplied by MoE, the assistive technology branch of DTSL and BLENNZ.

3. DTSL supplies assistive technology to education, ACC and MOH. The name of the school was available only where the assistive technology was funded by MoE. For purchases funded by MOH and ACC, it was assumed that purchases for school aged tamariki could be used in both the home and school settings.

4. Data covered the 2019 period for both primary and secondary schools.

5. Decile and regional information were added to the tables manually, just for secondary schools. This is due to inconsistency in school names and because matching schools to demographic information would be a time-consuming exercise.

6. Data for humanware (braille devices) was harder to source as is not purchased through DTSL, the main supplier. DTSL advised there is now a move by organisations working with those with low vision to use devices loaded with software for support rather than separate hardware. This was confirmed by BLENNZ who supplied a list of technology they fund. This does not include any demographic information.

7. There were many more purchases of assistive technologies by primary schools than secondary schools. This is due to the early intervention policy where schools work to provide students with assistive technology earlier, so they are familiar with it by the time they start secondary school and complete NCEA assessments. MoE, TalkLink and ACC indicated that many of the technology purchases for primary schools go with the student to their secondary school and therefore have been included in the results.

8. Some purchases are whole of school purchases. The software is purchased and made available to all students via the school network. This is generally the case with Texthelp Read&Write. Where the number of schools is noted in the data this represents purchases per school, not students. The purchase may be for the school or for one or more students at that school.

9. Where data is noted as being ACC or MOH, the school is unknown. This purchase data has come from TalkLink and the name of the school has not been supplied.

10. Where the source is ‘Data from Website / school unknown’, the purchase has been made directly through the DTSL webstore and no school information is available.

1.2.2 Limitations

The data has several limitations, including:

1. It is not possible to have a complete data set for all assistive technology used by New Zealand students without contacting every school. The data is reliant on what has been

funded and purchased by the MoE, ACC and MOH.

2. The list does not adequately show the support from RTLB Clusters where they have purchased equipment like C-Pen Readers, iPads and apps, Chromebooks etc and made these available for students who may not have a SENCO or meet the MoE criteria. It may be that the area is not well supported with MoE assistive technology funding applications.

3. MoE provide funding for learning needs not diagnosis/condition (data not collected for this). It hasn't been possible to gain a complete understanding of exactly what additional needs the students who have received funded technology have. Assumptions have been made based on anecdotal evidence.

4. BLENNZ provided a list of what they have supplied to students with low vision, but this does not include school or age data. This is in the second tab of the attached spreadsheet.

5. There may be some crossover between data sources. For example, DTSL and the MoE may report the same purchase. Spot checking of the data suggests this is not a frequent occurrence, but figures should only be regarded as indicative.

6. Students may have funded their own assistive technology and the purchase may have been made through a vendor other than DTSL. This won't be reflected in the data.

1.3 Inventory

The inventory has been compiled using:

- data provided by MoE, DTSL, BLENNZ
- anecdotal evidence provided by Talklink, MoE and BLENNZ.

The inventory includes technology found in the data and technology referred to in interviews. It is assumed these are the assistive technologies most commonly used by New Zealand students. Please note that school numbers are for primary and secondary schools.

Application	Purpose / used for	Reported by	Category	Platform	Cost (approx, NZD)	Purchases per school	Subscription model
Braille Note Touch	Braille keyboard and speech synthesiser	BLENNZ	Braille keyboard Screenreader	Windows Mac Android	TBC	TBC	
BrailleSense U2	Braille keyboard and speech synthesiser	BLENNZ	Braille keyboard Screenreader		TBC	TBC	
CPen Reader	Portable, pocket-sized device that reads text out aloud with an English human-like digital voice. Has access to storage to store text and a dictionary. Hard copy text only.	MoE TalkLink	Text scanner	All	$405	457	
C-Pen Exam Reader	C-pen with exam mode only for exams.	DTSL	Text scanner	All	$405	5	
ClaroRead	Text to speech. Word prediction.	DTSL	Text to speech Rate enhancement	Windows Mac	$550	8	
Clicker 7	Writing support, prediction, speech feedback, audio notetaker, word prediction.	MoE TalkLink	Rate enhancement Writing support Text to speech	Windows and Mac	n/a	96	
Clicker 8	Writing support, prediction, speech feedback, audio notetaker, word prediction.	DTSL	Rate enhancement Writing support Text to speech	Windows Mac	$667	3	
Clicker docs	Word processing support.	DTSL	Rate enhancement Writing support Text to speech	Chrome iOS	$287.50	52	3 year subscription model/per account
Clicker writer	Word processing support.	DTSL	Rate enhancement Writing support Text to speech	Chrome iOS	$287.50	2	3 year subscription - loaded to an account
Co:Writer Universal	Word prediction, speech to text, spellcheck, topic dictionaries.	DTSL TalkLink	Rate enhancement Writing support Text to speech	PC/Mac iOS Subscription	$158	6	1 year subscription - downloaded to an account.
Dolphin	Screen reader. Magnification.	MoE BLENNZ	Screen reader	Windows based	$5 per month	1	Monthly subscription
Dragon Professional	Speech recognition.	MoE BLENNZ	Speech recognition	PC	$615	119	Professional individual licence

Application	Purpose / used for	Reported by	Category	Platform	Cost (approx, NZD)	Purchases per school	Subscription model
EquatIO - Math made digital	Converts handwritten and spoken notes into mathematical formulas.	DTSL	Mathematics support	Web based	$342	2	
Texthelp Read&Write	Suite of tools to support reading and writing including word prediction, screen reader vocabulary support, speech input, dictionaries.	MoE TalkLink DTSL Dyslexia Foundation	Rate enhancement Writing support Text to speech Speech recognition	Web based	$342	163	Yearly licence downloaded to an account.
Grammarly Premium	Corrects grammar and spelling.	SRMs DTSL	Writing support	Web based	$356	9	Free or yearly subscription model for premium.
iWordQ - iOS	Word prediction.	DTSL	Text to speech Rate enhancement Speech recognition	iOS	$42	56	One off cost - iTunes download.
Jaws	Screen reader. Provides speech and braille output.	BLENNZ MoE	Screen reader	Windows based	$2,000	2	
MAGic	Screen magnification	BLENNZ	Text magnification	Windows	$400		
Non Visual Destop Access (NVDA)	Free, open-source screen reader for Windows. Can convert text to braille.	BLENNZ	Screen reader	Works best with Gsuite and Google	Free	n/a	
Notability	Notetaking and pdf creation.			IOS app	$18	5	Redeem download
Sonocent audio notetaker	Desktop software that turns audio into visual blocks; notes can then be structured using coloured highlighting and combined with images and text notes.		Speech recognition Audio	PC Mac	$317	7	Annual Subscription
Tint and Track	Digital colour overlay/reading ruler.	DTSL	Visual stress	Windows Mac is planned	$120		
Voice Dreamer Reader iOS	Text to speech.	DTSL	Screen reader	Apple	$30	7	Redeem download
WordQ	Word prediction.	MoE TalkLink	Rate enhancement Writing support Text to speech	Windows and Mac Chrome	$356	165	Download - one off cost
WordQ UK I or UK II for Chrome	Word prediction.		Rate enhancement Writing support Text to speech	Chrome	$69	266	Download to specific Google accounts - one off cost
ZoomText Magnifier/Reader 2020	Sister program to Jaws. Magnify text on screen. Screen reader.		Text magnification Screen reader	Windows based	$1,329		

1.4 Categories of assistive technology

Assistive technologies included in the inventory table are described and grouped by category below. Several tools such as Texthelp Read&Write, Co:Writer and WordQ provide several functions in one package. These tools have been referred to in the individual categories, but it should be noted that if one of these applications is purchased the school or student will have access to all the functions the tool includes.

1.4.1 Rate enhancement / word prediction and writing support

Speed or Rate Enhancement Software can make a difference to the amount of time and effort needed to produce a document by using word prediction and completion and the expansion of abbreviations. This supports students with dyslexia or other learning differences who may struggle with writing output or spelling.

Several applications that support rate enhancement are frequently used by students at New Zealand schools. They include:

- WordQ

  This has an exam mode which can be set for up to eight hours. It cannot be disabled unless the machine is restarted, which would be obvious to an exam supervisor. Exam mode disables all features that could offer an unfair advantage, while still retaining key features of word predictions, speech feedback and proofreading.

  DTSL has provided MoE with phonetic te reo Māori pronunciations for 400 words. This is available for WordQ only.

- Texthelp Read&Write

The following rate enhancement applications are used by only a small number of students:

- CoWriter
- Clicker version 7 and 8

  Clicker is primarily used to support students with low literacy and assist with developing sentence structure. The features within Clicker are very structured and it offers little flexibility. Students capable of creating documents but needing word prediction are better supported using WordQ or Texthelp Read&Write.

1.4.2 Text to speech and screen readers

Text to speech and screen readers render text and image content as speech or braille output.

Screen readers provide far more complex functionality than a text to speech tool which will commonly just read the text on the screen back to the reader. A screen reader will read the metadata, navigate through headings, speak image alternatives, and identify internal and external links.

The W3C Web Initiative reports that many computers and mobile devices today have built in text-to-speech software. Some people who need more support, such as the blind and those with low vision, use screen readers.[4]

Screen readers will often allow all major functions of the Microsoft Windows operating system to be controlled with keyboard shortcuts and spoken feedback. Often a mode designed specifically for web browsers is activated when a browser is in the foreground.

Screen readers are often associated with having a high cost. Non-Visual Desktop Access (NVDA) is open source and free and according to Wikipedia is now the most popular screen reader in the world.[5]

The most common screen readers used by students at New Zealand schools are:

- Dolphin
- Jaws
- NonVisual Desktop Access (NVDA)
- Voice Dreamer Reader iOS
- ZoomText Magnifier/Reader 2020.

1.4.2.1 Inbuilt accessibility features

Built-in accessibility features that come with Windows, Chrome, iOS and MacOS also provide several built-in screen reading features, but these generally do not provide the depth of functionality that standalone screen readers do.

The most common problems reported with text to speech are mispronunciations. For example, Māori words and some names are often mispronounced as are words that have two pronunciations depending on meaning. Some students find the slightly robotic nature of the voice tiring to listen to, although technology is improving. Some software has the option to define how the words are pronounced. An NZQA research project is investigating solutions for providing text to speech in te reo Māori.

Cost is another prohibitive factor and may deter schools from purchasing the more expensive screen readers.

1.4.2.2 C-Pen Readers

The C-Pen Reader is a hand-held digital highlighter used to scan and read aloud text from hard copy materials. It also provides a dictionary look-up function and the ability to save scanned text. C-Pen Readers are approved for use in assessments by several countries including Australia, the United Kingdom, the United States and South Africa.

The C-Pen Reader has an exam function that allows the dictionary and other look-up functions on the phone to be disabled while the C-Pen Reader is being used in an assessment. This means the student has access to the text reading function only. The exam mode is enabled by setting a PIN on the device. It is disabled by the same PIN being entered at the end of the assessment.

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[4] W3C, Web Accessibility Initiative, 'Text to Speech', Available from https://www.w3.org/WAI/perspective-videos/speech/. Accessed 27/06/2020

[5] Wikipedia, Screenreaders. Available from https://en.wikipedia.org/wiki/Screen_reader. Accessed 27/05/2020

There is also a C-Pen Reader specifically manufactured for assessments - the C-Pen Exam Reader. It provides text reading functionality only and does not require a PIN to be set. Some New Zealand schools are using the C-Pen Exam-Reader for use in internal assessments. Schools can purchase a set of C-Pen Exam Readers for students who regularly use C-Pens to use in assessments.

C-Pen Readers are used widely by students in New Zealand schools. According to the assistive technology funding data for the 2019 year, there were approximately 450 C-Pen Readers purchased. C-Pen Reader purchases have been across several different regions and a range of deciles. The data does not account for C-Pen Readers purchased by schools or students in other years or purchases of C-Pen Readers through any channel other than MoE, ACC, MOH, or directly through DTSL.

A C-Pen Reader cannot be used with digital text and is for use with hard copy only.

1.4.3 Speech recognition

Speech recognition (also known as speech to text or dictation) is an assistive technology tool that is used by people who need support with writing. Speech recognition converts speech into digital text. Speech recognition helps students who:

- Need support with handwriting. Using dictation allows them to create text that is easily read.
- Need support with spelling. Providing pronunciation is correct, the software will spell the word correctly for the student.
- Think faster than they can write by hand or type on a keyboard, helping them get all their thoughts into words.
- Have motor skills issues. It enables them to write more comfortably and accurately, and includes students who have difficulty using a keyboard.

Speech recognition can adapt to how a student speaks and accuracy increases with use. It also converts audio recordings into digital text.

1.4.3.1 Inbuilt accessibility features

Many devices have built-in dictation tools. This includes desktop and laptop computers (Windows and MacOS), smartphone and digital tablets (Android and iOS), and Chromebooks (Chrome OS). MacOS, iOS and Chrome are online only. Windows is offline but the dictation tools are not currently widely used compared to MacOS, iOS and Chrome options.

1.4.3.2 Speech recognition tools

There are four main speech recognition tools:

- Dragon (Professional)
- Texthelp Read&Write
- WordQ
- Co:Writer.

Speech recognition only works well for students who have reasonably consistent pronunciation of English sounds, however Dragon Professional can be trained to recognise many more voice types.

Dragon Professional for Windows is the only dictation tool that builds a voice profile and creates a phonetical dictionary. It also has offline capability. This is the only version of Dragon used by New Zealand students as the version for the MacOS was taken off the market due to Apple making changes to the Mac operating system.

Texthelp Read&Write also provides speech to text capability. It is associated with an email account. A large number of schools have purchased this after a large sales drive by Texthelp Australia.

1.4.4 Magnification / visual stress tools

1.4.4.1 Magnification

Magnification software is used by students with low vision to read and view content on screens. Magnifying or zooming text can make it easier and more comfortable to read written content.

Inbuilt capability

The Windows, Mac and Chrome operating systems include screen magnifiers as part of their accessibility options.

Standalone text magnification products

There are two standalone text magnification tools that have been commonly used by New Zealand students:

- MAGic
- ZoomText.

MAGic was bought by Zoomtext and has been discontinued as Zoomtext is considered a superior product.

Zoomtext can be purchased as a standalone magnification tool or with the Jaws screen reader (Fusion) or with a simpler screen reader product. The Zoomtext magnification product doesn't pixelate images or text, which inbuilt magnification tools often do. It also sharpens the edges of images and provides different pointer options, which are more easily seen on the screen. Zoomtext only works with Windows and requires a reasonably powerful computer.

1.4.4.2 Screen overlays

Digital screen overlays are a visual stress tool that replace the colour overlays or reading rulers that students with Irlen Syndrome or Dyslexia sometimes use to make text more readable. The most popular product in New Zealand that provides this functionality is called Tint and Track.

1.4.5 Multi-function assistive technologies

Some assistive technologies include several functions within the one application. Usually this is a combination of screen reading technology, speech recognition and rate enhancement. Co:Writer, Texthelp Read&Write and WordQ all include screen reading, speech recognition and rate enhancement within the one application.

There is a clear advantage to having one application with several different functions as students don't have to swap between the different applications to access the functions they require and only need to gain familiarity with one application, rather than a suite of applications.

Several of these applications also include support tools such as topic dictionaries. These would need to be disabled during an assessment.

1.5 School licences

Some applications can also be purchased as a school licence and loaded onto the school network for all students to use as required. This means where schools have a licence for any of these applications, the licence may be for the school, with multiple students using the application to support their learning. This means the application will not just be used by those with higher needs but others who may also benefit from the learning support the application provides.

It is not possible to know how many students are using an application without directly contacting individual schools and asking for data. Texthelp Read&Write is used by several schools, with one Auckland RTLB cluster purchasing licences.

1.6 Platforms and devices

Network for Learning (N4L) reported the following device use across primary and secondary schools for 2019:

Device Type	Device Share
iPad	25.08%
Linux PC (or Chromebooks)	18.15%
Windows PC	17.75%
iPhone	16.16%
Android Phone	8.84%
Mac	8.34%

N4L data includes student owned devices that they use at school as part of the Bring Your Own Device (BYOD) policy that many schools have in place, including primary and secondary schools, and shows iPads are the most used device, followed by Chromebooks. This is not surprising as many primary schools have purchased iPads for student use but does not reflect secondary schools where iPad use is not so widespread.

MoE reported that Chromebooks are the most common devices used by secondary schools. The spread of devices reflects the funded assistive technology which can be used with several different devices and platforms.

This data was pre COVID-19, during which time MoE provided students with devices and connections as needed. Post COVID-19 lockdown data that reflects these purchases should be considered once available.

Discussion of findings

1.7 Overview

There are several assistive technology tools commonly used by New Zealand students that may be appropriate for use in external assessments. When considering the technology, this research asked whether the technology:

- is appropriate for use in an assessment
- has known conflicts with the NCEA Online platform (this is not necessarily a reason to rule the technology out)
- must be used on a platform or device that is not compatible with the NCEA Online platform or contravenes NZQA policy
- supports use of te reo Māori
- supports the New Zealand curriculum and education framework
- is widely used by students, over a range of deciles and spread regionally.

1.8 Speech recognition

Speech recognition (also known as speech to text and dictation) should be trialled in the assessment environment. Using a speech recognition tool would remove the need for an assessment reader and/or writer and allow the student to use a tool they are familiar with, improving their level of comfort with the exam. For those students who don't meet the criteria for having a writer, having access to speech recognition may decrease the time they need to complete the assessment and improve the readability and clarity of their responses.

Dragon and WordQ are used by a large number of students. WordQ also provides rate enhancement and speech recognition, but can only be used with Windows. (Please see the section on rate enhancement for more information.)

Sonoccent notetaker is also used but only by a small number of students.

Speech recognition only works well for students who have reasonably consistent pronunciation of English sounds. Dragon can be 'trained' to understand the user so will provide better support for students with speech difficulties than Texthelp Read&Write or the inbuilt accessibility tools.

Dragon can be trained to recognise a student's voice and learn words associated by topic area. This would be advantageous in an assessment as this means it can be trained to recognise te reo Māori words and is able to manage more complex words in te reo Māori. It should be noted that on server-based versions of Dragon, the information relating to how the user speaks is stored on the server and would not be accessible during the assessment. This means Dragon would not perform well for the student; however Dragon Professional has offline capability.

In 2015-16 CALL (Communication, Access, Literacy and Learning) Scotland, in collaboration with the Scottish Qualifications Authority ran the Talking in Exams project, which involved 28 schools across Scotland piloting the use of Dragon Professional Individual software with students. The Talking in Exams project found that Dragon could help some students achieve previously unattainable literacy goals, and participating staff felt that:

- 28% of the students who trialled Dragon would be likely to use it in examinations

- 54% may be able to use it
- 17% definitely would not be candidates for using Dragon.[6]
- Dragon may be appropriate for using in some NZQA assessments but may not be appropriate for assessments that focus on literacy. This needs to be discussed with NZQA's School Relationship Managers to determine how it can best be used.

Most platforms also provide inbuilt speech recognition. This is more basic and doesn't offer the same breadth of functionality as Dragon Professional Individual for example. The speed of the built-in accessibility features is also likely to be inferior to Dragon.

Accessibility features that are built into the platform, should in theory work with the SoNET software without configuration being required, but this would need to be tested.

Dragon Professional, Texthelp Read&Write and WordQ all have exam modes. Students would still need separate accommodation because of the need to speak during the assessment.

Some students may still prefer a writer.

1.9 Screen readers

Screen readers (sometimes known as text to speech) are widely used by students with low vision and learning differences such as dyslexia.

It is appropriate to use speech readers in assessment to support students to understand the assessment questions and check their assessment responses have been written as intended (using the audio to play the response back).

1.9.1 Commonly used screen readers

Texthelp Read&Write includes text to speech functionality and is used by a large number of schools.

Jaws is also used by a large number of students with low vision and can be purchased with magnification software (Zoomtext Fusion).

Jaws is an expensive option but provides complex screen reading. It has a natural sounding voice that students say they prefer. It does not manage languages other than English well.

Non Visual Desktop Access is open source and free and gaining popularity with New Zealand students.

BLENNZ noted that students may use several different tools and therefore it's not appropriate to recommend testing just the most widely used tools as this will not meet the needs of all students.

Text to speech functionality is often part of the accessibility features provided by most platforms. Text to speech does not provide the in-depth capability of a screen reader.

[6] Lawson, Shirley, January 2018 'Using Speech Recognition in Examinations', accessed at https://www.callscotland.org.uk/blog/using-speech-recognition-in-examinations/ 14/04/20

Built-in accessibility text to speech features are usually more basic than off the shelf applications and the default voice options often sound mechanical. This research indicates it should be possible to use the built-in functions with assessments.

Other matters to note:

- Text to speech is an accessibility feature on several websites.
- Text to speech functionality does not have the capability that a screen reader provides.
- Text to speech reads the words on the screen while a screen reader will provide far deeper and more complex reading of the screen and its elements.
- Text to speech functionality is usually not appropriate for blind students or students with low vision where selecting text on the screen is not possible.
- It should also be noted that students who are familiar with using a particular tool to support their learning will struggle using a new tool in an assessment and this may affect their experience and the outcome of the assessment.
- Research into text to speech tools and productivity in India showed that users with low vision are reluctant to change screen reading tools because of a perceived issue with productivity loss.[7] This relates to employment and lower income countries but is likely an issue for students who have been provided with expensive screen reading technology and are also managing learning and assessment pressures.

1.10 C-Pen Readers and use of supplementary material in assessments

C-Pen Readers are commonly used by New Zealand students to read paper-based text. Some schools are using C-Pen Readers for internal assessments.

A C-Pen Reader cannot be used with digital text. It is for use with hard copy only. However, supplementary material is still being provided in hard copy with digital assessments and this could be an opportunity, given the wide use of C-Pen Readers within New Zealand schools, to allow students to use assistive technology to support their use of hard copy as well as digital materials. This is assuming that NZQA continue to use paper based supplementary material in the medium term. The user experience improvements and new assessment design may mean all supplementary material used with digital assessments is digital and the need to consider use of C-Pen Readers becomes redundant.

C-Pen Readers could also be considered for approval for paper-based assessments and those schools still choosing to sit paper-based assessments where digital assessments are available. There have been requests from secondary schools to NZQA's School Relationship team to consider approving C-Pen Readers for use in paper-based assessments. This is outside the scope of this research.

NZQA has the following concerns about the use of C-Pen Readers in assessments:

- C-Pen Readers are expensive devices and approving use in assessments may mean we are not supporting equitable access.
- Setting the exam function would require already stretched exam centre managers (ECMs) and Supervisors to manage setting PIN numbers for the C-Pen Readers.

[7] Mccarthy, Pal, Cutrell and Marballi, (2012) *An analysis of screen reader use in India.*

- Supplementary assessment material is expected to become obsolete in the short to medium term.
- 2019 data shows C-Pen Readers are in use across all New Zealand regions and school deciles and may be widely used if approved for assessments.

1.11 Rate enhancement and writing support

Rate enhancement tools decrease the number of keystrokes required. Rate enhancement encompasses expansion of abbreviations (e.g.ASAP becomes 'as soon as possible'), word completion and word prediction. Rate enhancement is often used by students with dyslexia, or other students who need a longer time to respond. Tools that provide rate enhancement usually include writing support. Writing support usually includes proof reading tools and topic dictionaries.

Having access to a rate enhancement and writing support tool in an assessment would shorten the length of time needed to complete an assessment and improve the readability of the response.

The most popular tools for rate enhancement are WordQ and Texthelp Read&Write. Co:Writer is rarely used by schools. Both Texthelp Read& Write and WordQ are usually purchased on an enterprise or universal type licence that allows all students at a school to use the product.

Both provide rate enhancement with text to speech and speech recognition and can be used across several different platforms.

For use in assessment, it needs to be possible to 'turn off' rate enhancement and writing support tools that provide topic dictionaries or any means to access information that is not permitted in an assessment. Usually this is possible via an exam mode. WordQ, Texthelp Read&Write and CoWriter have exam modes that restrict the functions students can access. This would be reliant on an ECM or supervisor setting the exam mode for the student. The WordQ exam mode is based on a timer and locked functions cannot be accessed until the timer runs out. Students who are familiar with using a particular tool to support their learning have been known to struggle with use of a new tool in an assessment and this may affect their experience and the outcome of the assessment.

WordQ has several phonetic pronunciations in te reo Māori meaning if the student uses a common te reo Māori kupu (word) it will be read back to them with the correct pronunciation. This supports NZQA's work to provide equitable access to assessments by supporting students to provide a response in te reo Māori if they choose to.

1.12 Magnification / visual aids

While magnification tools come with the built-in accessibility tools on most platforms, there are some advantages to using a stand-alone application such as Zoomtext.

Zoomtext has three versions. The most basic offers magnification (Zoomtext Magnifier) and other tools to make visual elements on the screen easier to see. It can also be purchased with built-in Jaws screen reader (Zoomtext Magnifier/Reader) or bundled with the Jaws screen reader, Fusion.

Giving students the option to use Zoomtext with assessments provides the following benefits:

- The screen reader and magnification functionality can be used together.
- Zoomtext provides greater functionality than that offered by platform accessibility features and likely to be offered by SoNET.

Zoomtext is an expensive option and it is preferable that students have access to the accessibility features offered by the platform they are using.

Tint and Track provides digital colour overlays, making text easier to read for students with dyslexia or Irlen Syndrome. This is functionality that is not provided by platform features.

1.13 Demographics

Analysis of the data provided by DTSL, MoE and BLENNZ showed that assistive technologies are being used across a wide range of school deciles and regions. Analysis comparing school size vs what assistive technology had been provided was not completed due to the lack of consistency in data (for example the way school names were entered) but could be considered in further research. This may be a factor that impacts on a school's ability to support students with additional learning needs and provide them with assistive technology.

It has also been reported that higher decile schools are more likely to apply for and have special assessment conditions approved.[8] This may be related to school size or socio-economic factors.

While lower decile schools may have fewer special assessment conditions approved, it does appear they have access to assistive technology. This could mean they may find it easier to access assistive technology to support students with additional learning needs in assessments than to apply for a special assessment condition. This should be considered when formulating policy to define how assistive technology is used in assessments.

1.14 NCEA Online Platform

To maintain the integrity of the assessment and reduce the risk of cheating, the NCEA Online platform prevents the student from moving out of the browser while the assessment is being completed. If the student moves outside the browser this raises an exception, locks the assessment and the supervisor is alerted to the possible breach.

Some assistive technologies would require the student to leave the browser to use the tool. It should be noted that if remote invigilation tools are being used with assessments the same rule would apply, with any movement outside the browser raising an exception.

Further analysis is needed to understand what these changes are and their impact on assistive technologies and students who rely on these features.

1.15 Devices not considered as part of this inventory

Several devices or tools are used to support the learning of New Zealand students with additional needs, including:

- braille note taking
- braille keyboards

[8] 'Collins, Simon (2018), NCEA injustice: Huge gaps in reader-writer assistance,' *New Zealand Herald.* Available from https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12156502&ref=clavis&fbclid=IwAR2aDtte2AN0Qya9y6TF8Mkooo0sXO3mkHQa9XFLuk9buSPXuAV0v7tjRRk

- eye gaze and switch tracking software
- specialist keyboards with large keys to support users with low vision
- colour overlay/reading rulers.

These devices have not been considered as part of this research for the following reasons:

- Specialist keyboards should be available to students to use as part of their usual set up during an assessment and should be compatible with NCEA Online platform .
- Eye gaze and switch technology is a complex area. There are currently no students using this sort of technology in assessments in New Zealand but further investigation would be required if the option was made available as these students could enter digital assessments.
- Tools that support visually impaired students are complex and there is a move towards providing devices such as iPads loaded with applications rather than providing expensive software. This requires further investigation.
- Colour overlay/reading rulers are already used in assessments by students with additional learning needs such as Irlen Syndrome and dyslexia,.

1.16 Touch screens

Several students with physical disabilities rely on touch screens. Sometimes the touch screen may be used as a keyboard. Incompatibility with NCEA Online could cause issues with some applications and exclude students who use keyboards accessed via a touch screen from being able to participate in digital assessments.

Students supported by BLENNZ often use iPads loaded with software, rather than using more expensive hardware. This is an accessibility issue as iPads are not currently compatible with the NCEA Online platform.

1.17 Te Reo Māori

Research is being undertaken by the University of Waikato to identify wordbanks, speech to text tools and speech synthesis that could be used to support the use of te reo Māori in assessments.

This research should be considered when thinking about which assistive technologies should be approved for use in assessments.

Conclusion

New Zealand students with additional learning needs are provided with assistive technology to support their learning and to enable them to meaningfully engage with the curriculum in primary school so that by the time they reach secondary schools they are familiar with the technology and can use it with ease to support their learning. Those students should be supported to use those same tools in their assessments. This helps level the playing field for all students.

If supporting use of assistive technology makes assessments more accessible for students who have additional learning needs, assessments will become more accessible for everyone. There are New Zealand students who may not be eligible for SAC but have difficulty with reading and writing and could benefit from use of assistive technology in assessments.

As has been noted previously, students who are familiar with using a particular tool to support their learning can struggle with use of a new tool in an assessment and this may affect their experience and the outcome of the assessment. Such students may have been using the technology for several years before they reach NCEA level and have become very familiar with its use. Supporting the use of assistive technology in digital assessments is an opportunity for NZQA to provide equitable assessment and support all New Zealand students to maximise their success.

References

American Institute for Research, *Assistive Technology Manual 2019–2020*, University of Wyoming, 2020.

American Foundation for the Blind**,** A Review of Freeware and Shareware Screen Magnification Software for Windows. Available from https://www.afb.org/aw/14/4/15707 (accessed 13/05/2020)

Blind Education Network New Zealand, *Technology.* Available from http://www.blennz.school.nz/guides-and-resources/technology/ (accessed 03/03/2020)

Collins, Simon (2018), 'NCEA injustice: Huge gaps in reader-writer assistance,' *New Zealand Herald.* Available from https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12156502&ref=clavis&fbclid=IwAR2aDtte2AN0Qya9y6TF8Mkooo0sXO3mkHQa9XFLuk9buSPXuAV0v7tjRRk

Dyslexia Foundation New Zealand, *2017 SAC Data.* Available from http://www.dyslexiafoundation.org.nz/dyslexia_advocacy/2017-sac-data.php (accessed 12/01/2020)

Dyslexia Association of Ireland, *Access to Text.* Available from http://www.dyslexia.ie/information/computers-and-technology/access-to-text/ (accessed 12/05/2020)

Enable Ireland, https://www.enableireland.ie/report, Assistive Technology for People with Disabilities and Older People: A Discussion Paper by Enable Ireland and Disability Federation Ireland (DFI)

Lawson, Shirley, January 2018 'Using Speech Recognition in Examinations.' Available from https://www.callscotland.org.uk/blog/using-speech-recognition-in-examinations/ (accessed14/04/20)

Martin, Jamie, 'Dictation (Speech-to-Text) Technology: What It Is and How It Works'. Available from https://www.understood.org/en/school-learning/assistive-technology/assistive-technologies-basics/dictation-speech-to-text-technology-what-it-is-and-how-it-works (accessed 03/04/2020)

Mccarthy, Pal, Cutrell and Marballi, (2012) An analysis of screen reader use in India. Proceedings of ICTD 2012, the 5th ACM/IEEE International Conference on Information and Communication Technologies and Development. Available from https://www.microsoft.com/en-us/research/publication/an-analysis-of-screen-reader-use-in-india/ (accessed 1/05/2020)

Microsoft Learning Tools (2020), Virtual Learning Network Assistive Technology Blog. Available from https://vln.school.nz/blog/view/988656/microsoft-learning-tools (accessed 10/05/2020)

Ministry of Education, New Zealand, *Assistive Technology*. Available from https://education.govt.nz/school/student-support/special-education/assistive-technology/ (accessed 12/05/2020)

Ministry of Education, New Zealand, *Special Assessment Conditions.* Available from https://education.govt.nz/school/student-support/special-education/special-assessment-conditions/ (accessed 20/12/2020)

NZQA, 'Digital Assessment Vision, Available from https://www.nzqa.govt.nz/about-us/future-state/digital-assessment-vision/. Accessed 20/05/2020

O'Connor, Coll, Literacy Support - Comparing software for word prediction, Virtual Learning Networks. Available from https://vln.school.nz/blog/view/918772/literacy-support-comparing-software-for-word-prediction (accessed 02/05/2020)

Shein, Fraser & Tsang, Vivian. 'WordQ Writing Software. Available from https://www.quillsoft.ca/wordq5 (accessed 28/04/2020)

W3C, Web Accessibility Initiative, 'Text to Speech', Available from https://www.w3.org/WAI/perspective-videos/speech/. Accessed 27/06/2020

World Health Organisation & World Bank (2011) *World Report on Disability.* Geneva,CH;WHO