Assistive Technology Resources for Children and Adults with Disabilities

Closing The Gap

Solutions

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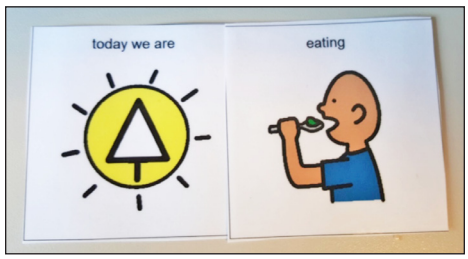

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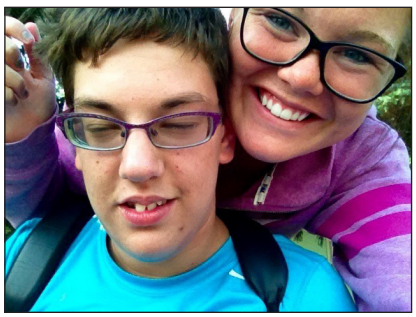

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Adults with Autism: The Need for Visual Supports

During the school years, we learn that children with autism respond well to visual supports. Visual supports is an evidence-based strategy used to help students with transitions, task completion and also supports instruction, behaviors, social skills, communication and so much more. Yet, when these students leave school and enter into the adult world, these supports tend to disappear. It is important to continue "what works" on into the adult environments. These visuals can be used within the CILA (Community Integrated Living Arrangement or group home), day program and employment. These visuals promote independence. The need for independence is even more important when you are an adult. This increased independence will improve the quality of life of the individuals you serve.

A student with an IEP is not only eligible for services, but they are also entitled to receive these services. This is effective all the way until the day before their 22nd birthday (in the state of Illinois). An adult with a disability might be eligible for services, but they are not entitled. Due to this change in how services are provided, we have to make sure that while a student with autism is still entitled to the services the school is truly working on ways to increase their independence in all areas, not just educational, but also daily living and life skills.

There are many ways to use visuals within the house that can increase independence: check lists, schedules and labeling. A check list can be used for steps in a recipe, steps in cleaning, steps to use the bathroom (going to the bathroom, washing your hands, taking a shower), doing laundry and more. A schedule can be used to follow the routines of the day. Labeling throughout the house assists an adult with autism to process where items are and can be used within schedules, and checklists and can be used to support communication.

There are also similar ways to use visuals within the day program and employment, as well. Schedules will help an adult with autism to be more independent in these environments, as well. Just like the home, labeling throughout the day program will also assist adults with autism to process where items are, can be

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used within schedules and checklists and used in order to communicate.

The other great benefit of the use of visuals in the adult environment is the training that is required for staff in order to use these strategies. Training can be done by the parent or in-house staff. There is no company or large fees to pay in order to train the staff that will be utilizing these strategies. Additionally, there is no technology that might break down. The most difficult component will be the consistency of use. All staff needs to understand and use the visuals in order for the system to be effective. They need to be used consistently and with fidelity.

In order to create visuals, one can use Boardmaker symbols, clip art, photographs, drawings and even the written word. The choice would depend individually on what the adult requires in order to understand and process the information being provided within the visual.

Image 1: Having authentic photos of various food options that are available provide the adult with autism the ability to make a choice of what they want to eat that day and when they might want more of something.

DETERMINING WHAT IS NEEDED

Look at the adult's day and begin by engineering (labeling) the environments that they are in. Label areas that you believe will assist with independence. Typically, labeling what goes in different drawers, cabinets and closets is a good place to start. Next, list the various tasks that the adult might go through during the day. Some examples might be washing hands, going to the bathroom, doing laundry, cooking, making the bed, different cleaning tasks, work tasks, etc. Then determine what type of visual this particular adult requires to make this information understandable (photo, line drawing, clip art, words, etc.). Next, create visual task sheets for these routines. Place these visuals where the task will take place. If there are tasks that might occur in multiple environments, then consider making multiple task sheets (ie: washing hands in the bathroom and the kitchen and day program). Creating a schedule(s) for the adult is the final step. Remember that following a schedule is an important skill to have. I am sure we would all be lost without our schedules, whether it is an Outlook calendar, a cell phone app or other. Determine what format the adult with autism can process, how many scheduled items can be viewed at one time without being too overwhelming and how to indicate "finished." People with autism typically have a need to be

Image 2: A visual to assist with completing laundry is a visual for sorting laundry.

Image 3: This simple visual was placed on a wash machine to assist an adult with autism to understand that the machine was in the process of washing clothes and not to open it when this visual was on the machine.

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able to communicate finished, done, what is next, I can move on, what is next, etc. Determine if the adult will do this by crossing off an item, taking off a velcroed item, flipping over a visual or other methods.

Make sure to also use a symbol to indicate "no." This symbol can then be used when there is something in the day that is cancelled or changed. By placing this over what was to occur, it will assist with understanding that it is a change and eventually, over time, assist with flexibility. At first, one might have to imbed a highly motivating activity right after the "cancelled" activity to assist the adult to accept that something has been cancelled. See image 4.

Once these visuals are all in place and staff is trained on how to use them, the adult with autism will be able to be more independent and, therefore, improve their quality of life. ■

Image 4

This visual was hung over the showerhead where the adult with autism could reference during taking a shower.

34th ANNUAL CONFERENCE

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When any school district or hospital staff member registers for a preconference workshop or the three-day conference, one administrator (Special Education Director, Principal or Hospital Administrator) from that organization can attend the conference, Wednesday through Friday, and the exhibition preview, Tuesday evening, for FREE! One free registration per district/hospital.

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A $30 "RETURN" DISCOUNT is available to ANY past conference registrant and must be used by **JUNE 30, 2016**.

This discount can be used for any preconference workshops OR conference registration and is IN ADDITION to any and all other applicable discounts.

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Conference - Wednesday, Thursday, Friday, October 19-21, 2016 Includes Preview of Exhibits – Tuesday Evening, October 18

Registration Received	On or Before June 30	July 1 - September 8	September 9 - October 6	October 7 - Onsite
Standard Rate	**$440**	**$490**	**$515**	**$540**
Group Discount - 5 or more	Groups 5+ Deduct $30	Groups 5+ Deduct $30	Groups 5+ Deduct $30	Groups 5+ Deduct $30
Group Discount - 8 or more	Groups 8+ Deduct $50	Groups 8+ Deduct $50	Groups 8+ Deduct $50	Groups 8+ Deduct $50
All group registrations must be received at the same time.	Groups 20+ Deduct $70	Groups 20+ Deduct $70	Groups 20+ Deduct $70	Groups 20+ Deduct $70
Parent Rate *(A letter describing your child's disability must accompany registration)*				**$275**
Full-time Student Rate *(Proof of full-time student status must accompany registration)*				**$300**
Presenter Rate	**$350**			**$400**
Exhibitor Rate	**$350**			**$400**

Single-Day and Exhibit Hall Only Registration	Price
Thursday Only - October 20	**$275**
Friday Only - October 21	**$125**
Exhibit Hall Only - Tuesday evening through Friday, October 18-21	**$150**

Preconference Workshops - Monday and Tuesday, October 17-18, 2016 Includes Preview of Exhibits – Tuesday Evening, October 13	Price
Monday, October 17 *(Some preconference workshops carry an additional fee for materials)*	**$275**
Tuesday, October 18 *(Some preconference workshops carry an additional fee for materials)*	**$275**
BUNDLED PRICING! Monday and Tuesday Bundle ($60 savings)	**$490**

Part I: Reading for People who are Blind or have a Visual Impairment

Devices and Techniques

"Literature is my Utopia. Here I am not disenfranchised. No barrier of the senses shuts me out from the sweet, gracious discourses of my book friends. They talk to me without embarrassment or awkwardness."

~Helen Keller, The Story of My Life

One of the main areas in which people who are blind or have a visual impairment suffer, particularly if they have lost their vision at a later age, is the loss of their ability to read. Suddenly being unable to read mail, books, magazines, restaurant menus and product labels, to name just a few areas, means a loss of independence and a subsequent decline in quality of life. Often people will turn to their family and friends for help; however, having to rely on others is unsatisfactory to many people and the psychological burden further leads to a decline in quality of life. If a student experiences vision loss, being unable to access textbooks or see the whiteboard can put them at a disadvantage to their peers and lead to a loss of motivation in school and poor grades. Therefore, being able to propose viable techniques that can enhance the ability of a person who is blind or visually impaired to read is very important, and thankfully, there are many devices that can be utilized. This article will focus on optical and technological solutions, as opposed to Braille solutions (Braille books, Braille displays etc.), although learning Braille is highly recommended wherever possible and appropriate.

OPTICAL SOLUTIONS

Optical magnification can be helpful for the patient with low vision, provided there are reasonable expectations that one magnifier will not meet all needs. Many different devices to aid near vision may be trialed at a low vision evaluation, including hand-held magnifiers, stand magnifiers and high powered spectacles. These devices are very task specific, and different print sizes may require a different device. Once a patient's ocular condition is stable and being managed, it is appropriate to be referred for a low vision examination to assess which tools might be appropriate to best meet the patient's goals.

Optical devices present some potential benefits over electronic magnification. Some of those benefits include:

- Their relative cost
- Their portability
- The ease of access to purchasing an optical magnifier (depending on the type/power needed)

Optical aids, in general, are much less expensive than electronic magnification. For many patients, especially if on a fixed income, this is a deciding factor in their choice of device. Optical aids are also generally very lightweight and portable,

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making them ideal for use when out shopping, in a restaurant, at the bank and so on. Depending on the power needed, optical magnifiers can also be found in many stores, making them convenient to purchase.

Primarily due to their cost and the ease of access, optical magnification is very popular. However, when weighed against electronic magnification many downsides are apparent:

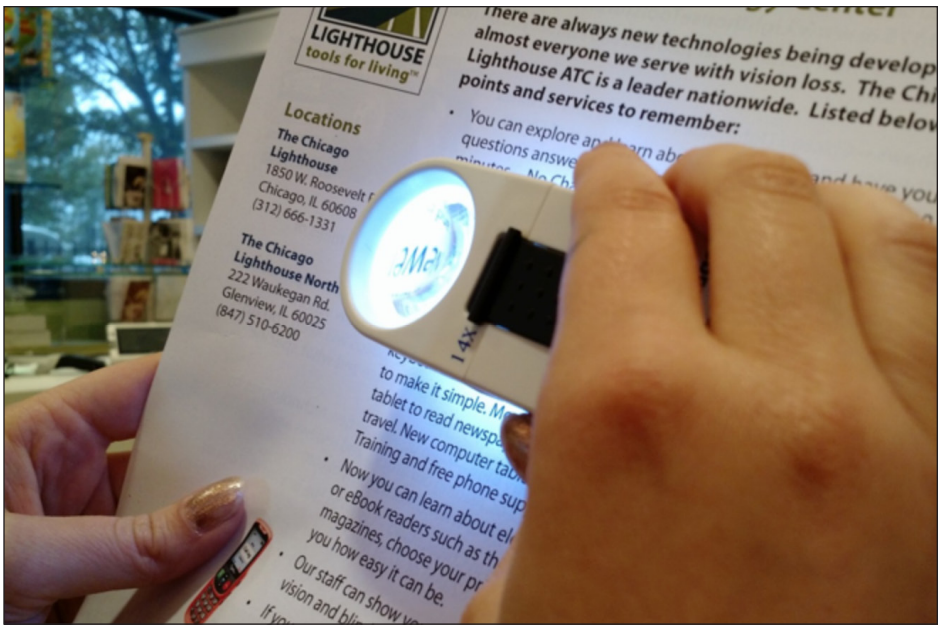
- Peripheral aberrations are introduced by optical lenses – the higher the power, the worse the aberrations
- The higher the power of the lens, the smaller the aperture to look through
- Optical magnifiers often have to be held when using them to read, especially difficult for patients with hand tremors
- High powered glasses mean very close focal distances, which may be uncomfortable for longer periods of reading
- Optical magnifiers have a lack of contrast options for patients with a loss of color or contrast

Each optical device has pros and cons that have to be weighed when evaluating a patient and their specific needs.

When reading with a hand-held or stand magnifier, there are difficulties to overcome. For the patient requiring lower powers, these difficulties are lessened. Lower powers allow for larger apertures to look through, giving an increased field of view and ease of use. There is also more leeway with where the patient holds the magnifier in order to see a clear image, again increasing ease of use. Finally, lower powered lenses introduce fewer aberrations, meaning a clearer image.

With higher powers, problems become more pronounced and may lead to a patient being unsuccessful in achieving their reading goals. With low or high powered magnifiers, hand tremors are an issue, and for patients suffering from this or those wanting to read for long periods, stand magnifiers may be the best option.

High powered spectacles have the potential to offer a hands-free method to reading for a patient, however some of the same limitations apply. The higher the power of the lens, the closer a patient is required to hold their reading material. For the 70-year-old patient with presbyopia but who is not low vision, a reading addition of +2.50 diopters may be prescribed. The focal length of this addition is the reciprocal of the add power, which in this case gives us a focal length of 40cm (15.75 inches), which is a comfortable distance to read at. For the patient with low vision, however, we may need to prescribe an addition of +5.0 diopters. This will provide enhanced magnification, both through the lens and through relative magnification, however, it will require the patient to hold their reading material at a 20cm (8 inch) distance, making it unpleasant to read for any length of time. In addition, if not measured carefully, high powered lenses have the potential for additional optical issues, such as prismatic effect, as well as distortions introduced when looking away from the optical center. Additionally, if the patient's vision impairment is affected by too many holes in the vision, or scotomas, then high-powered reading glasses would typically be less functional than a handheld magnifier.



Optical magnifiers can be a good solution for some people who have a visual impairment; however limitations imposed by the nature of optical lenses may make them unsuitable for other people.

If optical devices are deemed not appropriate, due to a need for additional contrast, for example, or the extent of vision loss, then other avenues must be pursued. These can be broadly separated into electronic magnifiers, devices that read aloud and digital/talking book services.

ELECTRONIC MAGNIFICATION

Electronic magnifiers are a fairly recent invention for which the principles have remained the same since its inception. The electronic magnifier consists of a camera mounted at the correct focal distance and a screen. A user places the document they wish to read underneath the camera, and the live image is displayed on the screen. The document is illuminated by the machine and a user is then able to manipulate the magnification of the image in order to make it a readable size, as well as adjust the color scheme to, for example, white text on a black background, in order to reduce glare and increase contrast. Electronic magnifiers (also called CCTVs) often come with an X-Y table, a table underneath the camera that can be moved smoothly along the X and Y axis in order to locate text when magnified. Other options might

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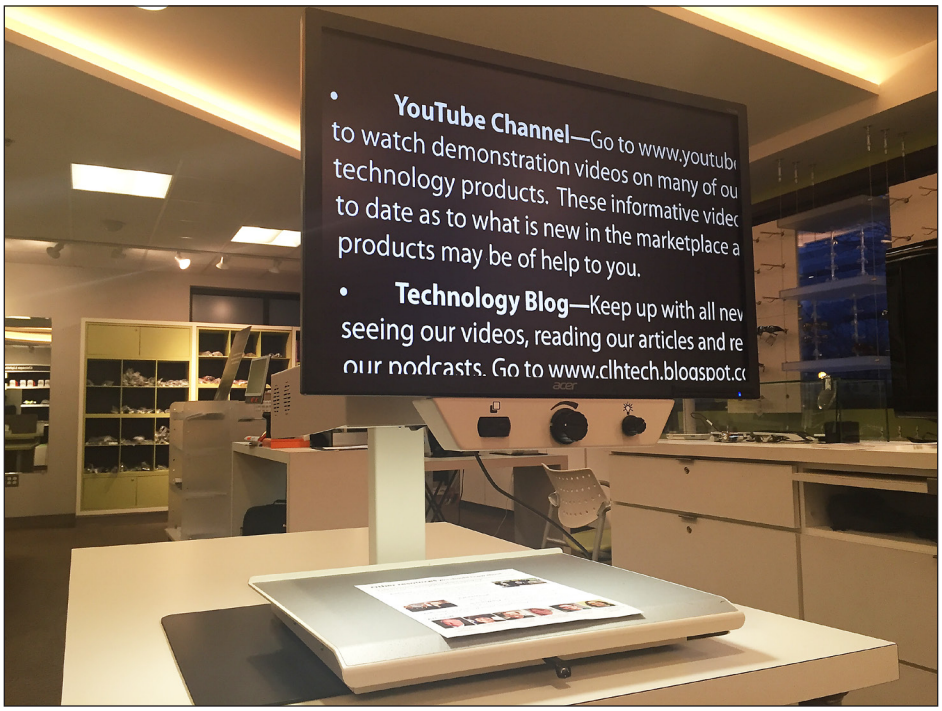
include a brightness control and line markers/windowing, which make it easier for a user to keep track of the sentence they are currently reading when at high magnification levels.

The benefits of a CCTV, compared to a regular optical magnifier, are many. Firstly, the CCTV introduces no aberration to the image being viewed. This makes the overall image sharper and easier to read for the user. The camera and screen setup also avoids the problem associated with optical lenses, wherein the higher the power of the lens the smaller the aperture of the magnifier. For users who need higher levels of magnification, a CCTV allows them to view a larger area of text more easily. Being able to see as much text as possible on the screen at any one time is of great benefit for reading comprehension, as only seeing one word at a time makes it difficult to retain what words have been read and form them into a comprehensible sentence. Finally, a CCTV offers options, such as different color schemes and line markers/windowing, that an optical magnifier cannot. One major downside to CCTVs is their cost, which is generally in the $2,500-$3,000 range for a desktop model and has to be covered out of pocket.

There are many different designs of CCTV to choose from on the market today. The traditional desktop model is still very popular and modern desktop designs often consist of a high definition camera for better image clarity and an LCD flat-screen for display of the image. Screen sizes generally range from 17-inch to 24-inch, with some devices having the capability to connect to an external monitor or television if an even larger display is desired. It is worth noting that a 17-inch screen is often sufficient if the user sits closer, due to relative magnification. It is also worth considering whether an HD camera is necessary. If the client requires relatively little magnification HD cameras are most beneficial as they allow a sharp image at lower magnification levels. At higher magnification levels, however, the difference between HD and standard cameras may be negligible. A general rule of thumb when choosing a magnification level for reading is to try to make the text as small as possible while still being able to read it. This will allow the maximum amount of text to be fitted on the screen, aiding in ease of use of the machine and reading comprehension.



A traditional CCTV design, such as the Magnisight HD shown here, can often be the best choice for reading large amounts of text.

Due to demand from consumers and advancing technology, there are now multiple fully-featured smaller electronic magnifiers to choose from which may be in a handheld form, such as the Zoomax Butterfly (3.5-inch) and Snow 7 HD (7-inch) or in a smaller portable desktop form. Due to their small size, the handheld devices are more suited for spot-reading tasks, such as looking at product labels in a store.

Portable desktop CCTVs, such as the Visiobook from Baum (13-inch), **Magnilink** Zip from LVI (13-inch or 17-inch) or Humanware's Prodigi Connect 12 (12-inch) are of benefit to users that don't have a lot of space and require something that can be moved. They can also be less intimidating to first time users due to their smaller size. Many of the portable desktop CCTVs have batteries and can be used away from a power source, as well as cameras that can rotate to look and zoom in the distance. This is of great benefit to students who need to see the whiteboard, as well as read handouts given to them in class. This type of CCTV is also often designed to fold flat when not in use or when being moved, making it easily transportable between classes or from room to room in the house and reducing the amount of space needed to store it. Often these devices do not have X-Y tables and so may not be as suited to large amounts of reading as a traditional desktop CCTV.

Another option for those who need a portable solution is a camera designed to be connected to a computer. These cameras connect via USB and use software to display a live image on the computer's screen, as well as allowing more advanced functionality, such as OCR, and the ability to take pictures and in some cases video, which can be a great benefit to the student

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who is visually impaired. This design of camera again allows viewing in the distance, as well as near. Current examples of these devices are the Magnilink S from LVI, the Zoomax Mars HD and the **E-bot** from HIMS. As this design of CCTV does not have a screen connected to it at all times, it is very lightweight and portable, however, it must be connected to a computer to be used. Some of these cameras also offer an HDMI out port and can be connected directly to a television or monitor with an HDMI input, while the E-bot also allows wireless connection to an iPad, turning the iPad into the screen.

So, as we can see, there are many different types of electronic magnifiers to choose from! The best type of device for the user is dependent on their goals and environment, a topic that will be covered in the second part of this article. For reading large amounts of text, such as books, newspapers and magazines, the traditional desktop CCTV generally performs the best. This is due to a number of factors:

- The traditional desktop CCCTV has an X-Y table, facilitating smooth reading and easier tracking when reading large amounts of text.
- The traditional desktop CCTV has a larger monitor, allowing for more text to fit on the screen at any one time and aiding in reading comprehension.
- The traditional desktop CCTV has more options for adjustment, making it easier to use in an ergonomic position, important if reading for long periods.
- The traditional desktop CCTV is usually very simple to operate.

ELECTRONIC MAGNIFICATION: LATEST DEVELOPMENTS

An interesting development in the field of electronic magnification is wearable devices, which have the potential to allow a user to read in a more natural manner. One of the latest of these devices is known as eSight and consists of a pair of electronic "glasses" that have a camera mounted in the bridge and video screens mounted on the inside. The electronic part of the device is mounted on the head with a distance prescription built in if the patient requires a distance RX. The glasses are connected by a wire to a control panel that allows the user to magnify whatever they are looking at, as well as adjust the contrast and colors, freeze the image and so on. The device can focus at all distances and can be worn while walking, making it very convenient to use.

eSight electronic eyewear may show the future of electronic magnification, its wearable design potentially allowing users to read in a more natural manner

The great benefit of this type of device for reading is that it allows a user to read in a more natural manner. In order to read, a user simply points their nose at what they would like to see and then magnifies as necessary, scanning across the sentence as they read. For the user who is intimidated by a CCTV, or finds it difficult to keep track of what they are reading, this type of device can offer a more natural solution. For some, adapting to this device is more difficult than adapting to a traditional electronic magnifier. This is because of two main reasons; firstly the clarity of the image displayed by the video screens of the eSight glasses is not as good as the image displayed by modern CCTVs. Secondly, when a user magnifies the image, any movements of the user's head become accentuated, making the image shaky. The higher the magnification, the more this issue becomes apparent. If the user also has shaky hands, the problem becomes exponentially worse when reading, although this can be circumvented by placing the document being read on a table or reading stand.

Despite these issues, the technology in eSight has a lot of potential to grant a more natural style of reading to those with a visual impairment and may indicate the future direction that electronic magnification will take. For the moment, only the most dedicated user is appropriate due to the practice needed to get the most from the device and the high cost of entry at $15,000. However, as the technology matures, there is hope that these barriers will be broken down. ■

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Chromebooks and AT

Over the summer, an assistive technology specialist in a Nova Scotia school district wrote to one of my colleagues,

> "The IT department just dropped a Chromebook into my lap… What do I do with these things?"

Her school district had not just gone GAFE (Google Apps for Education), but got laptops that ran the Google-dedicated, cloud-powered operating system known as Chromebooks.

If you're not familiar with them, Chromebooks are computer resource thrifty, and thus cheap, laptops that run Google's Chrome operating system. Most of what a Chromebook does is powered by apps in the cloud.

They're not completely thin clients – there are now more and more Chrome apps that can run like traditional software without an Internet connection. And they aren't intended for mobile use the way Android or iOS are, two operating systems that are designed primarily for touch access, media consumption and games.

Google figured there was a niche for a computer platform that was personal computer designed for productivity (word processing, calculating, image processing etc.), like Mac and Windows, but without all the computer oomph, which most of the world never makes use of.

It's a design concept that has really connected with schools: Chromebooks are cheap, have a long battery life, built with virus/hack resistance at the hardware level and their Web-based centralization makes them really easy to manage for IT departments.

North American schools are snapping Chromebooks up at a rate not unlike what we saw with iPads only a few short years ago. Google says that 30,000 Chromebooks are activated in US classrooms per day, more than all other devices combined. And a recent report by Future Source Consulting said that in the third quarter of this year, Chromebooks hit 51% of computers sold to US schools – 1.63 million units. www.futuresourceconsulting.com/2015-12-K-12-Google-Chromebooks-2983.html

The laptops themselves aren't made by Google, but by all sorts of computer manufacturers (HP, Samsung, Dell, to name a few). But unlike iPads, because Chromebooks aren't that popular with consumers, their growth in education, for the most part, has stayed out of the media and public consciousness.

In this article, we're going to review the accessibility options on a Chromebook. For testing, I used a 2014 Samsung Chromebook Series 3, which is a lightweight, fairly cheap model that was priced around $200 US when it was purchased.

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THE BUILT-IN ACCESSIBILITY FEATURES

Image 1 shares some of the built-in accessibility features in the Chromebook that you access through settings. A lot of these were just recently added (December 10th, 2015) with little fanfare or notification.

VISUAL SUPPORTS

Visual supports include a large mouse cursor setting, high contrast mode and a screen magnifier. You can even connect most brands of Braille displays directly to the Chromebook. But as of December 10th, Google upped their game considerably by updating their own screen reader, ChromeVox. ChromeVox is built into the Chromebooks OS. Just run an update, if you haven't done so recently, and it should now be one of your accessibility options.

To make ChromeVox work, you just hold down the Shift and Search keys on a Chromebook keyboard (or Windows key on an external keyboard. For Mac Windows machines running the Chrome Web browser, there are other key combos), then press the arrow keys to highlight the area you'd like read to you. There's also a sticky key option in your settings to facilitate that. You can also install ChromeVox as a Chrome Web browser extension so that you can run it on Windows and Mac computers. (For more details see www.chromevox.com/index.html.)

ChromeVox uses an orange highlighted box to identify what the area of focus is (image 2). The voice will say "dialogue box," "dropdown," and other descriptions to let you know where you are and what you can do. Playing around with it, I was able to navigate not just Web pages, but Google docs and Gmail. It's a bit early to say if ChromeVox gives enough support for a full non-mouse and/or sightless navigation experience. But it seems to be shooting for that.

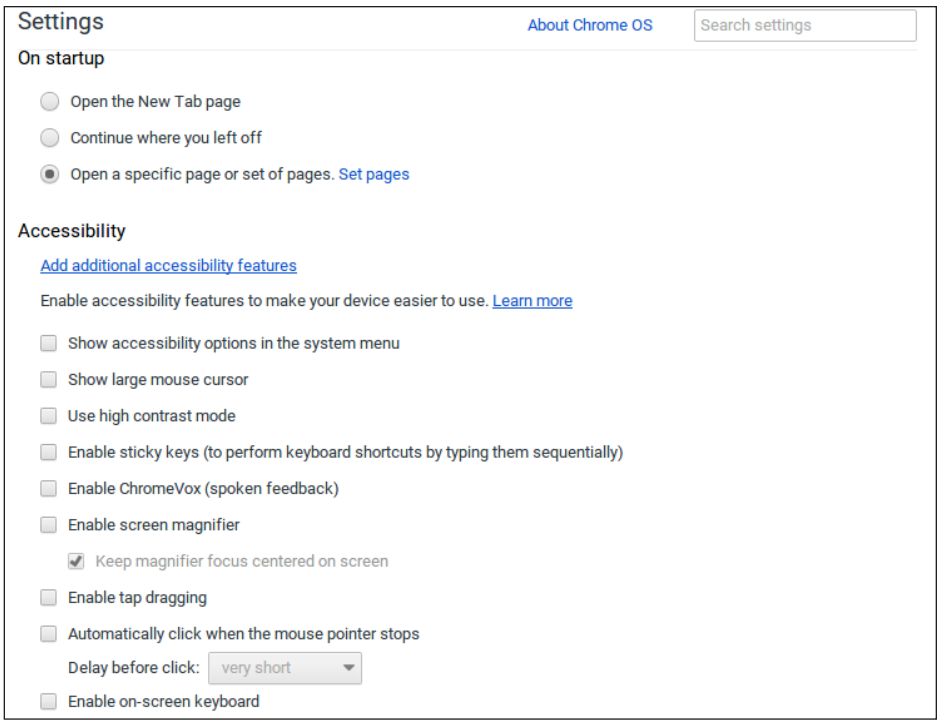

Image 1: The Chrome OS accessibility options found in settings

POINTING/MOUSE ALTERNATIVES

The Chromebook is a PC – like a Windows laptop, a Macbook or Linux computer. (Fun fact to impress your IT/computer geek friends: the Chrome OS is built on a foundation of the open source Linux operating system kernel.)

As such, you get connectivity via not just Bluetooth, but via USB ports, too. As a PC, it's also designed for multi-tasking, unlike mobile systems like Android and iOS. So in theory, Chromebooks should have lots of accessibility options.

In practice, while there are lots of things you can connect to a Chromebook

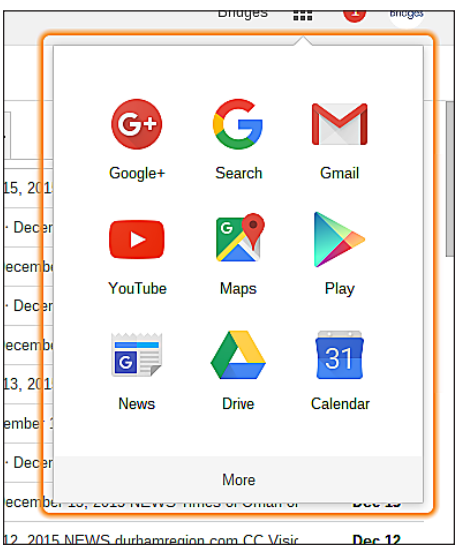

Image 2: Chromevox navigating apps in Chrome browser quick launch window

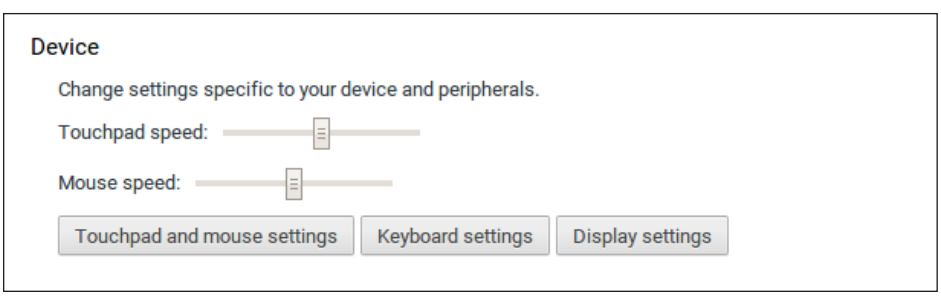

Image 3: Changing mouse settings in a Chromebook

– pretty much anything with a USB or a Bluetooth connectivity – there isn't a lot of software to help you run it.

So as you consider alternative access for your Chromebook user, a good rule of thumb is if your preferred access option needs drivers or another layer of software for it to work effectively, it's not going to work well on the Chromebook.

Any plug 'n play USB pointing device – trackballs, joysticks, etc. – or keyboards should work on the Chromebook. Until recently, there were few customizations. But that recent update has improved things. Double-click and mouse movement speed have been added to the advanced settings (image 3).

There is now a sort of dwell click in Advanced Settings. You can turn on "Automatically click when the mouse pointer stops," (image 4) which allows you to click without using your mouse buttons or a switch for a click. The fine tuning of this function is minimal and vague. You can chose from five settings – from "extremely short," which seems to be about a 10th of a second, to "very long," which seems to be just over a second.

Does this mean you can use a head pointer with a Chromebook? The SmartNav Natural Point (from NaturalPoint www.naturalpoint.com, $499) requires drivers, so it likely wouldn't work on a Chromebook. The TrackerPro from Ablenet (www.ablenetinc.com, $999) is plug-and-play, so it should be all right. I was able to test the Quha Zono Gyroscopic Mouse from Finland (available in the US from www.graspat.com, $999) (image 5). It's plug-and-play and can be worn on the head or other parts of the body; it moved the pointer without any lag and the new automatic click function activated icons as expected.

Currently, the software or drivers that you would use on a Windows or Mac PC to tailor accessibility even more precisely or to have clicking options on screen with your mouse movement just aren't available for Chrome. At least, not yet.

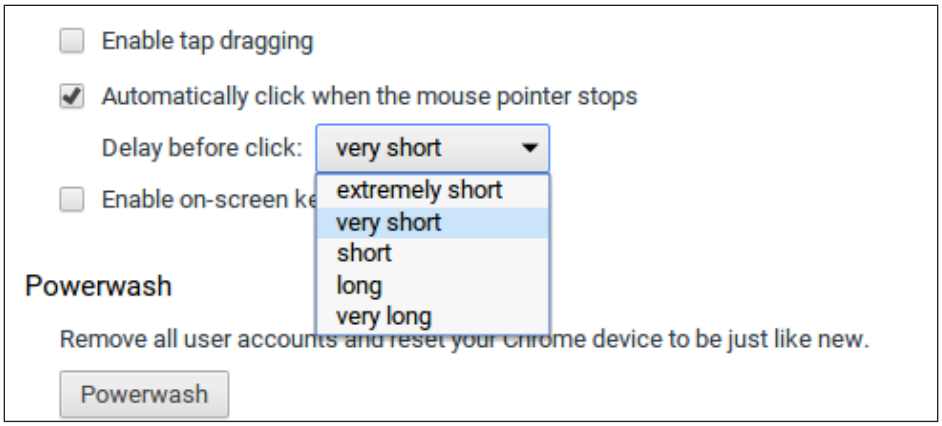

Image 4: Settings for Automatically click when the mouse pointer stops.

However, BJLive (image 6), an accessibility hardware company from Spain, has a neat solution built into their joysticks, trackballs, wheelchair joystick and other pointing devices (www.bjliveat.com/access.html, prices range from just over $100 to under $500). They connect via USB, so they are plug-and-play. But like a lot of AT devices, they have their own software in Windows that lets you customize the settings on the device – speed, sensitivity, acceleration, orientation and button function, etc.

What they've done that's different is that BJOY settings are saved to the device itself and travel with it. You do have to plug the device into a Windows machine because the software to adjust settings is only available in Windows. But then those settings travel with the device across operating systems, including Chromebooks (and Mac, Android and Linux, too).

The BJoy devices are ideal for connecting a student in a wheelchair who uses multiple computers at different locations. Or imagine a classroom computer projected out. The student can participate or demonstrate work to the whole class just by plugging in his/her device – no re-customizing or need to run the activity on the student's personal computer.

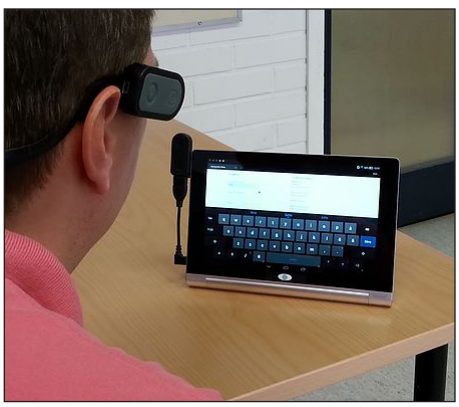

Image 5: The Quha Zono Gyroscopic Mouse www.graspat.com

Image 6: BJLive www.bjliveat.com/access.html and www.bridges-canada.com/assistive-technology/BJOYMice.aspx

TOUCH AND VOICE RECOGNITION

You can buy Chromebook models with touch screens for more money. In

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settings, you can turn on an on-screen keyboard that is customizable with emoticons. Most Chrome OS functions can be controlled by short-cut key combinations (see list here: www.support.google.com/chromebook/answer/183101), which, of course, is essential for the ChromeVox, too.

From the Chrome Web Store you can download a few more on-screen keyboards as apps or extensions to the Chrome Web browser. But I couldn't find any on-screen keyboard that has generated consistently positive reviews and promises considerably more functionality than what is already in the Chrome OS.

Another recent addition to the accessibility options is "tap-dragging" for moving objects with a tap and drag of your finger on a touch screen.

The keyboard is also where you turn on voice recognition, touch or click the microphone (image 7). Voice recognition is just for dictating text, and it works reasonably well without training for someone who speaks English fluently and without a lot of background noise. But this is not full command and control.

On the Chrome Store, you can find a number of apps and extensions that give you the ability to search with your voice and other specific functions, but nothing that claims to let you control your Chromebook hands-free.

Will we see a lot more development in the area of touch access? Perhaps. Google's tablet/mobile platform is Android. But recent reports indicate that Google is apparently planning to merge the Chrome OS and Android into one platform sometime in 2017.

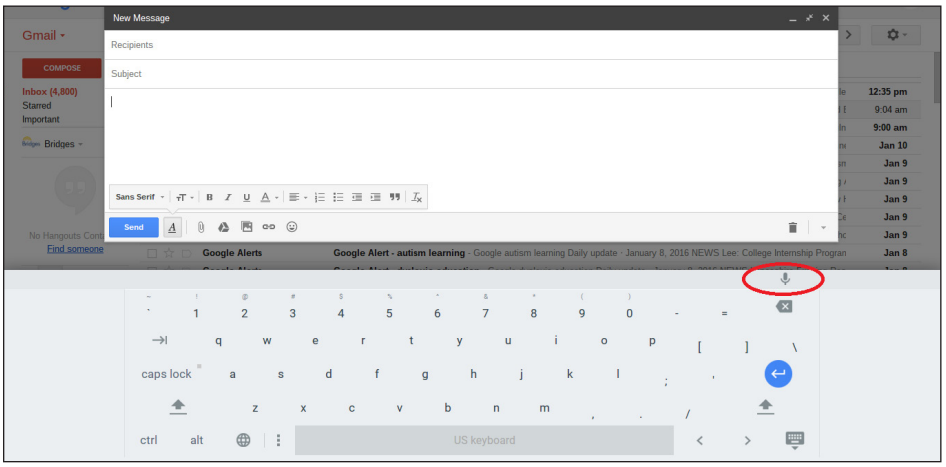

Image 7: Chromebook onscreen keyboard. The microphone activates voice recognition.

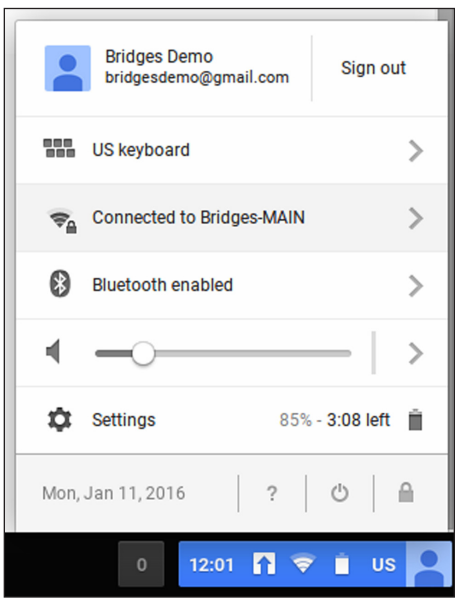

Image 9: Set up Bluetooth

Figure 8: Blue2 from Ablenet www.ablenetinc.com, $179.

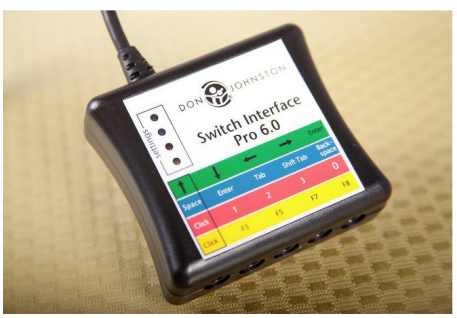

Image 10: Switch Interface Pro 6.0 by Don Johnston, www.donjohnston.com, $94.99.

SWITCH INPUT

Method 1 — Bluetooth

A Bluetooth connected device, such as the Blue2 from Ablenet (www.ablenetinc.com, $179) (image 8) will get a switch talking to a Chromebook. You can use the switches built into the Blue2 or connect up to two switches of your choice. Just like with iPads, you'll need to pair the Bluetooth switch interface with your Chromebook; we're using the Blue2 here as an example.

To set up the connection, you'll have to enable the Bluetooth function in the settings on the Chromebook, (image 9).

Then activate the pairing button on the Blue2 (refer to the set-up instructions that come with the Blue2). The Chromebook should detect the Blue2 in a few seconds, depending on your Chromebook. Select it and voila!

There are different switch modes built into the Blue2 (refer to the Blue2's instructions) to work with different switch software.

Method 2 USB Interface

But Chromebooks have USB ports, can't we just plug a switch interface into that?

Yes, but it has to be plug-and-play since you can't use your Windows- or Mac-based drivers or software on a Chromebook. So that eliminates any USB switch interfaces that need drivers

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installed, e.g., the Crick USB Switch Box (www.cricksoft.com, $159)

But if your switch interface is plug-and-play, then it should work. The Hitch from Ablenet (www.ablenetinc.com, $99) and the Switch Interface Pro 6.0 from Don Johnston, (www.donjohnston.com, $94.99) (Image 10) have settings in the box that are controlled with buttons and the switch jacks. I tested the DJ Switch Interface Pro and it worked fine. Plug in a switch to any of the jacks and emulate any of the key/mouse strokes on the DJ Interface. Of course you can also use a switch adapted mouse for your interface, but it does limit your access options.

SWITCH-ENABLED SOFTWARE FOR CHROMEBOOKS

So now that you've got your switch talking to your Chromebook, what can you do with it?

At the time of writing, there wasn't an easy way to use the switch for full control, the way that you can on the Windows operating system with third party programs. Or through controls built into OS itself, like you have on the iPad.

If you're looking for early learning activities for your switch user, a recent search of the Chrome Web Store found only one developer actually creating single switch apps for the Chromebook, www.sensoryapphouse.com.

The apps that sensoryapphouse.com had posted included speech analysis, symmetry painting and various visual stimulation apps. All single-switch accessible with reference to Bluetooth switch access in their descriptions on the store.

Of course, if you find suitable games and activities on the Chrome Web Store that are accessible with simple keyboard shortcuts or mouse clicks, then you can emulate these with your switch to run your activity or touch screen access on a touch enabled Chromebook. (See "Simple Switch Activities on a Chromebook" on the next page.)

Image 10: HelpKidzLearn - www.helpkidzlearn.com

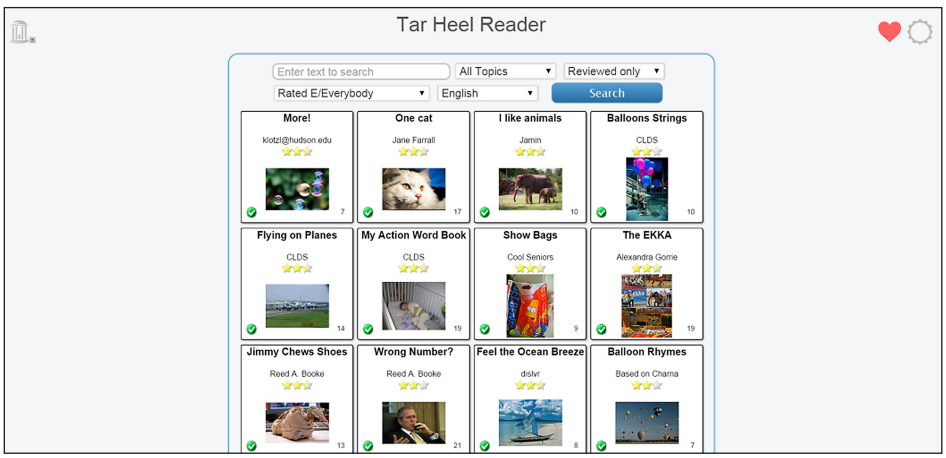

Image 11: Tar Heel Reader - www.tarheelreader.org

CONCLUSION

Voice recognition, on-screen keyboards, dwell click and lots of shortcut keys and the new ChromeVox are a tantalizing array of accessibility options. But remember, that although the Chromebook is designed to do multi-tasking, it is a lightly powered PC. A sophisticated, programmable, on-screen keyboard that can control other apps, like we have in Windows – e.g., the Grid, REACH or Communicator 5 – for truly hands-free control, just might not be possible on Chromebooks, even if someone tried to develop it.

So even if you can plug in the access peripheral and it works, the crucial glue of either 3rd party software (as in the Windows environment) or more complete built-in features (as in the iOS environment) that bring all of these bits together just aren't there yet.

So what about a student who needs more robust accessibility features but is in a school that's using Chromebooks? Someone who needs to write and read with a switch, a mouse, headmouse or Eyegaze. She might need word prediction and customizable on-screen keyboards that interact with education apps etc. etc.

How do you give that student access while giving access to the same software tools that the other students with Chromebooks are using?

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One option is to get a Windows computer and run the Chrome Web browser.

Most, if not all, the applications that Chromebooks deliver for school is through the Google Apps for Education (GAFE) Web-based education computing environment. GAFE includes word processing, presentation, spreadsheets, classroom management, math stuff and more. All of these applications can be run out of a Chrome Web browser running on any Mac or Windows PC.

So, if you run a Chrome Web browser on your Windows computer, you can access both the Google Apps for Education (GAFE) and the unmatchable accessibility options that are available for Windows. All those third party programs – word prediction, screen reading, on-screen keyboards, eye-gaze, magnification … whatever – you can run over-top of the Chrome Web browser to deliver access to the GAFE tools that all the other students are using.

It's a good bet that your district or school is purchasing their Chromebooks from one of the major manufacturers — HP, Dell, ACER, etc. — and they all make Windows computers, too. All you have to do is convince the powers-that-be to purchase one Windows machine for the student who really needs the extra support. ■

SIMPLE SWITCH ACTIVITIES ON A CHROMEBOOK

Although, you won't find a lot of switch apps on the Chrome Web Store, you can find lots of switch activities you can run on a Chromebook through various websites. If you've spent the past few years using an iPad, then you might not be aware of them as these sort of interactive websites don't necessarily work well on iOS (iPad's, iPhone's) browsers. The iPad iOS environment of iPads and iPhones has encouraged dedicated app creation rather than the Web 2.0 model of interactive websites. Nonetheless, there are many of these cloud-based activities you can access through a Chromebook's Web browser and will work with a single switch. Of course, if you find suitable games and activities on the Chrome Web Store that are accessible with simple keyboard shortcuts or mouse clicks, then you can emulate these with your switch interface and get access to your activity that way.

HelpKidzLearn www.helpkidzlearn.com is a subscription-based service that provides an array of accessible learning games. This has been a consistent favorite, particularly for those familiar with Inclusive's SwitchIt series, as it's by the same company. Prices are low and new activities are constantly being introduced.

Choose It Maker 3: www.helpkidzlearn.com/shop/online-software/chooseit-maker-3 The popular simple authoring software for creating simple choice-making activities is now delivered through the Web. Use it for early math, literacy, communication teaching and training. Add your own pictures, symbols, sounds – it's very easy to use. And now you can share out your activities to iPads or Android tablets and any Chrome, Windows or Mac Web browser.

Tar Heel Reader www.tarheelreader.org offers a collection of free books that can be read aloud to the user. You can also use the Web interface to create your own simple electronic books. The spacebar will move forward through the book, but your choice of book to read does need to be selected with a mouse.

Here's a bunch of free British websites that have come out of schools and not for profits.

Priory Woods Videos: www.priorywoods.middlesbrough.sch.uk a series of switch accessible (and touch, too) animated and slideshow videos that demonstrate simple cause and effect.

Sen Switcher: www.northerngrid.org a number of shape-oriented games that can be personalized with different color options. Again, from a not-for-profit in the UK.

Papunet: www.papunet.net/games fun, animated games that help children develop their motor skills, as well as demonstrate cause and effect. Developed by a Finnish not-for-profit.

Shiny Learning: www.shinylearning.co.uk an extensive list of switch-accessible games and demos that teach cause and effect.

Assistive Technology Assessment:

The Tried and True and the Brand New

THE TRIED AND TRUE

Since the 1990 reauthorization of IDEA with its definition of assistive technology (AT) services, which included "the evaluation of needs, including a functional evaluation, in the student's customary environment," there has been a nationwide trend to identify and train staff within each school district to be more knowledgeable about assistive technology.

In response to a need expressed by service providers in Wisconsin school districts, the Wisconsin Assistive Technology Initiative (WATI) developed the WATI Assistive Technology Assessment Process in 1994 to help school district staff identify the information they need in order to determine when assistive technology is needed and what that assistive technology might be. This process has been updated four times. Each time, it was distributed in the form of a large manual. The manual contains informational tools to provide basic AT information that can support team decision making. In 2009, the last revision to the paper version was made.

The WATI AT Assessment Process stresses a team approach to asking questions that focus on the AT needs of a student. It is based on the steps of information gathering, decision-making and trial use. Forms to support each of those steps were also developed. There is a WATI form for each step of the identified AT assessment process. WATI made those forms and the entire manual available at no charge on their website, www.wati.org, and over the course of the years that they have been available, they have been downloaded by educators in over 40 countries, including Canada, England, Germany Czech Republic, India, Singapore, Australia, Poland, Viet Nam, Malaysia, South Korea and many more. They have been translated with permission into Spanish, Mandarin and Korean.

Many institutions of higher education and medical schools use the WATI AT Assessment Process to teach how to provide an appropriate, defensible AT assessment, and both, the forms and the process, have been included in numerous textbooks.

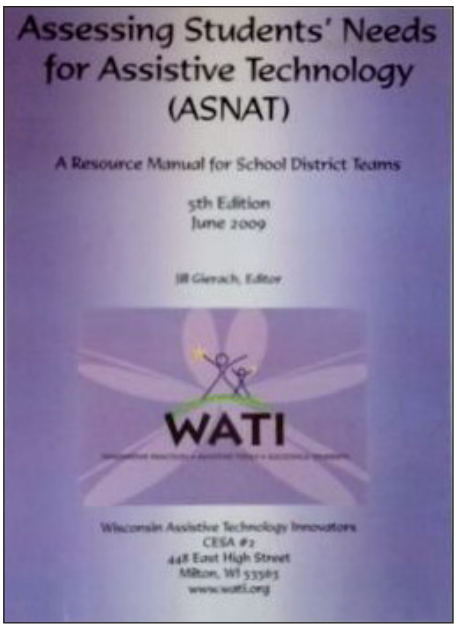

Image 1: ASNAT manual.

PENNY REED, Ph.D., is an independent consultant in the field of special education specializing in assistive technology services. She was founder and director of the Wisconsin Assistive Technology Initiative (WATI), Dr. Reed is an original member of the Leadership Team for Quality Indicators for Assistive Technology (QIAT). She is the author or co-author of numerous resources, guidelines, and assessment tools to help school districts develop and improve their assistive technology services, includingEducation Tech Points: A Framework for Assistive Technology. Dr. Reed provides consultation and training across the country.

JILL GIERACH is a teacher with a masters in teaching children with multiple disabilities. She is a certified instructional coach, holds a teaching license in assistive technology, and is nationally certified by RESNA as an assistive technology practioner. She has advanced training in AT assessment, non-verbal reading assessment, environmental communication teaching, and Tangible Symbols Communication. She was the last director of the Wisconsin Assistive Technology Initiative and as such the editor and contributing author of the 2009 WATI ASNAT manual. Jill is currently an independent consultant and the Director of CESA 2 Assistive Technology Services.

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THE STEPS OF AN AT ASSESSMENT USING THE WATI FORMS

Briefly, the sequence of events when using the WATI AT Assessment Process includes the following steps and identified forms.

GATHERING INFORMATION STEP 1: TEAM MEMBERS GATHER INFORMATION

Review existing information regarding student's abilities, difficulties, environment and tasks. If there is missing information, you will need to gather the information by conducting formal or informal tests and observing the student in various settings. The WATI Student Information Guide and the WATI Environmental Observation Guide (see image 2) are used to assist with gathering information. The Student Information Guide is a series of questions to guide the team's information gathering. It is 31 pages and is not designed to be used as a whole, but rather for the team to use the initial referral question (see image 3) to determine in what areas they need to gather information about the student's abilities and performance. An example of the student information guide on reading is included. The Environmental Observation Guide is a single sheet and is provided to help identify events and issues within the student's environment that are important in determining the student's need for AT.

STEP 2: SCHEDULE MEETING

Schedule a team meeting, including parents, student (if appropriate), service providers (e.g., special education teacher, general education teacher, SLP, OT, PT, administrator), and any others directly involved or with required knowledge and expertise. Each of these individuals bring to the meeting the information they have gathered.

DECISION MAKING

STEP 3: COMPLETE THE PROBLEM IDENTIFICATION PORTION OF THE WATI AT DECISION MAKING GUIDE AT THE MEETING.

Choose someone to write all topics where everyone participating can see them.

The team should quickly move through:

- Listing the student's abilities/difficulties related to tasks.
- Listing key aspects of the environment in which the student functions and the student's location and positioning within the environment.
- Identifying the tasks the student needs to be able to do.

The emphasis within this stage of problem identification is identifying tasks the student needs to be able to do and the relationship of the student's abilities/difficulties and characteristics of the environment to the student's performance of the tasks.

STEP 4: PRIORITIZE THE LIST OF TASKS FOR SOLUTION GENERATION

Identify critical task(s) for which the team will generate potential solutions. This may require a redefining or reframing of the original referral question, but is necessary so that you hone in on the most critical task

STEP 5: SOLUTION GENERATION

Brainstorm all possible solutions. The specificity of the solutions will vary, depending on the knowledge and experience of the team; some teams may generate names of specific devices with features that will meet the student's needs, other teams may simply talk about features that are important, e.g., "he needs voice output," "it needs to be portable," "needs few (or many) messages," "needs input method other than hands," etc. Teams may want to use specific resources to assist with solution generation, including the WATI AT Check-

WATI Environmental Observation Guide

Classroom(s) _____ **Teacher** _____

Student _____ **Date** _____ **Time** _____ **Observer** _____

Task: Ex. Writing a report, completing math problems, researching topic in media center, etc. **Directions:** Are they visual, auditory or both? **Time:** How long for task completion?	**General students response:** How do other students respond to the directions? How do they complete their work?	**Target Student Response:** Do you notice any difference in how the target student handles the directions? How do they begin, maintain, and end the task? Was the time for the activity sufficient?	**Barrier to task completion:** What do you notice about the environment that might affect the target student's work (e.g., manner that the directions were delivered, time to complete the task, etc.)?
Task: **Directions:** **Time:**			
Task: **Directions:** **Time:**			
Task: **Directions:** **Time:**			

Potential Strategies: What pops into your head as a solution that you might bring to the brain storming session during the decision-making meeting?

Questions: What additional information do you need? What questions do you have for the teacher, therapist, student, or parent?

Image 2: WATI Environmental Observation Guide

REFERRAL QUESTION

What task(s) does the student need to do that is currently difficult or impossible, and for which assistive technology may be an option? _____

_____

Based on the referral question, select the sections of the Student Information Guide to be completed. (Check all that apply.) Only complete the sections pertinent to the referral question.

❒ Section 1 Seating, Positioning and Mobility	❒ Section 7 Mathematics
❒ Section 2 Communication	❒ Section 8 Organization
❒ Section 3 Computer Access	❒ Section 9 Recreation and Leisure
❒ Section 4 Motor Aspects of Writing	❒ Section 10 Vision
❒ Section 5 Composition of Written Material	❒ Section 11 Hearing
❒ Section 6 Reading	❒ Section 12 General

Image 3: Referral questions are used to gather information about the student's abilities and performance.

list, AT Continuums for each identified task (See image 4), on line resources and/or a knowledgeable Consultant.

STEP 6: SOLUTION SELECTION

Discuss the solutions listed, thinking about which are most effective for the student. Used the SETT Scaffold for Tool Selection to identify and discuss needed features of potential AT tools. At this point, names of specific devices, software or apps may be listed. If the team does not know the names of items, use resources noted in Step 5 or schedule a consultation with a knowledgeable resource person.

STEP 7: IMPLEMENTATION PLAN

Develop a plan (including trials with equipment) – being sure to assign specific names and dates, and determine a meeting date to review progress (follow-up plan).

TRIAL USE
STEP 8: IMPLEMENT PLANNED TRIALS

Follow the implementation plan that was developed during the decision making meeting. Use the WATI Assistive Technology Trial Use Guide to document decisions and outcomes.

STEP 9: FOLLOW UP ON PLANNED DATE

Review trial use. Make any needed decisions about permanent use. Plan for permanent use.

THE BRAND NEW

Now, the WATI AT Assessment Process will reach an even broader audience through a series of Assistive Technology Internet Modules (ATIM) at www.atinternetmodules.org. The ATIM project by the Ohio Center for Autism and Low Incidence (OCALI), under the direction of Jan Rogers and with the assistance of Heather Bridgeman, is bringing together some of the most recognized experts in the field of assistive technology to design and develop robust, stand-alone training modules that address most aspects of AT service provision.

The WATI modules, which are part of the ATIM project, address typical school task areas and apply each of the specific steps of the WATI process and highlight them with examples and case studies to help the reader learn to use the WATI AT assessment process. The Overview of Using the WATI Assessment Process is the first module in the ATIM series of modules using the WATI AT assessment process. The content, which originally appeared in the Assessing Students' Needs for Assistive Technology (ASNAT) manual, has been updated, expanded and enriched for the ATIM modules.

The modules currently available on www.atinternetmodules.org include:

- An Overview of Using the WATI AT Assessment Process
- Communication - WATI - Parts 1 and 2
- Computer Access - WATI - Parts 1 and 2
- Funding Assistive Technology
- Mobile Device Access - WATI - Parts 1 and 2
- Reading - WATI - Parts 1 and 2 Seating and Positioning - WATI - Parts 1 and 2

When completed, there will be approximately 38 WATI modules. The modules currently in development are:

- Environmental Access - WATI - Part 1 and 2
- Hearing - WATI - Part 1 and 2
- Math Access - WATI - Part 1 and 2
- Mobility - WATI - Part 1 and 2
- Motor Aspects of Writing - WATI - Part 1 and 2
- Organization - WATI – Parts 1 through 5 (including Self Management, Information

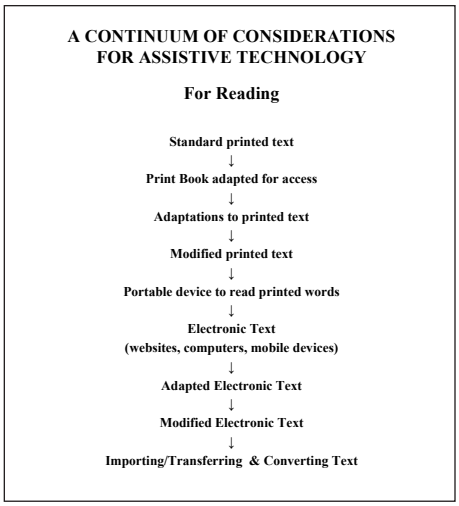
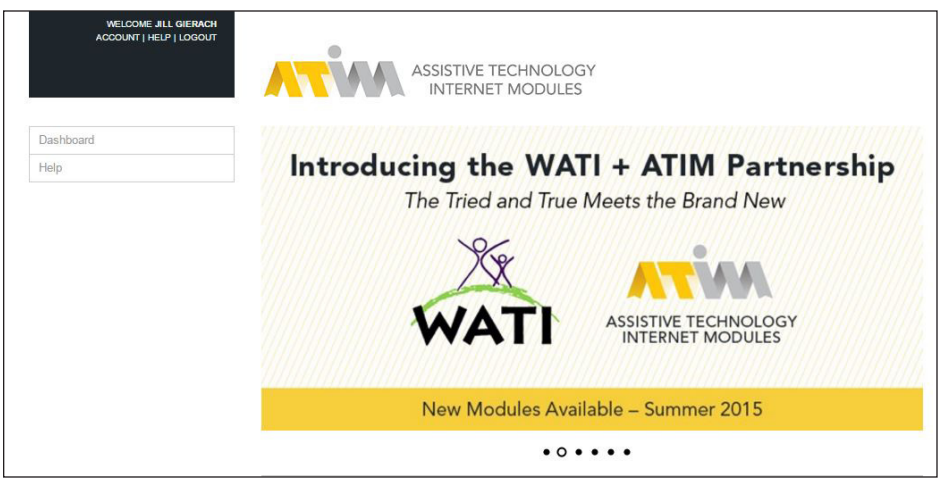


Image 4: A continuum of consideration for AT.

Jan Rogers and Heather Bidgeman



ATIM website www.atinternetmodules.org

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- Management, Time Management and Materials Management)
- Recreation and Leisure - WATI - Part 1 and 2
- Students with Multiple Challenges - WATI - Part 1 and 2
- Switch Access - WATI - Part 1 and 2
- Vision - WATI - Part 1, 2 and 3
- Writing Composition - WATI - Part 1 and 2

Each of the content modules (e.g., Reading, Writing Composition, Mobile Device Access) provides additional information about the specific task area to help the team work through the WATI process to identify potential assistive technology tools that could help the student more effectively perform that task. Part 1 of each module discusses relevant research and helps to narrow the focus to identify key features the student needs in a tool. Part 2 of each module discusses potential tools and guides the team in developing a trial implementation plan that will yield the data needed to make a long term AT tool selection.

Use of the WATI materials has continued to grow. Between 1995 and 2009, there were 14,802 unique users of the WATI legacy site. Last year, 114,000 visitors checked out the materials. Now, due to a partnership with OCALI, the WATI Assessment manual content has be updated and provides our users with an interactive learning experience.

The ATIM site delivers an elegant, supported and consistent experience for the learner. All access to content on the site is free, although there are options for college credit or CEU verification for a fee.

The expansion of the original 13 chapters of the WATI manual to 39 modules allows for additional leaning supports to be included, such as video, pre- and post-test assessments, hot links to additional website supports and suggestions of extension activities to use for deeper learning.

After creating a account (which is free) and logging in, the student has several browsing options.

Choose a module of interest. There will be a module navigator at the top of the list that will explain content of the module.

Click the triangle in the circle to expand the title and show a description of the module. Here you will also see the names of the authors and their bios, as well as the estimated time it will take to complete the module.

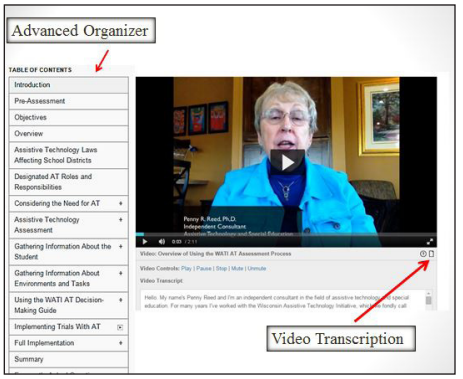
Each module begins with a short video introduction by the author. At the left of the video, the learner will see a list of all the elements included in the module. This is the advanced organizer.

The module content begins with a short pre-assessment of seven to ten multiple choice or true/false questions. Each question, when answered, provides feedback. The student may print a pdf.

Case studies are an important element of the WATI modules. At least one application of the module content will be explained through the use of case studies, videos and picture supports in each module.

This new updated version of the WATI Assessment process includes many interactive supports. Some included within the text itself are zoom features to enlarge embedded forms, rich text supports and video transcription support. Also, within the advanced organizer there are sections that include all forms, citations and research mentioned in the module, as well as examples of frequently asked questions around the content and questions appropriate to use within professional learning communities. A glossary of terms, as well as suggestions for extension and application activities, are provided by each author. There is also a post-assessment at the end of each module.

It is hoped that individuals that have used the WATI assessment process and manual over the past will find value in this interactive and updated version and that new users will benefit from the expanded learning supports. Access remains free. The ATIM site also provides



Advanced Organizer is to the left of the video introduction.

options for one college credit after completion of specified modules and for documentation of CEU credits for additional fees. Check it out now at www.atinternetmodules.org. ■

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Moving Beyond the Device Mentality for AAC

AAC devices have been around for a decade and have helped to significantly improve the everyday life of many individuals with complex communication needs. Everything, from specialized typewriters to hard-wired button grids to software-driven touchscreens, has been used to aid individuals in their communication.

Because of the long history of augmentative communication where so much is focused on the actual physical device, it can sometimes be difficult to think past the limitations of that history. When I talk to therapists about moving communication beyond a single device, they often aren't sure what I mean. But doing so has the potential to greatly improve the support we provide to those with complex communication needs.

Coming from a history of devices with physical buttons and dedicated speech-generating circuitry and then transitioning to software-based replicas has left us thinking of communication devices as standalone physical units. We carry a mental model of luggable self-contained communication devices, of all-in-one packages that we plug in, program and monitor. Everything is on the device, and the device is everything. We hold to this mindset even though today's devices are actually downloading updates and linking to online resources on a regular basis.

It's not always immediately clear how this device-centric mentality can be limiting. But if, for example, we assume that everything must stay with the physical device, then we limit who can actively help the communicator to only those who can access the device in person. We also limit supporters' time learning about or modifying the device to already-constrained therapy sessions.

If, instead, we can shift our thinking to ask questions like, "What would I do differently if I could access a communicator's vocabulary remotely?" or "How would my therapy sessions change if I knew beforehand what had been happening for the last week?" then we can start to get beyond this device-centric mentality and find some valuable innovations to AAC.

Today's cloud-connected world makes it entirely possible to build AAC solutions where the user's vocabulary and content is synced remotely instead of just on the device. At CoughDrop, we've worked with around 25 speech therapists, occupational therapists and AT specialists across the country to build a simple, flexible AAC app that uses the cloud to free communication from the restrictions of

BRIAN WHITMER is a software developer and usability expert from Salt Lake City, Utah. He is the father of four children, the oldest of whom has Rett Syndrome. After founding and establishing the educational technology company Instructure (Canvas), he has worked to improve assistive technology for struggling communicators, like his daughter.

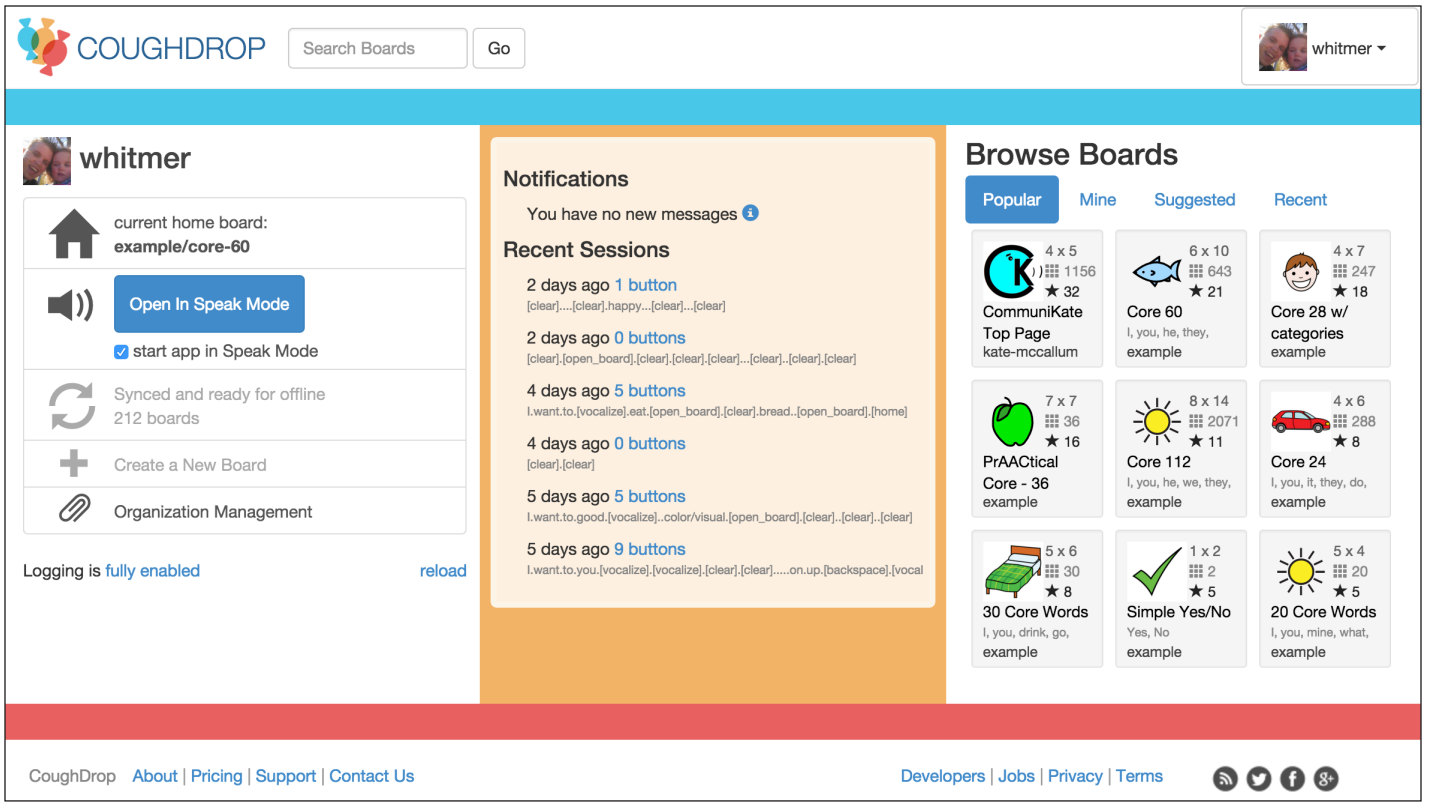

Image 1: CoughDrop is a new AAC app that leverages the cloud to better support communicators and the team around them.

a single device. It takes a bit of a mental shift to really process what that means. Most of the time when I talk to therapists, parents and other supporters, they refer to the communicator's device as their voice, their vocabulary, etc. They're justifiably possessive of the hardware, because if it breaks, it has the potential to cause a serious disruption for their communicator.

But if the device and the vocabulary were actually separated, say by automatically backing up changes to the cloud, then a broken device just means you need a different piece of hardware to access the vocabulary. You can get part of the way there by finding an AAC provider who supports manual iCloud backups. With CoughDrop, we actually take this a few steps further with automated backups and by running our app on most hardware, including iPads, Android tablets, Chromebooks, Windows devices, etc. So breaking a device just means it's time to log into whatever else you have on hand. The vocabulary itself now lives somewhere else, safer and more accessible than it would be when thought of as "living" on the physical device.

I do hear people bring up concerns about spotty or limited Internet connections, but syncing to the cloud doesn't mean that you have to be constantly connected to the cloud. Mobile phones lose their data signal all the time, and they can still function as needed. They just sync up any changes that happened while offline the next time they connect. This can be true of uncoupled AAC solutions, as well.

In a truly uncoupled environment, with the user's content available for access by more than just a single device, we get some other interesting innovations, as well. Suddenly we can now consider new remote opportunities for interaction with and analysis of the user's boards. For example, since in CoughDrop a user's vocabulary is stored in the cloud, it's possible for therapists and teachers to program a communicator's boards without having to take it away. I talk to plenty of specialists who cringe when I ask them about keeping a communicator's "voice" overnight, but with a device-centered mentality there's not really another alternative.

In addition, vocabulary sets can be created and maintained collaboratively. Since the vocabulary set is no longer tethered to the physical device, parents and therapists can work together to make changes without having to work around the communicator's active schedule – and can even enlist help or perspective from other specialists who may live a few states or countries away. The number of experts who have access to a communicator's situation is no longer limited by geography.

There are obvious benefits to thinking of a vocabulary as uncoupled from a physical device, but there are a number of unexpected benefits, as well. For example, we've had teachers build curric-

ulum boards that they can then assign to multiple communicators. They make weekly or daily changes to the board, perhaps to highlight different days of the week, and those changes are automatically pushed to all their communicators at once. It's a great use case that we'd never thought of ourselves. There are plenty of other use cases like this one that have yet to be discovered, all because we've traditionally thought of everything having to be stored, built and updated on each communicator's physical device.

Logs and reports are other valuable resources that have traditionally been considered "stuck" on the communicator's device. CoughDrop allows communicators to opt in to usage logging and to sharing the results of those logs with therapists, teachers, etc., through the cloud. That means that therapists can review what's been happening for the last week or month before the communicator ever sets foot in the therapy room, helping them to be more productive with their limited face-to-face time.

I'm hopeful that the AAC industry, as a whole, will move toward more cloud-based solutions because I believe it frees up information and access in a way that can better support communicators and empower the support team around them. We're already seeing some other providers move in that direction, with editing tools and subscription-based Web reports showing up from additional vendors. We're working toward general support at CoughDrop with our open API and, more importantly, with our work on a cross-platform file format for board sets called the Open Board Format (openboardformat.org). In the end, more flexibility benefits the end users, which is what we should all be working toward anyway.

As we get more and more people on board with moving beyond the device-centric mentality, I'm confident we'll see more opportunities for integrating AAC into other resources used by communicators and their support team, as well.

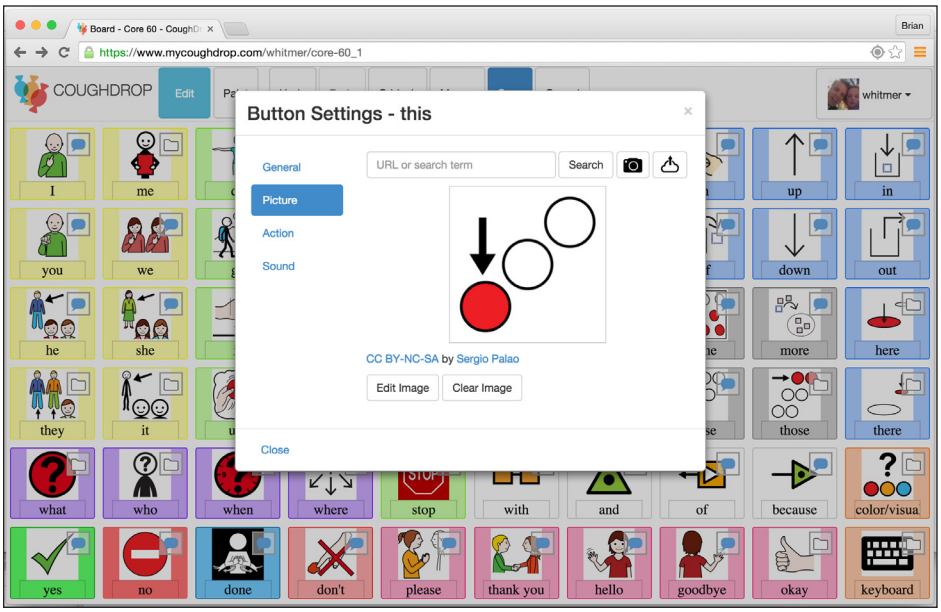

Image 2: CoughDrop boards can be reviewed and edited remotely on a laptop, tablet or any other device.

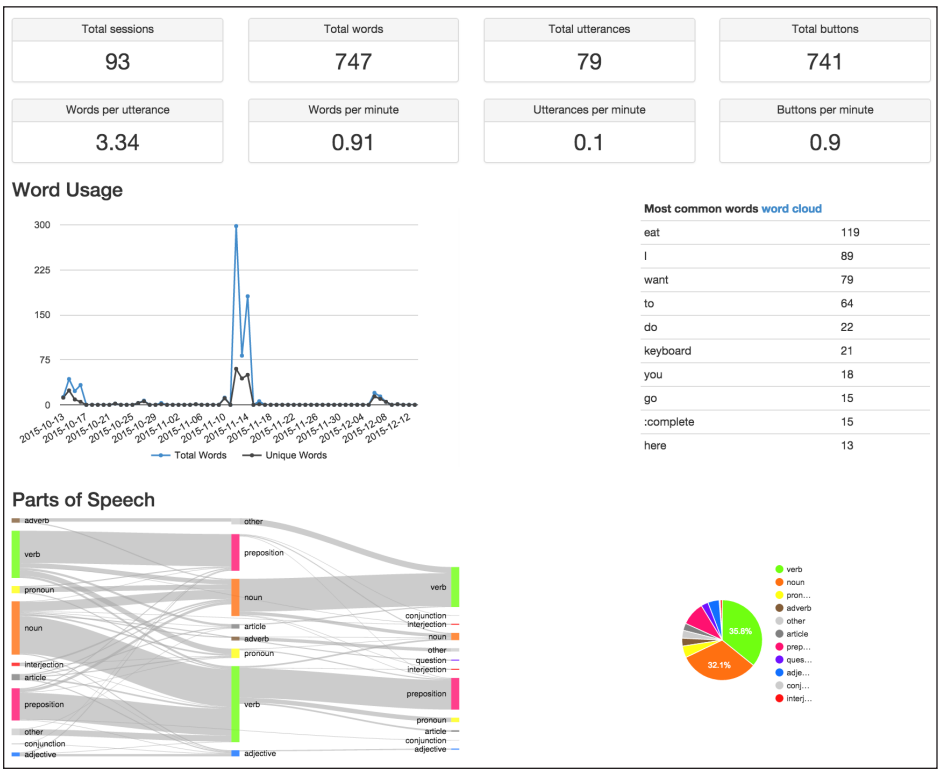

Image 3 – CoughDrop provides detailed reports that can be accessed by the team on their own devices, so everyone knows what's going on without having to take away the communication device.

There are plenty of tools and apps out there that could benefit from opting in to sharing information, but with everything stuck on the device, it wasn't feasible to even consider it. I'm excited for the potential for innovation that new kinds of integrations will offer.

There are definitely privacy concerns with leveraging the cloud for augmentative communication, and user privacy

concerns must remain a top priority. However, these concerns are readily being addressed as the health care and education industries both work to incorporate the benefits of cloud-based solutions. At CoughDrop, we're always working to incorporate best security practices, and user privacy will always be a top priority.

Leveraging the cloud for AAC is definitely new. We have a long history of device-centeredness that isn't going to go away anytime soon. However, by thinking beyond the history of AAC, I believe we'll continue to find new and powerful innovations that can greatly improve the lives of struggling communicators across the globe.

CoughDrop is a modern, cross-platform AAC app that empowers communicators and the support teams around them. You can sign up for a free two-month trial at www.mycoughdrop.com. After that, the app is priced per communicator at $6 per month or $200 for five years. ■

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Making Middle School Math Accessible

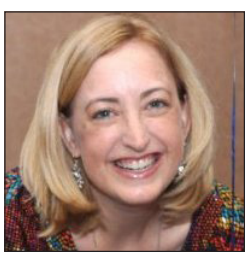
Chronicles of a Middle School Math Teacher and Todo Math for the Classroom

Halfway between San Francisco and Palo Alto, you'll discover a middle school in the heart of the high-tech corridor in Northern California. Walking into Mr. Myers' classroom, you'll find a math community of eight middle-schoolers. Not quite the brat pack from a John Hughes flick seeking ways to break out of school, but an eclectic group using their know-how and ingenuity to solve real-life problems using math. Patrick Myers is a special education teacher in a self-contained classroom at Ralston Middle School in Belmont, CA. It's his fourth year teaching middle school, a veteran considering the nation's attrition rate is at 13% for special education teachers, twice the rate of the general education teacher population (http://specialed-shortages.org/about-the-shortage/). His classroom is a mix of girls and boys, two 6th graders, three 7th graders and three 8th graders. Mr. Myers' ability to differentiate math on the fly can be attributed to a well-prepared classroom containing multi-sensorial materials, hands-on activities, open-ended math discussions that allow all of his students to participate and a trusted digital math app called **Todo Math**.

SETTING THE STAGE FOR A COMMUNITY OF MATH PRACTITIONERS

At the beginning of the school year, Mr. Myers wanted his students to create meaningful connections with the academic content and with each other. "Keeping students deeply engaged in math lessons is a real challenge. Math can get abstract very quickly and for many of my students, any hint of abstraction can make them disengage immediately," warned Mr. Myers. "I also wanted to avoid the long lectures I remembered from my childhood. I was resolved to make math fun and meaningful."

Mr. Myers led a math talk about implementing a classroom dollar system. He asked students about what kind of work they could do to earn money. How would students spend the money they earned? Could the classroom have a store? What would they buy and sell? How much



ANNA JOHNSON is an educational technology professional with a passion for connecting organizations, like Enuma, to their prospective audience of parents, schools and educators. Anna began her career in early childhood education serving as a teaching assistant at the Mills College Children's School in Oakland, CA. After earning her BA at Mills College, she earned her Masters of Science in Educational Technology Leadership at California State University. As a high-tech veteran with over 15 years of experience, she has worked and consulted for start-ups and organizations, like Enuma/Todo Math, Teach For America, Macromedia (now Adobe), PeopleSoft (now Oracle) and NCSoft's Project Injini, on how to design, implement and market technology to parents and schools. Anna is a special education advocate, iPad devotee, edtech believer and campaigns passionately for congenital heart defect awareness and research.

would the items cost? Mr. Myers facilitated student discussion by asking for more details, helped them identify problems and brainstorm solutions while documenting their conversation using Thinking Maps. In addition to Thinking Maps, students created a menu of items that could be purchased at the store. The most expensive and prized item on the menu is having a lunch with their star teacher. Can you guess what it costs to have lunch with Mr. Myers? $100!

Using open-ended questions helped make this investigation accessible to all of the students in the class, and answering these questions didn't require students to memorize complex formulas or abstract symbols. Instead, students were asked to employ their reasoning skills. Leading a class discussion to help facilitate mathematical discourse by posing purposeful questions adheres to NCTM's (National Council of Teachers of Mathematics) Principles of Actions: Ensuring Mathematical Success for All (2014). One of the eight teaching practices for effective learning states:

Effective teaching of mathematics facilitates discourse among students to build understanding of mathematical ideas by analyzing and comparing student approaches and arguments. (p. 10)

"Leading a discussion about our classroom dollar system helped to engage students immediately. Every student in my class loves money," says Mr. Myers. "My students ask each other 'How much have you saved? How much more do you need to make $100?'" Being able to ask and answer these types of questions in the moment indicates a student's reasoning abilities that may not be apparent on a standardized test.

KEEP THE CHANGE AND TODO MATH

The classroom dollar system makes math real for the students. What they learn in class is easily transferrable outside the classroom. But there are certain concepts that are really tricky to master in Mr. Myers' new economy. For example, counting change. "Many of my students are able to count change, but there are others who still have not mastered naming the coins or knowing their value. I like to use Todo Math for the Classroom to help these students hone their coin-identifying and counting skills."

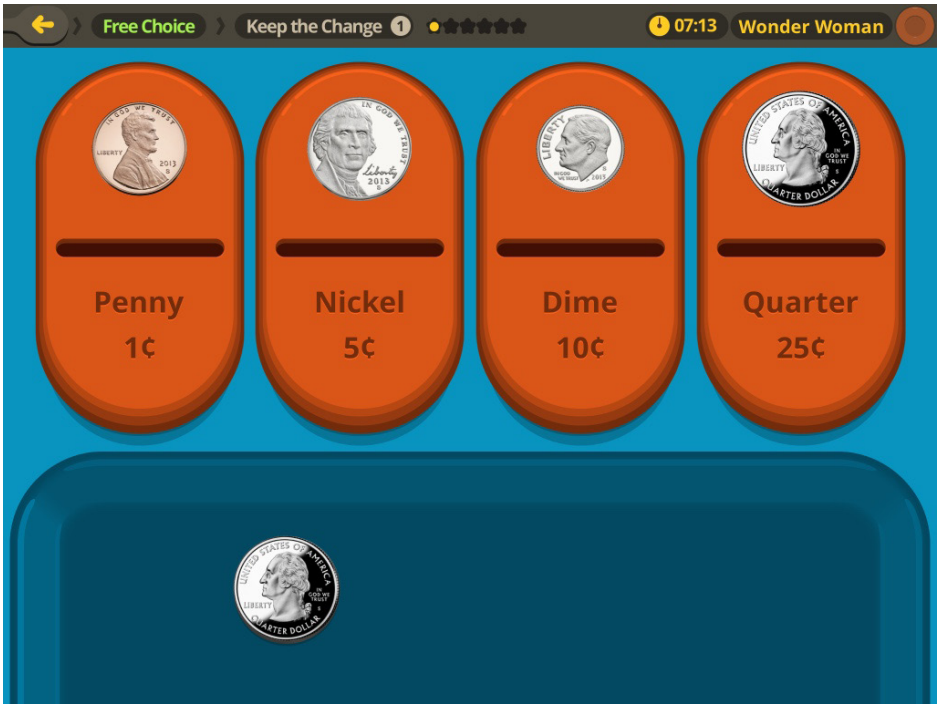


Figure 1

Todo Math is an app with a growing curriculum that includes 600+ math activities and 29 multi-level games, all aligned to kindergarten – 2nd grade Common Core State Standards. Keep the Change is the Todo Math game that Mr. Myers uses to provide differentiated practice for his students who have not yet mastered coin-counting. "I like Todo Math's Keep the Change game because students interact with digital coins that look like real money," says Mr. Myers. Sometimes illustrations of coins confuse students, and some students with neurodifferences respond negatively to illustrations because they require them to think abstractly. But with Keep the Change, students interact with digital coins that make sounds, are proportionately sized and are photographic images of real coins. This helps students transfer the skills they master in Todo Math to the real world. (see fig. 1)

In addition to the Keep the Change game, Todo Math is used to address any gaps in students' skill sets, like skip-counting, and as a targeted approach to remediating their deficiencies. "My students use Todo Math's Counting game to supplement money practice," says Mr. Myers. One-to-one correspondence and cardinality are key stages in developing number sense (Fosnot and Dolk, 2001, p. 33). Todo Math's Counting game provides explicit one-to-one and skip-counting practice so students have opportunities to develop efficient counting strategies. Skip-counting by 5s and 10s is especially important to master so students can count dimes and nickels efficiently and accurately. With 20 levels and a help button, a student can play the Counting game independently, at their own pace and at their own level. (see fig. 2-3)

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ACTIVITY

Coin Activity: Use a hundred chart to help students count coins. Provide students with mixed coins. Have them sort the coins. Begin with the largest denomination and work toward the smallest. Have students place coins with the largest denominations first. For example, given 2 quarters, 3 dimes, 1 nickel and 2 pennies, students would place quarters on 25, 50; the dimes on 60, 70, 80; the nickel on 85; and the pennies on 86 and 87. The last coin in the sequence tells the students how much money they have altogether. This method is effective for bridging the developmental progression from concrete to abstract coin counting.

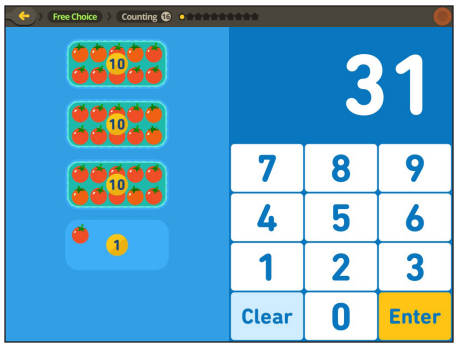
Differentiation suggestions:

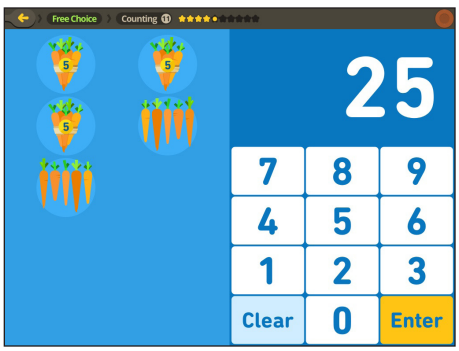
1. Limit the types of coins used for the activity. Have students work with just pennies or just dimes. Make the activity more challenging by mixing two types of coins.
2. Create a key that includes the values for each coin and encourage students to reference it when they need it.
3. When given the coins, ask students to estimate how much money they have. Ask them to estimate well over the value and under the value. Adding this extra challenge to the activity will help students hone their magnitude and reasoning skills.

ADDRESSING THE LIMITATIONS OF RIGID MIDDLE SCHOOL MATH CURRICULUM

One of the realities Mr. Myers faces as a special educator is having to differentiate math activities based on working with students with a wide range of varying skills and abilities. A lot of out-of-the-box math curriculum for middle school is published in a one-size-fits-all format with a strict scope and sequence. This highly structured format leaves little room for students who need more flexibility. "I have a student with splinter skills who can do complex computations but struggles with early math concepts, like magnitude, and is unable to manipulate numbers on a number line," says Mr. Myers. "I have to think out-of-the-box when adapting the math curriculum for my students. Multi-sensorial adaptation is key to being able to differentiate for my students. It's not all about levels, but about providing scaffolding in multi-sensorial ways to support acquisition of information and retention of the information."

Concrete, semi-concrete and abstract (CSA) is an instructional model used to support students in order to create their own understanding of mathematical concepts (Van de Walle, Lovin, Karp and Bay-Williams 2014, p. 78). This developmental progression works with early math concepts, including place value, addition and subtraction. Todo Math's Light it Up game is a favorite in Mr. Myers' classroom precisely because it incorporates concrete, semi-concrete and abstract concepts all in one game. Light it Up provides students opportunities to arrange building blocks (concrete) on a number line (semi-concrete) to match equations (abstract). "Using a mental number line is an effective strategy to solve equations without having to overly rely on algorithms," says Mr. Myers. For students with memory deficiencies, algorithms can be hard to remember. Using pictorial or mental number lines helps reinforce the magnitude of numbers and





Figures 2 and 3: Students can play a counting game independently.

allow students the freedom to use their reasoning abilities to solve operations. In addition, number lines are a great way to help students move from the concrete to the abstract. (see fig. 4)

DOCUMENTATION, REAL-TIME REPORTS, PROGRESS MONITORING AND PREPARING FOR IEP MEETINGS

Keeping meticulous notes and records of student progress is a necessary aspect of a special education teacher's job. IEP teams rely on observations and empirical evidence in order to determine a student's strengths and uncover gaps in student's skill sets. But making the time to collect and record the data in between lesson-planning, parent/teacher conferences, providing students social/emotional support and collaborating with other teachers and service providers is a daunting task. When supplemental curriculum is digital, like Todo Math, collecting data and

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monitoring progress makes the job more manageable.

"I have to show why students need to work on certain goals and the reports from Todo Math provide the evidence," says Mr. Myers. Along with the Todo Math app, Mr. Myers is provided access to a Web-based teacher account that lets him add and delete student accounts, customize settings for each student and generate progress reports. "With the Todo Math for the Classroom reports, I can show splinter skills by seeing how many problems a student answers correctly in one mathematical concept, like mathematical reasoning, and how few questions are answered correctly in another concept, like counting and cardinality." Teacher observations and notes are effective for providing an overview of a student. For a quick analysis that's straightforward, the reports generated by Todo Math for the Classroom are a great option, especially for parents.

FINAL THOUGHTS AND WISE WORDS FROM MR. MYERS

Many of us who came of age during "The Breakfast Club" remember math class much like detention … utterly boring and tedious. Teaching and learning math is changing with the adoption of the Common Core State Standards, as well as new research on how the brain learns math. Students with mathematics difficulties who receive special education services are expected to be provided the same opportunity to access the same math curriculum as their typically developing peers. In order to do so, Mr. Myers offers these tips:

1. Make math fun.
2. Make math real.
3. Learn math on your own.
4. Make math visual.
5. Have fun teaching math.
6. Try Todo Math for the Classroom to support differentiated math practice.

"I never thought teaching math could be so much fun," Mr. Myers revealed. "When I was a student, math was boring and I had trouble connecting what I was learning in the classroom to the real-world. I discovered, while teaching my students, that they can be motivated to do math just by solving real-life problems. Math is real to them and they use math to describe what they see each day by collecting data and charting their own progress."

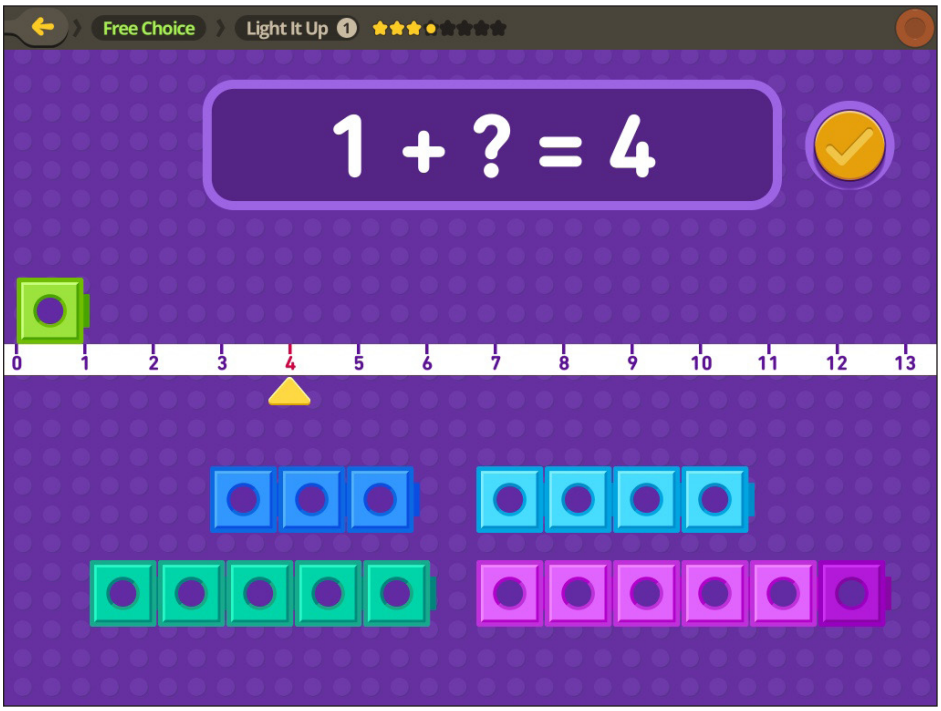

Figure 4: Number lines are a great way to help students move from the concrete to the abstract.

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TODO MATH FOR THE CLASSROOM

Todo Math is a research-based, award-winning, preschool–2nd grade Common Core State Standards-aligned supplemental curriculum for ALL learners in diverse and inclusive classrooms. Todo Math for the Classroom is a service that includes:

- Todo Math application for iPads and iPhones (Currently developing to make it available for Android devices in 2016)
- Web-based teacher dashboard and integration with the app
- Account management for up to 30 students per classroom
- Reports with student progress monitoring
- Ability to set accessibility preferences for students

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Touch as a Way of Seeing: The iPad and Apple Watch as a Low Vision Support

THURSDAY, FEBRUARY 18, 2016

1:00 PM - 2:30 PM CST

This session will consist of an overview of the iOS and Apple Watch accessibility features that can benefit users who have low vision. Zoom screen magnification and other options for customizing the display of information will be discussed in detail, along with an introduction to the VoiceOver screen reader.

A number of apps, complimentary to the built-in accessibility features, will also be demonstrated, and participants will also learn about a number of online resources for developing their knowledge of iOS and Apple Watch accessibility for low vision users.

LUIS PEREZ

New Options in Switch Control with iOS 9 for iPad

TUESDAY, MARCH 8, 2016

10:00 AM - 11:30 AM CST

With every new iPad OS update come new changes and options for switch access on the iPad. With iOS 9, there are new options for Scanning Styles, Tap Behavior and a new option called Recipes!

No, we're not baking cakes, but creating your own Recipes in Switch Control will, for example, allow a switch user to scan to and open a book in iBooks and then change the switch settings to a swipe left or right action and, when finished, close the Recipe and resume normal scanning.

Learn what's new, how it works and how to customize it for your students' needs! **(Basic understanding of switch access on the iPad required.)**

DAN HERLIHY

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The Next Generation AAC: What Research and Mobile Technology Offers

THURSDAY, MARCH 10, 2016

10:00 AM - 11:00 AM CST

For millions of nonverbal children around the world, the simple act of self-expression can be a struggle. Learn how SuperSpeak, a revolutionary augmented and alternative communications (AAC) tool for mobile devices, is breaking down barriers for these children by combining the fields of science, gaming, education, psychology and technology in a single, affordable iPad or iPhone app.

This webinar will help you understand how learning through play and creating a simple and consistent learning environment can enhance the experience for children with special needs. Through the use of images, sound and video, SuperSpeak enables children to express themselves and to communicate with their family, friends and loved ones.

KATRINE PEDERSEN and KIRSTEN MCLOUD

From Paper to Electronic - Creating Electronic Documents from Printed Materials

MONDAY, APRIL 11, 2016

1:00 PM - 2:30 PM CDT

This session will cover a variety of solutions for converting and importing printed materials into iPads, computers, Chromebooks and other tablets by utilizing scanners, document cameras, apps and computer programs and cameras on cell phones. Topics covered will also include options for saving in different file formats, text-to-speech and typing or annotating on documents.

Need to type on that worksheet, have the passage and questions read aloud, or simply need an on-the-fly solution for reading printed materials? We'll discuss that. Quality and cost comparisons for all platforms, as well as minimum hardware requirements for devices and computers, will also be discussed.

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LUIS F. PEREZ, Ph. D., is an Apple Distinguished Educator, Google in Education Certified Innovator and Inclusive Learning Consultant.

KATRINE PEDERSEN, Special Needs Teacher, Pre-school Principal. Tromso, Norway

DAN HERLIHY, AT/Technology Resource Specialist, Connective Technology Solutions, Inc., Hoosick, NY.

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product spotlight

Communication with the Tobii I-Series+

The I-Series+ consists of the Tobii Dynavox I-12+ and I-15+, two speech generating devices that can be controlled through gaze interaction via an optional built-in eye tracker. The I-Series+ is optimized for individuals with cerebral palsy, Rett, ALS or stroke/aphasia, who rely on augmentative and alternative communication to make their voices heard, in order to live more independent and integrated lives.

ENHANCED SOCIAL CONNECTIVITY

With the Tobii Dynavox I-Series+, staying social has never been easier. The wide range of software and functionality lets you easily engage in daily communication through speech, as well as effortlessly connect with others via e-mail, text messaging, chat, Skype or through phone calls using the most advanced Bluetooth technology. I-Series+ devices also lets you take and share photos, surf the Web, play games, access regular computer applications and control the environment around you.

ALWAYS ON

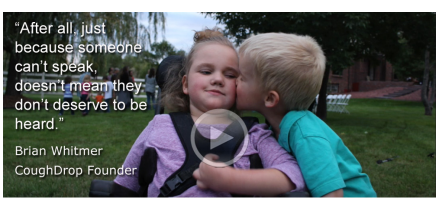
From face-to-face to long distance communication, the I-Series+ adapts to your lifestyle and can be used indoors, outdoors, in bed, at the dinner table – anywhere, anytime.

PURPOSEFUL, DURABLE DESIGN

Tobii Dynavox I-Series+ devices are designed with a purpose – to adapt to your needs and provide more communication independence than ever before, while standing up to the hardships of everyday life. Take it along with you without worrying about damage. Use it in noisy environments and still be heard. Switch users at school without losing your personal settings. I-Series+ devices are convenient, reliable, tough and built to be used.

LEARN MORE

CoughDrop Releases Open Source Cross-Platform AAC App for Struggling Communicators



CoughDrop (mycoughdrop.com) launches the first official release of their cross-platform augmentative and alternative communication (AAC) app to better serve individuals with autism, ALS, cerebral palsy, Rett Syndrome — and the teams that support them. Individuals with complex communication needs, as well as their parents, therapists, teachers and caregivers, can now take advantage of CoughDrop's cloud-based approach to AAC help make their voices heard.

"We've received some really great feedback since launching the beta version of our app just over a year ago," explains Brian Whitmer, founder of CoughDrop. "Now we're excited to have it available for download in the App Store and on Google Play, as well as on any web-enabled device."

CoughDrop is a cloud-based application that individuals with complex communication needs can use to generate speech using a tablet, smartphone, laptop or other device when they struggle using their own voice. Unlike most AAC apps, CoughDrop is cloud-based so any changes to a communicator's vocabulary "boards" are automatically backed up and synced, and changes can be made remotely as well.

"We want to free up communication so it's not so stuck on a single device," said Scot Wahlquist, Director of Business Development. "I know from personal experience with my son how frustrating it is when an individual's voice is lost because of a broken device, a dead battery, or even just to

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take it away to program in some new words." CoughDrop can also be run on multiple devices at the same time, so communicators can use one device at home a different device at school, with everything staying updated.

In addition, CoughDrop's cloud sync enables the support team around the communicator to have access to the vocabulary and reports from their own devices.

"One of the best indicators for success is how engaged the team is around a struggling communicator," says Whitmer. "Having access to boards and reports across devices lets parents get to know the vocabulary, helps therapists use their session time more effectively, and keeps everyone on the same page – all while no longer having to take away the communicator's speech device."

The CoughDrop application is published as an open source product, which means that anyone can access the source code used to build the app.

"We're excited to be sharing this powerful communication tool with the world. We believe that a communicator's voice shouldn't be locked in a proprietary system," explains Whitmer. "CoughDrop can export content using open standards, and even the app itself is open source, so there's always freedom of access for the individual." The CoughDrop source code is available on GitHub at http://github.com/coughdrop/coughdrop.

CoughDrop is available for download today from multiple app stores. Users can sign up at mycoughdrop.com for a free 2-month trial, and after that choose either a month-to-month subscription or a long-term purchase.

ABOUT COUGHDROP

CoughDrop is a simple, flexible, cloud-based AAC app written for today's communicators. It embraces the web to provide simpler management of vocabularies across devices, better reporting and insights on communication over time, and coordination tools to help the team around the communicator stay informed and empowered. CoughDrop runs on most modern devices including tablets, smartphones, laptops and even unlocked speech devices, and is available with a free trial before purchasing. Learn more at mycoughdrop.com.

LEARN MORE

Crick Software announces Clicker 7

Clicker 7
The complete literacy toolkit

Crick Software's child-friendly literacy tool, Clicker, is being used in thousands of schools around the world to raise reading and writing standards.

Clicker 7 builds on the success of previous versions of this much-loved program and makes it easier than ever for teachers to provide personalized literacy support across the curriculum - from planning, to writing, to proofing.

Students will benefit from a variety of exciting new additions to the software; they can use Clicker's built-in planning tool, Clicker Board, to help them prepare for writing, Voice Notes to record their ideas or rehearse their sentences, and have their text read back to them in a friendly, realistic child's voice that they can identify with.

Teachers will love the ease with which they can create and edit new Clicker activities, Word Pool, Clicker's new tool for targeted spelling interventions, and having instant access to a host of free training materials to help them get started. Students at schools purchasing the Clicker 7 Unlimited Site License will also be able to install Clicker on their home computers for the very first time, giving them access to a consistent level of literacy support wherever they are working.

Those working in special needs settings will view Clicker 7's enhanced accessibility features as a real highlight. In addition to streamlined switch access and full touch screen compatibility, Crick has added two new access options - eye gaze support and SuperKeys, the company's unique 'zoom' solution for learners who need bigger target areas.

"The latest version of Clicker is more accessible, user-friendly, and customizable than ever before – it's the complete literacy toolkit for the inclusive classroom," says Crick Software CEO, John Crick.

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