Assistive Technology Resources for Children and Adults with Disabilities

Closing The Gap Solutions

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The power to express myself

Introducing Indi™, the world's first all-in-one, speech tablet for symbol communication

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Making AAC Work!

Augmentative and Alternative Communication (AAC) refers to all the tools and strategies that we use to support a person who can't communicate effectively using speech. There are many different AAC systems and approaches that can be implemented.

However, regardless of the system, there are some fundamental principles that should always drive our practice. Key guiding beliefs, and key strategies that will help us to support an AAC learner to develop functional and real communication to increase their participation. Give them a voice - and then help them to be heard! Making AAC work is far more about what we can all do to support and integrate the use of the AAC system, than it is about the actual tool.

GUIDING BELIEFS IN AAC

Here is a list of some of our guiding beliefs in AAC; things that we should remember as we support successful use of an AAC system.

- We always presume competence and believe, given the right tools and opportunities that an AAC user can develop successful communication and literacy skills.
- We should start with the end in mind - a robust vocabulary. Our goal is for AAC users to become successful and independent communicators, and to do this they need all the words and more, not a limited display. When we provide a robust AAC system based on core words, with access to a keyboard for literacy, from the beginning, we give them the greatest chance of success.
- We need to support the use of AAC by equipping the environment and working with communication partners.
- AAC users will learn how to use their AAC system when they see others use it! We must model (by pointing to words on the AAC system) as we talk.
- We are persistent, and never give up on communication, or quit using an AAC system before it has had time, real time, to be used and learned.
- We are consistent; using AAC regularly and reliably, not just for half an hour here and there in a day!
- Multimodal communication is fine - many AAC users will have multiple ways in which they communicate - sometimes it will be with their AAC system, gestures or vocalization. We should encourage and support all these different modes of communication.
- We are engaging and interactive, knowing that real communication comes from genuine engagement. When we provide real reasons to communicate, we can build success.
- We are patient, and prepared to allow time for communication to happen.
- We make AAC always available, no matter what! When AAC becomes a person's voice, it should not be taken away from them.

Let's discuss some of these beliefs in more detail.

CORE WORD VOCABULARY

Core words are the building blocks of language and make up 80% of the words we say and read. Even though some core words may be less "picturable" and may be seen as "hard-to-teach," core word learning should be central to our AAC system. When we give an AAC user core words, they have so much more flexibility and

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power to say more and to develop their language skills. If we are doing an activity with a "ball," and you focus on the AAC user saying or matching the "ball," how often can they use that word? Compare this to using core words like "get," "go," "more," "all done or finished," and "where," - all of these words can be used not only when playing with the ball, but in many other situations throughout a day.

All AAC systems also need specific and personal words to help enhance their message. These words can be added to the core words easily to boost and extend the language. Conversely, core words can be piggybacked onto specific words. For example, if the AAC user presses the word "pizza" when they want it, this is a perfect chance to model core words, e.g., "not" (we do NOT have any pizza,) "want" (oh - you WANT pizza,) "get" (we need to GET pizza,) or "help" (let me HELP to GET the pizza.) Working hard to add and personalize vocabulary is another key factor in the success of an AAC system.

SETTING UP THE ENVIRONMENT FOR AAC

AAC needs to always be available. We need to be able to instantly put our hands on it, so you can make the most of every opportunity for communication. Look around you - is the environment set up for AAC? Can we grab the AAC system, ready to communicate quickly and easily? Can the AAC user access their AAC system independently?

It's important to give the AAC user access to an AAC system so it needs to be in easy reach and/or always in the same place.

If the AAC user has a high-tech AAC system (such as an AAC app on an iPad,) it can be a great idea to have light-tech (or paper-based) version of it in places around the environment. Could we stick laminated boards to places such as the mirror in the bathroom, on cupboard doors or on tabletops? This means that the AAC can be used easily! Having a light-tech or paper-based backup of the AAC system is also useful if something happens to the AAC device.

MODELING

Once you have an AAC system set up with core words, but also personalized to meet the needs of the individual, and it's available in all environments, the next most important thing a team can do, is to model. Modeling shows and points to words on the AAC system as we talk to the AAC user. When AAC users see us pointing to the word(s,) they'll learn how to use them to communicate. We model communicating real messages in real situations.

When we start out modeling, it can feel clumsy. We don't know where the words are, it slows us down and sometimes we can't figure out which words to model. The more you do it though, the easier it will become. Simply start by modeling, and get all the team involved.

Here are some key things to remember about modeling:

- You do not need to model every single word that you say, instead model the key words in the sentence.
- Think about modeling one more word than the AAC user is currently using.
- Your modeled sentence on the AAC system doesn't have to always be grammatically correct.

- Make comments and describe things, rather than only asking questions when you model.
- Model on the AAC users system, or on light-tech paper-based systems.
- One model is never enough - you may need to model the same words in the same situations often.
- You may have to learn to model without expecting anything in return, as the AAC user may not always respond or reply.
- You don't need to make the AAC user copy the model that you provided.

If you are unsure on what words to model for your AAC user, one approach can be to look at communication functions, or the different reasons we communicate. For example, if you want the learner to use their AAC to make a request, then modeling words or sentences like: "want" or "I want that" can be useful. If you want the learner to give an opinion, then model words or sentences like: "good," "that bad," "like," "I not like," and "I think it __." The AssistiveWare Core Word Classroom (http://coreword.assistiveware.com), contains a bank of resources that are designed to help us figure out and choose core words.

COMMUNICATION PARTNER SKILLS

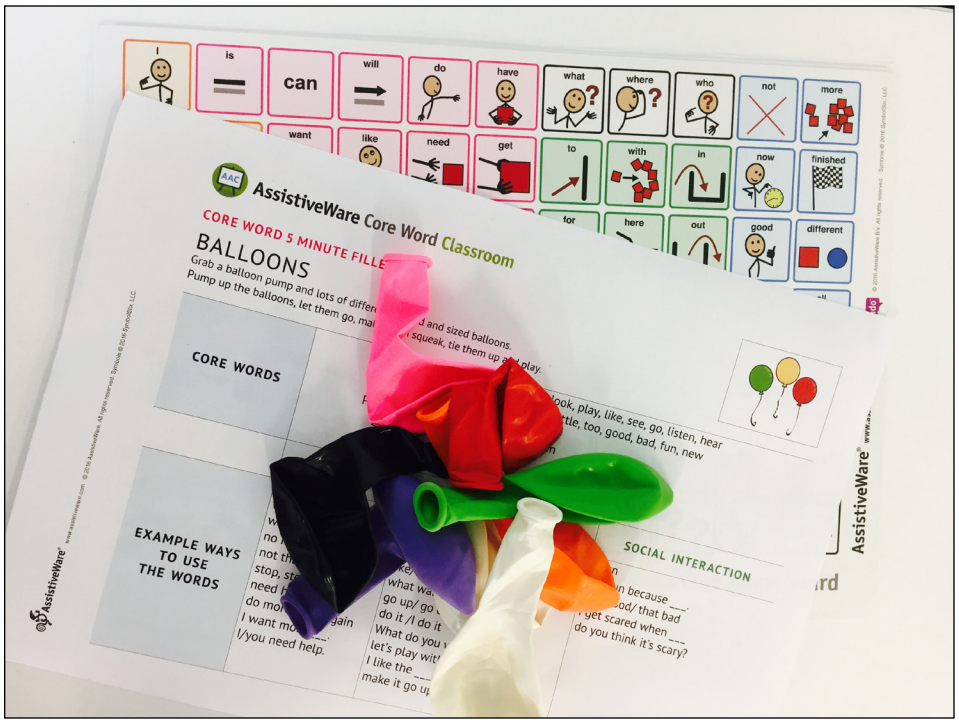
Our role as a communication partner to AAC users is crucial. What we do counts; what we think is important; how we respond matters and every interaction is an opportunity. Sometimes we need to provide training and support to other communication partners in the environment, so that everyone is on board with how to use the AAC system effectively.

Communication partners start off by making AAC available and then modeling.

What happens next, though?

Firstly, a good communication partner will allow more time, by pausing and waiting. We must remember to give the AAC learner longer to respond before we jump in with prompts, or to take over their turn to talk.

Naturally what comes after this is that we look to provide prompts and clues to our AAC learner to help them use their AAC system to communicate with us.



When you provide a prompt, there are a few different prompts you can provide:

- **Verbal Prompts:** such as "Find your chat words if you want to tell us what you think!"
- **Gestural Prompts:** such as pointing to their AAC system to remind them to use it, or pointing in the direction where they can find the word.

It can seem tempting to grab an AAC users hand to make them say words on their AAC system, this should be avoided. It's been shown that modeling is more effective than hand-over-hand and physical prompting for learning skills effectively.

The final thing to remember about prompting is that we should try to avoid providing too many prompts and always be thinking of ways to fade these prompts out over time. Remember, regardless of how often we provide prompts, or what type of prompts we provide, providing a model is still the most important thing we can do.

Next comes how we respond to an AAC learners attempts at communication.

Communication partners must respond to encourage the interaction and natural flow of the conversation. Additionally, our responses provide us with more chances to model, build and extend language.

Some key response strategies include:

- **Acknowledge:** we acknowledge all attempts at communication, even if they're requests for something that is not possible at the moment, e.g., if a student presses "outside," respond with "Thanks for telling me you want to go outside. We can do that later."
- **Attribute meaning:** we attribute meaning to the AAC learner's message, e.g., if a student presses "hot," respond with "Hot dog? Yes, we had hot dogs on Tuesday!"
- **Expand:** we expand the AAC learner's message, e.g., if the AAC learner says "more," we could model back "Want more?" on the AAC system.
- **Recast:** we recast, or restate the AAC user's message, so they can see different ways of conveying messages, e.g., if the AAC user says "My turn." we could say "Oh! You are telling me you want a go." while pointing to "YOU" and "GO" on the AAC system.

PRACTICAL WAYS TO ENGAGE AAC USERS

We need to find common ground with AAC users, discover their interests and begin to share real moments to engage and interact. We can then look for opportuni-

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ties to show them how to use words on their AAC system (modeling, as described above.) The more fun and motivating opportunities we create, then more communication can happen.

Here is a quick list of ideas, tips and tricks. It's not a complete list because we should always be coming up with new ideas and ways to engage!

- **Look at photos:** Talk about the pictures, people, what happened, what you liked and what you saw.
- Read through junk mail, catalogues or magazines: Talk about things to buy, birthday wish lists, gift ideas for friends, things of interest, stories about celebrities and recipes.
- **Create arts & crafts:** Talk about what to make, how to make it, describe the colors, what you see and what to use. Invite people to an art show to see completed art.
- **Watch a TV program or movie:** Talk about what happened, who's your favorite character, which part did you like most and was it scary or exciting.
- **Cook together:** Talk about what you have to do, the ingredients, taste, what you like or dislike about it.
- **Read a book together**: Talk about the pictures, characters and what happened - you don't always just need to read the words!
- **Play hide and seek or action games with toys:** Talk about the game while you take turns hiding toys. Make the toy do all kinds of fun actions. Model where words like: in, on and under, and action words like: jump or sleep.
- **Listen to music:** Talk about favorite music, instruments and songs, then sing and listen and play! Change the words to favorite songs.
- **Play with favorite toys and games:** There will always be a lot of games and toys that can spark interest and engage learners. What kinds of words and core words can you model while playing?
- **Make videos:** Talk about who and what the video will be about, have a video launch party.
- **Take selfies or set up a photo booth:** Taking photos are fun! Add a few props and it becomes even more fun. Talk about what to put on or take off and make a book or album with all the photos so you can keep talking about it later!
- **Watch YouTube:** Almost everyone can find something they love or find funny on YouTube. Watch small segments of YouTube and model language around what you are seeing and thinking.
- **Play with a favorite app:** Do you have a favorite app that you can play together while talking about it? Check out the Toca Boca and My Playhome apps - always loads of fun!
- **Play with Nerf guns:** Make targets on the wall; take aim and fire! All while talking on the AAC system.
- **Talk about favorite places:** Talk about favorite places and plan trips there. Take photos and videos so you can continue the conversation later.

The list could be never ending, so start your own list of tricks and activities. Be ready to make the most of every opportunity to engage AAC users and build language.

The AssistiveWare Core Word Classroom has some one-page quick reference sheets for common and motivating games, called their "Core Word 5 Minute Fillers." These are perfect for looking at core words to model during engaging activities.

CONCLUSION:

Making AAC work is one of the most important things we can do for any person who needs AAC to communicate. This just doesn't mean that we know how to turn the AAC system on. It means that we have guiding beliefs that drive our practice. Also, that we use key strategies such as modeling, timing, prompting, responding and engaging to ensure the AAC user has the best chance to develop successful and independent communication. What can you start doing today that will make AAC work for you? There is no better time to start than now.

RESOURCES AND WEB LINKS:

There are a few websites where we can get more information and resources on successful implementation of AAC. Some of these include:

AssistiveWare Core Word Classroom: http://coreword.assistiveware.com

Praactical AAC: http://praacticalaac.org

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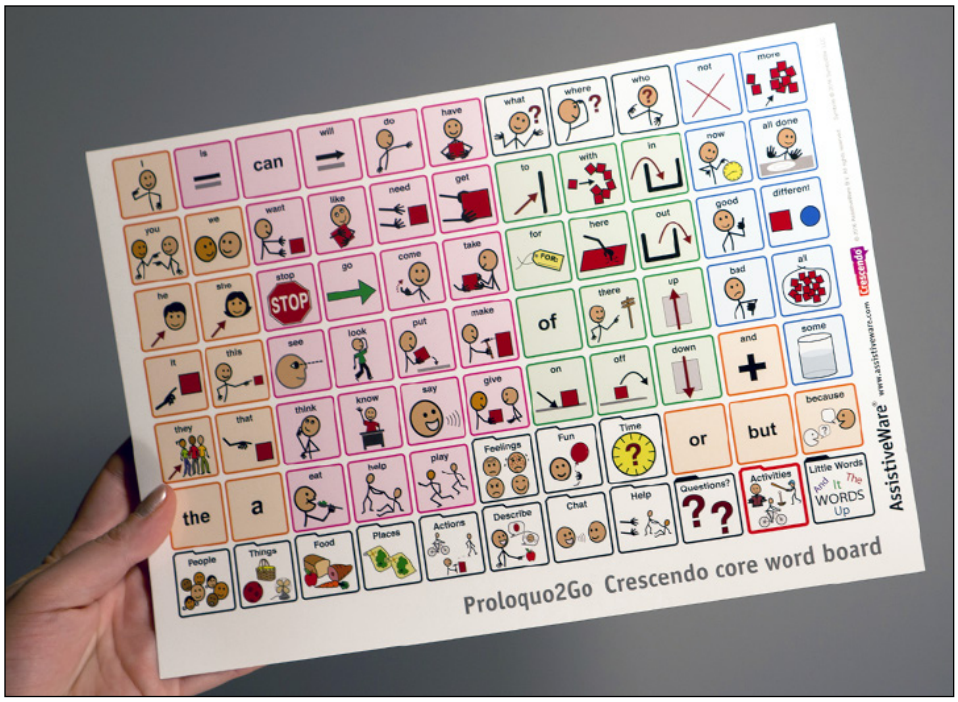

The Angelman Syndrome Foundation Communication Training Series: youtu.be/qQNCs5kjbe4

Dynamic Learning Maps Core Vocabulary resources and presentations from the Center for Literacy and Disability Studies: www.projectcore.com

Gail Van Tatenhove - http://www.van-tatenhove.com

Positive AACtion - Information Kit for AAC Teams: www.rockybay.org.au/resources/useful-links/#aackit

Jane Farrall, an AAC and literacy specialist: www.janefarrall.com

Linda Burkhart (AAC consultant): http://lindaburkhart.com

Motivate, Model, and Move out of the Way (Kate Ahern, AAC specialist and special educator): www.teachinglearnerswithmultipleneeds.blogspot.nl ■

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Fostering Communities and Professional Learning In Assistive Technology:

The opportunity for case specific discussions to increase provider knowledge and application of AT practices

Appropriate Assistive Technology (AT) can provide tools to improve educational outcomes for students with disabilities (Edyburn, 2013). According to clinical practices and AT research, AT can grant greater access to curriculum for children with disabilities. Additionally, students can use AT in the acquisition and expression of their knowledge (Copley and Zivani, 2004; Lewis (1998); Pell, Gillies, and Marjorie (1999); Priest and May (2001); Seymour (2005). However, only 3-5% of students with disabilities have AT written into their Individualized Education Program (IEP). (Edyburn, 2008, 2004)

To increase access to the general education curriculum offered to students through the use of AT, teachers and other education professionals need up-to-date knowledge and evidence-based strategies to integrate AT into their daily activities. (Koehler, et.al, 2014) However, release time for professional development and collaboration with colleagues is an ongoing struggle in schools, with many competing priorities for available professional development time.

In an effort to address this problem, and be responsive to the needs of the educational community, the Wyoming Institute for Disabilities (WIND) adapted a successful model, ECHO®, to increase the capacity of educators to identify, select and use assistive technology for students with disabilities. (Root-Elledge and Hardesty 2015); Root- Elledge and Hardesty, 2015-2016)

The novel ECHO model was adapted for use in education to increase the implementation of AT for students in school. ECHO also facilitates the development of communities of professionals who can share their expertise and learn from the collaborative coaching model offered by ECHO. (Arora et al, 2011)

WIND is part of a national network of 67 University Centers for Excellence in Developmental Disabilities and, in 2004, was designated as the state Assistive Technology Act program. The AT Act supports state efforts to improve the provision of assistive technology by providing funding to support state level activities, such as demonstrations, loans, reutilization and financing for devices.

Also included in the AT Act are state leadership activities including training, public awareness, information, and assistance. These activities are designed to meet the assistive technology needs

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of agencies, natural supports, and, most importantly, individuals with disabilities across the lifespan. To effectively address these responsibilities, WIND searched for a strategy that would meet the unique demographic and geographic characteristics of Wyoming yet remain flexible enough to help local education systems learn about the ever-evolving field of assistive technology. The desired model would need to provide educators with readily available and applicable strategies to increase the consideration and implementation of AT with students.

In 2014, as the lead agency for Wyoming's Assistive Technology Act program, WIND launched a virtual professional learning community, UW ECHO in Assistive Technology (AT).

THE ECHO® MODEL

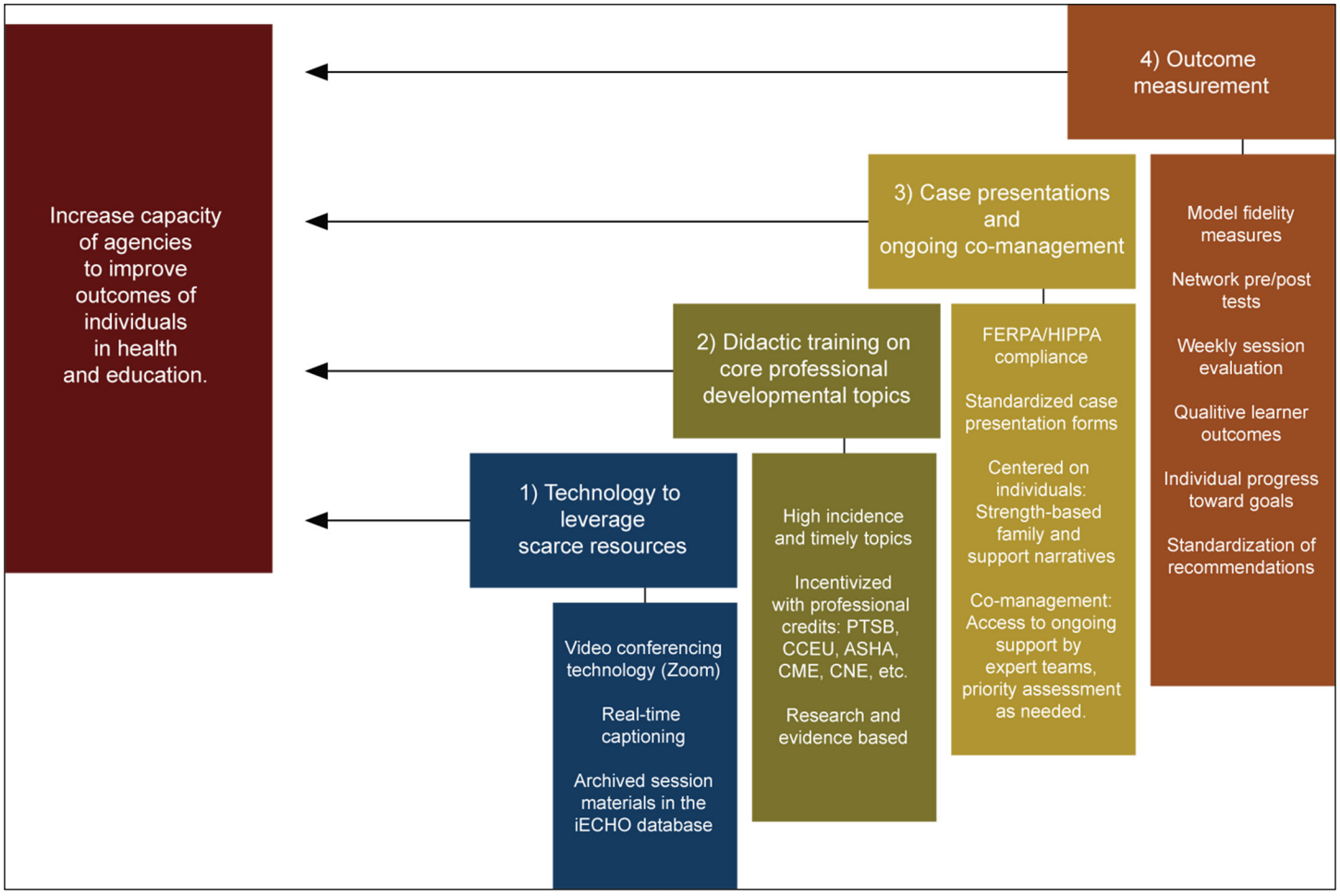
Project ECHO® was developed by Dr. Sanjeev Arora at the University of New Mexico, for building professional capacity to meet underserved health care needs and provide best-practice treatment to reduce disparities in care. (Arora et al., 2011)

UW ECHO in AT is a translation of this model from healthcare to education. The model provides the innovation, structure and flexibility WIND required (Hardesty & Root-Elledge, 2015; Hardesty & Root-Elledge, 2015-2016.) The goal of UW ECHO in AT is to provide lifelong learning and guided practice opportunities that support and exponentially increase the workforce.

UW ECHO provides weekly professional development, peer coaching, and case co-management. Co-management is defined as ongoing assistance provided to ECHO participants from interdisciplinary teams. Educators have an opportunity to discuss case recommendations and brainstorm additional strategies with the staff from the Wyoming Assistive Technology Resources, as well as state and national practitioners.

The UW ECHO networks' hub-and-spoke model is a knowledge-sharing community linking the "hub"- inter-professional specialists- with educators, administrators, and service providers- the "spokes"- for regularly scheduled video conference training and mentoring based on case discussions. By utilizing a video conferencing system, UW ECHO in AT offers weekly sessions which include a 30-minute professional development training on topics identified as relevant to the students served by the members of the ECHO community.

Following each professional develop-



The ECHO® Model Core Component

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ment presentation, ECHO participants engage in case presentations based on student or district level problems of practice. Case presentations, de-identified for each session, offer discussion and coaching opportunities from an interdisciplinary group of highly skilled educators and professionals as a way to build capacity in the application of effective practices supporting classroom, school, district and student outcomes.

The interactive nature of this modality for training and coaching in remote areas is increasingly in demand as organizations look for mechanisms to provide high-quality, responsive and timely professional development in a period of reduced budgets and limited time. Previous Closing the Gap articles (Hardesty & Root-Elledge, 2015; Hardesty & Root-Elledge, 2015-2016) have described the translation of the original ECHO model as well as professional development implications for education professionals.

This article will explain the process for case presentations and co-management as well as how ongoing mentorship is increasing provider knowledge and application of AT within local education agencies.

PROCESS FOR CASE CONSULTATION

In order to provide consistency and structure to the case presentation portion of weekly ECHO sessions, a series of case presentation forms were created to provide the interdisciplinary hub team information related to specific areas of concern. The case presentation forms, adapted from the Wisconsin Assistive Technology Initiative (WATI) assessment profile (wati.org), are similar to more traditional referral forms with some exceptions: the student, school, and other confidential information are not identified. Also, the UW ECHO in AT case presentation forms were developed to allow for the collection of both individual and aggregate data about the outcome of the ECHO peer coaching and co-management activities.

Professionals are asked to select and complete a case presentation form, or Student Information Guide (SIG), based on an area of concern which determines the SIG to use. There are six different SIGs to choose from: Communication, Reading, Motor Aspects of Writing, Composition of Written Material, Mathematics, and Organization. (www.uwyo.edu/wind/echo/assistive-technology/index.html) After a case has been presented, community members are encouraged to ask clarifying additional questions and then share their ideas about actions and AT solutions that might help the case presenter further address the area of concern for the student. Following each weekly session, recommendations are recorded and emailed directly to the case presenter to be shared with additional team members and families.

Six to eight weeks after the initial case presentation, the professional(s) are contacted via email and sent a follow-up document to complete. During this contact, case presenters are asked to report whether or not any of the recommendation(s) provided during the ECHO session were implemented or considered. In addition to tracking student success for individuals, follow-up data is compiled to test the effectiveness of this model as applied to education as a whole and for analysis to target future areas of improvement. **(See Table 1.)**

The two-part approach to data collection and analysis demonstrates the value of the University of Wyoming's Project ECHO in AT. Initial results indicate that individuals who present cases get valuable suggestions and ideas about ways to approach the use of AT with individual students. At the same time, evidence indicates that other ECHO community members experience benefits from hearing the ideas shared during the case presentations which can be generalized and applied to other students.

Participants learn from each other and gain new insights from experts during the question and discussion phase of each UW ECHO in AT session.

SESSION AND CASE RESULTS

During the 2015-2016 UW ECHO in AT sessions, over 416 individuals attended 27 sessions for more than 40 hours of ongoing professional development. Participants represented service providers, educators, case managers and administrators from both education and employment agencies. Every session included experienced professionals to guide conversation including certified AT specialists, occupational therapists, speech-language pathologists, general and special educators and frequently vision and hearing specialists from the Wyoming Department of Education.

Eleven cases were presented throughout the 2015-2016 academic year. All the professionals involved in those cases were contacted for a follow-up discussion. Nine responses were recorded. Of these responses, eight experts had continued contact with the student about whom they presented **(Table 1)**. Of the provided recommendations, a total of 12 were implemented, and eight were considered. The majority of implemented recommendations were described as simply implemented without further explanation related to outcomes of students using the assistive technology.

In addition to the collection of information about case presentation outcomes, all participants attending the UW ECHO in AT sessions were asked about the utility of the discussion and recommendations during routine session evaluations and network posttests. Results from these assessments suggest that participants are learning from the case discussions and applying the knowledge to individual students as well as schools and agencies that they serve.

Participant post-network evaluation from 2015-2016 indicated that by attending sessions, participants increased their knowledge, skills, and abilities to support access to assistive technology for professionals, educators, students and community members.

Additionally, 46% of individuals who completed the 2015-2016 posttest re-

Case ID #	Educator Responded to request for follow-up	Student Information Guide (SIG)	# of Rec.	Implemented Rec.	Consid-ered Rec.	Ongoing relationship with student
1726	NO	SIG 1 Communication	5	N/A	0	Contact with student not maintained
1620	YES	SIG 1 Communication	3	2 out of 3	0	Continued
5211	YES	SIG 1 Communication	4	1 out of 4	2	Continued
2327	NO	SIG 1 Communication	7	N/A	0	Contact with student not maintained
3889	YES	SIG 2 Reading	3	2 out of 3	2	Continued
6772	YES	SIG 2 Reading	8	3 out of 8	2	Continued
6132	NO	SIG 2 Reading	8	N/A	0	Contact with student not maintained
8268	YES	SIG 3 Motor Aspects of Writing	10	1 out of 10	1	Continued
2179	YES	SIG 4 Comp of Written Material	5	N/A	0	Information was provided to the educator, unsure of the number of AT recommendations that were implemented or considered.
3013	YES	SIG 6 Organization	6	3 out of 9	3	Student continued to work with the university's student support services for students with disabilities
9697	YES	NO SIG	10	N/A	0	Soon after the case presentation, the student had a medical setback that severely impacted their previous condition. The recommendations that had been provided were no longer appropriate and the team was waiting for the student's condition to stabilize.

Table 1: AT Case presentation outcomes (September 2015-May 2016).

ported their primary reason for participating in an ECHO session was to learn from the case presentations Furthermore, 77% of participants reported they implemented assistive technology practices as a result of their attendance during an ECHO session.

AT faculty and staff report that their attendance and guiding of practice within UW ECHO in AT has increased their capacity to provide training and technical assistance. For example, an incoming freshman and his mother came in seeking information on different devices and services to support the student's academic success. AT staff members were able to apply the information from this meeting for a case presentation and received several ideas related to different technologies the student could consider and trial. After the session, the WATR staff member met with the student and provided training on an ECHO Smart Pen and the digital library resource, Bookshare. The student also began working with the University Disabilities Support Services (UDSS) office at the University of Wyoming, and they helped the student access some of the assistive technology mentioned during the ECHO case presentation recommendation. After the session, the student continued working with UDSS for academic supports and guidance.

Additionally, a special education teacher from a rural town in Wyoming was interested in learning about new Augmentative Alternative Commun-ication applications to be used on the iPad. During the professional development portion of an ECHO session, participants learned about a new app to address this concern. The educator was able to borrow an iPad from the state AT Act Program with the app downloaded for a trial. The opportunity to trial the equipment with the student allowed the educator to determine the potential of the technology to support the student's needs.

Quote from the school district after trialing the app: *"We were able to work with the parents and teachers and after experimenting with the AT, came up with one app that is meeting our student's needs. Thank you!"*

These results suggest participants are gaining knowledge and confidence in implementing new strategies and recommendations. Individuals report they are generalizing the information received during the session to their

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students, classrooms, and districts. UW ECHO faculty and staff are continuing to identify the extent of implementation of recommendations throughout communities in Wyoming as well as specific outcomes for students. We hope to report on these outcomes in late 2017.

Participants from the UW ECHO in AT network report that professional benefits of case presentations include:

- Hearing about cases outside of district.
- Receiving a broad spectrum of
- perspectives.
- Access to a larger community to help brainstorm solutions.
- Knowing there are others to help with situations.
- Networking and relating to other
- districts struggles and successes.
- Cost effective professional develop- ment opportunities.
- Ongoing discussions with individuals about AT.
- Increase understanding of how AT can improve outcomes.
- Building connections with UW ECHO staff.
- Confidence in considering and implan- tation AT for students.
- Excitement for profession

(UW ECHO in AT evaluation data, 2016)

DISCUSSION

This platform challenges professionals, both internal and external to the State AT Act program, to seek learning opportunities beyond their current areas of knowledge. UW ECHO in AT participants are implementing strategies gained during the sessions to increase access to AT devices and services in their classrooms, schools, and districts. Attending UW ECHO in AT sessions and participating in case discussions has increased participant's ability to support and implement technology for educators, professionals, students and community members across the state of Wyoming. Preliminary results suggest strategies for AT use and implementation are being applied, but additional support and follow-up may be required to facilitate successful and long-term results.

If individuals or agencies are interested in the ECHO Model® for use in Education or with students with disabilities, please visit our website at http://www.uwyo.edu/wind/echo/ or contact projectecho@uwyo.edu.

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Google Technology as Inclusive Practice for Universal Design

INTRODUCTION

Universal Design for Learning (UDL) is recognized as a best-practice framework in designing instruction for all students. Incorporating technology options in UDL enhances the flexibility of learning experiences, providing personalization and inclusive educational opportunities. Districts and schools are increasingly adopting 1:1 technology programs and other technology practices such as bring your own device and flipped learning. Few studies show the effectiveness of these practices on outcomes for all students and in particular students with disabilities. This is critical for administrators, teachers and other professionals faced with decisions that affect the selection and implementation of instructional, universal and assistive technologies. Increasingly, schools are looking for universal technology solutions that are cost effective, flexible and easy to implement in a variety of classrooms.

This article will review Google apps, extensions and add-ons used in the everyday classroom where inclusive practices and technology integration are applied to students of all learning abilities. For each tool, we will show how it aligns with the UDL Guidelines Version 2.0 from the National Center on Universal Design for Learning.

THE FOUNDATION - UNIVERSAL DESIGN FOR LEARNING

Universal design is the concept of making all products and the built environment as aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life (think of curb cuts, automatic door openers and captions on TV). Applying universal design in education, means designing the curriculum and the learning environment to be as aesthetic and usable to the greatest extent possible by as many learners as possible. Everyone brings various cultural backgrounds, interests, skills, needs and other personal characteristics to the learning environment - and we should provide effective instruction to everyone.

Three primary brain networks that come into play in the learning process: the Recognition Network, the Strategic Network and the Affective Network. The Recognition Network is involved with how we gather facts and categorize what we see, hear and read, enabling us to identify letters, words, or an author's style. The Strategic Network is involved with planning and performing tasks; how we organize and express our ideas, such as writing an essay or solving a math problem. The Affective Network is involved with how learners get engaged and stay motivated. For example, how they are challenged, excited or interested.

UDL is a framework for educators to improve and optimize the learning envi-

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ronment for all learners as they plan curriculum. There are three main Principles that follow from the brain networks. Each Principle has three Guidelines, and each Guideline has three to five Checkpoints.

The general Principles are: Provide Multiple Means of Engagement, Provide Multiple Means of Representation and Provide Multiple Means of Actions and Expression. Engagement Guidelines include providing options for recruiting interest, sustaining effort and persistence and self-regulation. Representation Guidelines include providing options for perception, comprehension, language, mathematical expressions and symbols. Action and Expression Guidelines include providing options for physical action, expression and communication and executive functions. Checkpoints are strategies that educators can use to make the learning environment as welcoming as possible for all learners. We will follow this structure throughout the article to show the alignment of Google tools to UDL Principles, Guidelines and Checkpoints. The reader can reference a link to the UDL Guidelines in Figure 1.

TOOLS FOR TEACHERS

Management tools and UDL alignment

Teachers manage student assignments, differentiate instruction, and monitor student progress on projects andvvvdocument student work. These tasks can be accomplished using different Google tools and we will discuss how a teacher can use them to implement UDL.

Some tools, such as Google Classroom, Google Drive, Google Docs, Sheets and Slides, are general tools with application under all of the Principles. Google Classroom allows teachers to individualize instruction, track student submissions, provide timely feedback and download scores. Google Drive provides ease of organizing, document and folder sharing, monitoring and auto saving. Google Docs, Sheets and Slides allows teachers to produce documents, spreadsheets, presentations, modify tasks, monitor student work, collaborate with students, provide student feedback and track student progress. For example, when teachers use these tools to differentiate instruction, they align with the UDL Engagement Principle, the Guideline of sustaining effort and persistence and the Checkpoints of varying demands and resources to optimize challenge, and foster collaboration and community. When it's used in presentations, they align with the Representation Principle, the options for perception Guideline and offer ways to customize the display of information Checkpoint. When used for feedback or monitoring, they align with the Action and Expression Principle, the physical action Guideline and optimize access to tools and assistive technologies Checkpoint. Google Classroom and Google Drive primarily align under the Action and Expression Principle, the Guideline of providing options for executive functions and the Checkpoint of facilitate management of information and resources.

Other examples of teacher management tools include Forms, Stay Focused and g(Math). Google Forms can be used for tracking behaviors, collecting data and creating summary reports. Stay Focused increases teacher and student productivity by limiting the amount of time spent on time-wasting websites. Once your allotted time has been used, the sites you have chosen to block will be inaccessible for a predetermined amount of time. g(Math) is an add-on to Google Docs and Google Forms that creates and inserts equations, graphs, statistical displays and math quizzes. This tool understands what you're typing or handwriting and instantly turns your expressions into clear, accurate on-screen formulas. There are many ready-made formulae and functions. In the UDL framework, if Google Forms or Stay Focused is used to monitor behavior, the tools align with the Engagement Principle, self-regulation Guideline and promote expectations and beliefs that optimize motivation and facilitate personal coping skills and strategies Checkpoints.

Organization	Description	URL
National Center on Accessible Educational Materials (AEM)	Provides information, resources, research and technical assistance on the use of AEM for many different stakeholders including educators, families, individuals, publishers and media producers.	http://aem.cast.org/
National Center on Universal Design for Learning (UDL)	Provides information and resources on UDL connecting a diversity of stakeholders with many placed on their website. Some of the topics include UDL basics, advocacy, implementation, research, community and resources. The UDL 2.0 Guidelines can be found on this website.	http://www.udlcenter.org/

Figure 1 - UDL Guidelines - **References**: National Center for Accessible Educational Materials (n.d.). About accessible educational materials. Wakefield, MA: Author. Retrieved from http://aem.cast.org/about#.WPFCf2nyuM8

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g(Math) aligns with the Action and Expression Principle, by providing options for physical action (Guideline) and varying the methods for response and navigation (Checkpoint) as well as the Guideline for expression and communication and the Checkpoint of use multiple tools for construction and composition.

In short, these Google tools can work seamlessly to help teachers apply principles of UDL in their classrooms. (See Figure 2, **Teacher Management**)

TOOLS FOR STUDENTS

Self-regulation and monitoring tools and UDL alignment

Most students need assistance with organization and planning, and typically need explicit instruction to navigate calendars, electronic planners or other tools. Examples of student tools for self-regulation and monitoring include Google tools and websites such as Google Calendar, Google Keep, TabJump and Wunderlist. Google Calendar helps students to stay organized, set notifications, subscribe to course calendars and invite others to join or share calendars. Google Keep allows students to make checklists or notes that work as reminders. In Google Keep, students can add images, color code notes or share notes with others. They can also copy Google Keep notes to Google Docs. TabJump helps students easily jump to frequently used tabs, restores closed tabs and allows locking a tab to prevent accidental closing. Wunderlist allows users to create unlimited to-do lists, easily share to-do lists, start conversations about any to-do list or checklist with comments, attach photos, PDFs, presentations and more to any to-do list and create reminders. Wunderlists can be accessed from your phone, tablet or computer.

Self-regulation is a Guideline under the UDL Engagement Principle, so all of these tools align nicely. All of the Checkpoints: promote expectations and beliefs that optimize motivation, facilitate personal coping skills and strategies and develop self-assessment and reflection, could be aligned to these tools as well.

These tools also fit under the of Action and Expression Principle, Guideline of executive functions, and Checkpoints of guide appropriate goal-setting, support planning and strategy development and enhancing capacity for monitoring progress.

Several Google tools can be used in the UDL classroom to encourage self-regulation and monitoring.

Workflow tools, collaboration tools and UDL alignment

In today's classroom, students are expected to share work electronically and collaborate with other classmates. Examples of student work flow and collaboration tools include Google Docs, Sheets, and Slides, Google Hangouts, YouTube, Calculators, Checker Plus for Gmail, Extensity and Dualless. Students typically do their classwork with Google Docs, Sheets and Slides producing documents, spreadsheets and presentations. These tools allow for live, simultaneous work and encourage collaboration among students. This can help students sustain effort and persistence (Guideline) by fostering community, and varying demands to optimize challenge (Checkpoint). They also have commenting, suggestions, and revision history and chat features. Google Hangouts is a video conferencing tool that fosters collaboration and community, allows varied methods for response, construction and communication (Checkpoints under the Action and Expression Principle.) YouTube and other screen casting tools provide students with rewind-able teaching, alternative assessment, closed captioning and access to content. Students can also use these tools to verbally explain their thinking when allowed to make videos as one way to fulfill course requirements. Therefore, YouTube aligns with the Action and Expression Principle and expression and communication Guideline.

Calculators of various types support decoding of text, mathematical notation and symbols, optimize access to tools and vary methods for response and navigation. Calculators logically align with the Representation Principle, and the Guideline to provide options for language, mathematical expressions and symbols.

Checker Plus for Gmail provides sound and voice notifications. You can mark emails in Gmail as read or deleted, and there is a do not disturb mode. Extensity allows students to enable and disable extensions from one location. It also allows users to launch apps and extensions from one list. Dualless is a dual monitor solution. It splits the browser window into two windows each of which can be individually sized. All of these tools are great for managing information and resources, which is a Checkpoint under the Action and Expression Principle and executive functions Guideline. They also align with the Engagement Principle and self-regulation Guideline.

There are numerous Google tools that support student workflow and collaboration in the UDL classroom. (See Figure 2, **Self Regulation/Monitoring & Student Work Flow and Collaboration**)

MINDFULNESS TOOLS AND UDL ALIGNMENT

We're good at getting students excited about learning, but we also need to explicitly instruct students about mindfulness and the benefits of calming environments. Examples of mindfulness tools include Calm, Breathe, Practice Mindfulness, Singing Bowl, Stop Breath Think and G.lux. Calm gives students a moment to come back to center and promotes being present for learning. It has options to alter time increments, in guided or unguided sessions. Breathe temporarily pauses the current Google Chrome tab with a reminder to breathe. Instructors can customize each breathing session to be as short as one minute, with reminders as frequently (or infrequently) as students need. Some individuals use this as a reminder to get up and move. Singing Bowl is a countdown timer that plays the sound of a singing bowl twice to mark the beginning and the end of a meditation session. It can be customized to suit time needs. Practice Mindfulness helps

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students stay focused throughout the day by playing a mindful sound every few minutes. Instructors can also customize it to suit student needs and set preferred time, volume and sound. Stop Breath Think provides hands-on techniques to develop and apply kindness and compassion in daily lives, by practicing mindfulness. It helps meet the turbulence of our lives with kindness and compassion, and allows finding peace of mind no matter what's going on. G.lux changes the color temperature of the browser and websites. The idea behind this extension is to simulate the sun going down, making it easier to sleep after using the computer. Customizing screen color for web pages is one feature.

In the UDL framework, these tools align with the Principle of Engagement, the Guideline of self-regulation, the Checkpoints of facilitating personal coping skills and strategies as well as developing self-assessment and reflection. Mindfulness tools can help create calming environments to assist with positive learning and engagement. (See Figure 2, **Mindfulness**)

ACCESSIBLE EDUCATION MATERIALS

Some of the learning materials used in classrooms every day include textbooks, children's books, adolescent literature, newspapers, teacher-created and commercial documents, websites, multimedia digital materials, apps and video. However, these educational materials can create barriers for some students to access and understand the content. Barriers also arise if the format of the material (print, digital, audio or graphic) is not accessible to a student. Misalignment of material with a learner's needs may also present a barrier. Therefore, it's important to consider "how" and "if" learning materials help or hinder student learning.

Accessible Educational Materials (AEM) refers to print or digital learning materials that support content and high-quality learning for all students, including students with disabilities and second language learners. AEM should be designed, enhanced and used from the start with accessibility in mind to minimize gaps in opportunities for learning. In this way, students have greater potential for participation, progress and independence. Some examples of AEM include printed materials (books, workbooks, tests and quizzes) converted to accessible formats. Print, digital, audio and graphic formats are usable for students with disabilities through Braille, large print, audio and digital texts. AEM also includes other digital materials and technologies (podcasts, videos, ebooks, multimedia, tablets and computers, learning management systems) that are used with all students and support access into quality learning.

To be effective, AEM are timely, high quality and intentional. The National Center on Accessible Educational Materials states "Whether a material or technology is designed from the start to be accessible for all learners or is made accessible for learners with disabilities, it is considered AEM." AEM is essential for all areas of learning. We have featured literacy examples of AEM materials in reading and writing below because learning to read and write and using reading and writing to learn are the building blocks of learning any content in school and beyond.

Literacy Tools - Reading

When AEM are available for students in reading, the focus of learning can be placed on the content rather than the process of decoding itself. Since the display of words and symbols and how these in turn are perceived by readers can influence reading success for some learners, we can provide options for perception by customizing the display of information. For some students, customizing the display may be a preference, but for others, customizing the display can be the difference between gaining information from the content or not.

There is a plethora of accessibility tools for Google Chrome supporting literacy. A few examples for customizing the display of information include: BeeLine Reader, OpenDyslexic, Color Enhancer, Deluminate, High Contrast and Closed Captioning with YouTube or other tools. BeeLine Reader uses gradual color variations to help your eyes move smoothly from one line of text to another. OpenDyslexic was developed specifically to make text easier to read for individuals with dyslexia. There are many other options available. Color Enhancer is a filter that can be customized and applied to web pages to improve color perception for individuals who are partially color blind. Deluminate and High Contrast are extensions that invert the colors on web pages that can make the viewing easier on the eyes. Captioning, although originally developed for individuals who are deaf or hard of hearing, provides options for language and symbols as a video is displayed. YouTube videos for example can be displayed with user created captions and a closed caption option available for viewing videos. Options are available for customizing automatic captions when creating and posting videos, and for viewing transcripts in YouTube.

Text readers

Text readers provide literacy supports for both reading and writing by using technology to read the material aloud which often increases independence, as the student does not need to rely on a human reader. Text readers give students access to the general education curriculum at the same time as peers by providing alternatives to visual information. A few examples of text readers that work within Google include Read&Write for Google Chrome, Snap&Read Universal, Kurzweil 3000 + Firefly and SpeakIt! SpeakIt! is simply a text reader while the other examples have built-in reading and writing support along with the text reader. Snap&Read Universal and Kurzweil read both accessible and inaccessible text aloud which is especially critical for reading certain PDFs.

Other reading supports

Along with text readers, providing options for different levels of text allows students to gain information at a level where the material can best be comprehended while supporting vocabulary development. Examples

include Rewordify (website), Simple English on Wikipedia (website), Skimzee and Text Compactor (website). Rewordify is a free website that intelligently simplifies difficult English text for faster comprehension. It can also help teach words, build a better vocabulary, help teachers save time and produce engaging lessons and improve learning outcomes. Skimzee summarizes web pages. Note: be patient with this one, it may take some time to summarize depending on the complexity of the web page. Text Compactor is also a free website that summarizes or shortens text by a percentage. Some students need both summarization and simplification of text, so teachers can use Text Compactor and then Rewordify or similar tools. When Simple English is chosen for the language on Wikipedia, the articles use shorter sentences and simpler words and grammar than the English Wikipedia. (See Figure 2, **Accessible Educational Materials: Physically Reading, Low Vision and Color Blind**)

LITERACY TOOLS - WRITING

Writing productivity and production

Writing is a complex process. Providing digital support while writing improves organization, self-monitoring, revising and editing. With these supporting tools, student's energy can be directed to content, audience and enjoyment of writing. For some individuals, the physical process of using a writing utensil on paper to form legible letters, words, sentences and ideas can make the writing process daunting. For these individuals and many others, word processors such as Google Docs can act as a compensatory tool and a productivity tool by providing built-in spell checkers and formatting options. For example, text color and highlighting can assist students in organizing information into manageable content for later revision and editing.

For many individuals, word processors increase the speed of putting information into a written format. Providing students with a word processor designed for group use, such as Google Docs, increases collaboration. Word prediction tools support writing by predicting possible words and providing larger vocabulary options which increasing the ability to think. They may also support a student with a physical disability by decreasing the number of keystrokes needed to type a word. For poor spellers, they may predict words spelled phonetically that a standard spell-checker might not recognize. They also provide more sophisticated words that students may avoid without word prediction.

Speech-to-text turns spoken language into written text. This can be invaluable for individuals who have difficulty writing or those who prefer to talk rather than type. Google's Voice Typing, available in the Tools Menu of Google Docs, and VoiceNote II are speech-to-text options. Voice Typing allows an individual to speak text directly into a Google Document by simply clicking on a microphone icon. VoiceNote II is an app; so dictated text must be copied into another application. Examples of tools that have word prediction and speech-to-text options include Co:Writer Universal, Kurzweil 3000 + Firefly, and Read&Write for Google Chrome. Co:Writer and Read&Write predict words based on spelling and can also predict words phonetically. Word choices can be spoken aloud to support the writing process. In addition, Co:Writer predicts words based on grammar. Co:Writer and Kurzweil have the option of using speech-to-text within the word prediction. Co:Writer is available as an app and extension. The word prediction features described in Co:Writer, Kurzweil, and Read&Write are free for students during a trial period, beyond the trial there is a subscription fee. Educators can sign up for free premium access to Read&Write. Various purchasing options are available for class and school-wide use for Co:Writer, Kurzweil, and Read&Write.

Writing scaffolds for composition

In writing, learners have rich opportunities for expressing personal thoughts and for creating and demonstrating understanding, whether a story, lab report, journal or multi-media visual presentation. Some students though, have challenges in writing that go beyond accessibility. They may not know how to get started writing, have little motivation to write, lose focus in writing or have difficulty organizing and presenting ideas. Writing scaffolds are instructional tools that support students with greater independence, enjoyment and success in producing written products and can be systematically faded as the student develops more skills. Technology can scaffold the writing process for learners so their engagement and learning are maximized. Tools that feature text organizers (outlining, graphic organizers, mind mapping,) text readers (that allow students to "hear" their writing,) talking spell checkers and grammar correction address diverse student needs and are easily incorporated into instruction.

For example, students can outline and later revise their ideas for a writing assignment in a Google Doc and use a text reader to ensure their ideas and the organization (sequence, details, relationships) are clear. Google Draw also provides a simple and user-friendly format to create mind maps and graphic organizers where students and teachers have a visual tool to organize ideas brainstormed for writing and to organize them for their specific purpose. Connected Mind is a mind mapping or graphical outline tool to help with planning writing or producing a study guide.

Read&Write provides a robust menu of writing tool options for scaffolding the student writing process. Vocabulary and word choice is a critical part of the writing craft, and Read&Write provides a talking dictionary and a picture dictionary allowing students to confirm their word choices and even explore those that may be more appropriate. Kurzweil and Snap and Read Universal also provide writing supports. A translator option in Kurzweil and Read&Write assists students who may need language supports. Students may translate a word or phrase to English from

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another language, or vice-versa - supporting them to keep a fluid flow of ideas while writing.

Highlighter tools in Kurzweil 3000 + Firefly, Read&Write and Snap and Read support students to gather information to write about, categorize information by highlighted color and make study guides. Highlighted text can be imported into Google Docs for additional organization, editing and composing. Audio output can be activated when using the spell check feature in Kurzweil and Read&Write, providing a "talking spell checker" for students. Students also get real-time feedback with messages indicating if there are no spelling errors or provide suggestions for incorrect spellings in a suggestions list. If students are unsure, they can check the definition of the word in Kurzweil and Read&Write and also have that read aloud. Google Docs provides spelling suggestions that can be read aloud using a text to speech extension or add-on. The personal dictionary feature in Google Docs also provides an option to add specific words that a student may frequently misspell.

Using writing conventions and appropriate syntax can be a challenge for students. Built in grammar checks and in word-processing programs can be helpful in building supports and independence in editing written work. Spell checking tools may provide grammatical suggestions. One free Google Chrome extension we've found particularly useful for students - and ourselves - is Grammarly. As it's name implies, Grammarly helps with contextual spelling, grammar, punctuation, sentence structure and style on the free version. The paid version also includes features for plagiarism, vocabulary enhancement, and proofreading

Literacy tools and UDL alignment

In the UDL framework, these literacy tools align with all three UDL Principles, and several Guidelines and Checkpoints within each Principle. Multi featured tools such as Kurzweil, Read&Write, Co:Writer and Snap&Read align with almost all of the UDL Framework through the available or embedded vocabulary supports, language and syntax/grammar tools and other reading and writing supports including text reader, text compacting, and word prediction tools and integrated literacy support. In addition, we highlight below a few examples of tools that align with the Representation and Action and Expression Principles and associated Guidelines and Checkpoints.

For the Representation Principle, many of the tools discussed above and included in the table at the end of the article align with the Guideline of options for perception and Checkpoints of offer ways of customizing the display of information and offer alternatives for visual information. The Guideline of providing options for language mathematical expressions and symbols and associated Checkpoints to clarify vocabulary and symbols, clarify syntax and structure and support decoding text also align with these tools. Graphic organizer and brainstorming tools align with the comprehension Guideline and the Checkpoint of highlight patterns, critical features, big ideas and relationships.

For the Action and Expression Guideline, the AEM and literacy tools discussed above align with the physical action Guideline, the expression and communication Guideline and associated Checkpoints. Checkpoints that align particularly well are the methods for response and navigation, use multiple tools for construction and composition, support planning and strategy development, and facilitate managing information and resources. For example, Connected Mind aligns with the Checkpoints of support planning and strategy development, and the Checkpoint use multiple tools for construction and composition.

Literacy tools can mediate and bolster learning in a number of ways for a diversity of learner strengths, capabilities, needs and preferences providing a gateway to initial and advanced learning and success. (See Figure 2, **Accessible Educational Materials: Text Reader and Writing Supports**)

CONCLUSIONS

The number of tools and their potential to support teacher and student success through UDL and accessibility is exciting. As educators, we've seen an initial focus that centers on UDL with tools that are universal and effective for a diversity of needs can be a springboard to strengthen inclusive practices. Using the UDL framework and the Google tools, apps, extensions and other tools featured within the article has sparked our own collaborative conversations around UDL and the resources, supports and innovations that support challenging learning for all students in K-20. Although we shared many examples, our list is not exhaustive. There are more tools available with similar features and tools come on and off the market each day.

Keeping track of rapid changes and emergent technology can be daunting for teachers and professionals who wear many hats and juggle multiple responsibilities. We've found that collaboration is key to maintaining our own professional learning to better serve and support schools, educators and families. Collective commitment to the UDL framework, shared professional learning and the availability of teacher resources have bolstered inclusive and innovative practices in schools where we have worked. With the potential of building better student engagement and success in school and learning through UDL, we hope you are able to master the potential of these powerful Google tools in your daily practice. ■

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Figure 2: Google Tools for Inclusive (UDL) Practice

Teacher Management


Google Classroom


Google Drive


Google Docs, Sheets, Slides


Stay Focused

gMath

Self Regulation/Monitoring

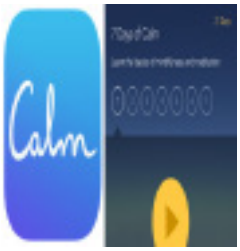
Google Calendar


Google Keep


Wunderlist

TabJump

Mindfulness



Calm

Breathe


Signing Bowl


Practice Mindfulness


Stop Breath Think


G lux

Student Work Flow and Collaboration


You Tube


Checker Plus for Gmail


Extensity


Dualless


Google Docs, Sheets, Slides

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Student Work Flow and Collaboration


Calculator


Cloudy Calculator


GED Calculator


Google Hangout

Accessible Educational Materials: Physically Reading


BeeLine Reader


BeeLine Reader PDF Viewer


OpenDyslexic


YouTube
Closed Captioning

Accessible Educational Materials: Low Vision and Color Blind


Zoom


Color Enhancer


Deluminate


High Contrast

Accessible Educational Materials: Text Reader and Writing Supports


Grammarly


Read&Write for Google Chrome


VoiceNote II

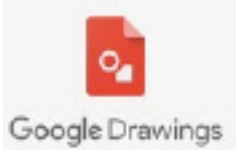

Select and Speak


Speakit


Snap & Read Universal


Co: Writer Universal

Kurzweil

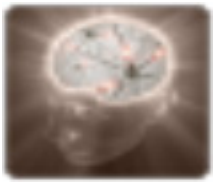


Google Draw

Rewordify

Text Compactor


Simple English Wikipedia


Connected Mind

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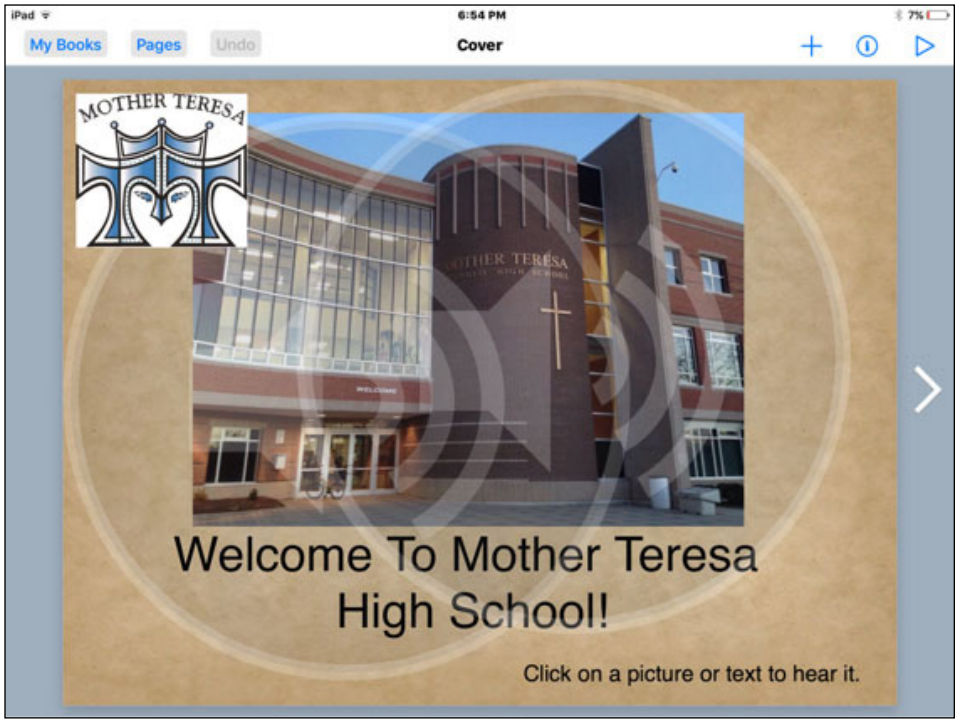
Supporting Executive Functioning with GSuite and iOS



Book Creator

Planning, organizing and monitoring your progress are all apart of how Executive Functions supports learning. For students, accommodations in these areas are key to success. Students must feel capable, connected and contributing to their learning experience to succeed.

Executive Functioning is our mental process that enables us to plan, focus our attention, remember instructions and manage multiple tasks successfully. When there is a breakdown in Executive Functioning, students can struggle in the classroom and in their daily lives. Breakdowns in executive functioning can present themselves in many different ways. Two general areas where Executive Functioning can affect students are Behavioral Regulation and Metacognition.

Behavioral Regulation refers to emotional control, being able to shift or transition between activities or tasks. In the classroom, this can look like an inability to transition between activities, safety concerns and failure to think through consequences. It can also showcase difficulty in following multi-step directions or instructions, difficulty with taking turns and perspective taking.

G Suite and iOS have great apps and extensions for supporting Behavioral Regulation and Executive Functioning. Here is a list of a few highlighted examples.

Book Creator is an amazing support for creating social scripts, schedules and language support. It includes picture, video, text, voice, drawing and comic features and iOS accessibility features. It runs on iOS, Android and will soon be web based. Within an elementary classroom, Book Creator can be used to support visual task analysis such as "how to tie shoes," or "steps to getting ready to go outside in winter." For students requiring

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transitional support, you can create a social script with voice and video detailing transition processes, e.g., students moving into middle school can create a book with pictures of new settings along with video of important processes such as "learning to use a lock and locker."

Choiceworks is a visual schedule and a great support for transitions, first or then, taking turns and waiting routines. It has built-in picture support and access to the integrated camera within iOS. The audible schedule announces each step and even has a built in visual timer to support the student in schedules. This can be used in the classroom for hand-washing routines, daily schedules, first/then and waiting routines. As a complete support, it pairs well with social scripting the skills using Book Creator.

Popplet is a mind-mapping app for iOS and is also web based. It can be used to support thinking through the process of choices or making actions and consequences more concrete in social skills lessons. It's an easy app to use and allows for text, images and drawings. The web-based version allows video within Popplet boxes. In junior high and middle school, it can be supportive in mapping out social situations, for example, "Because I did or said that… this happened or if I thought that… this happens…" (see image)

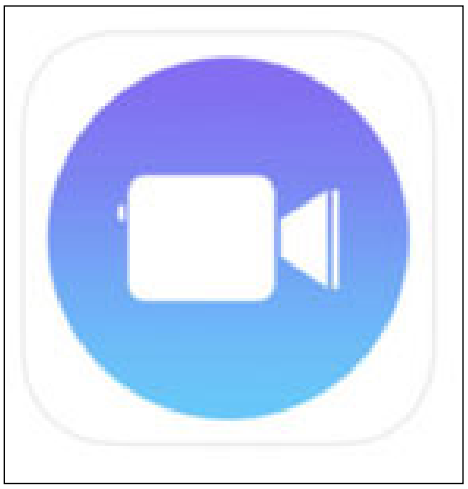
Clips is a new iOS app for creating and sharing fun videos with text, effects and graphics. It can be used for social scripts, visual schedules, reflections, sharing understanding and vocabulary activities with the single word caption for reinforcement with the audio, video or still.

Metacognition refers to the ability to initiate a task, working memory, planning, organizing and self-monitoring. In the classroom this can be difficulty with independent seatwork, completing routines independently, struggling with group work, lost, late or incomplete work. Students may also experience difficulty with problem solving.

G Suite offers comprehensive support for students particularly in junior high, middle school and seniors. The integrated suite of Calendar, Docs, Slides and Sheets provides strength of support in the areas of planning and organizing of work.

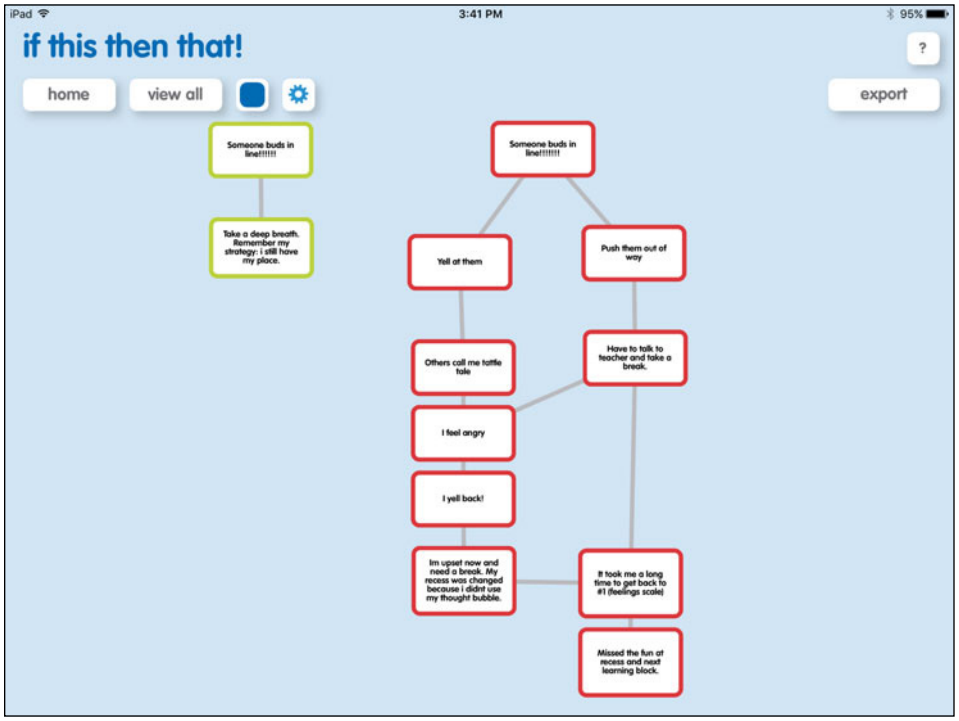
Choiceworks

There are management tools such as Google Classroom and Hapara that further support students by providing a learning environment where students go to find all digital materials they need to work through a unit of study. Google Classroom and Hapara are easy to use and provide teachers with an opportunity to share differentiated materials to students. From the students perspective, they simply log in and find their assigned task with the associated resources, a space to create their own work and a rubric to support and guide their creation.



Clips

Apps and extensions that support the areas of Metacognition relating to Executive Function



Popplet

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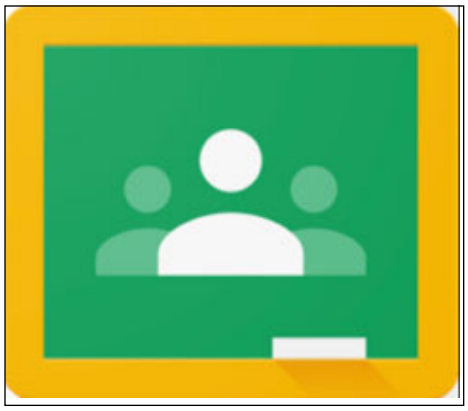
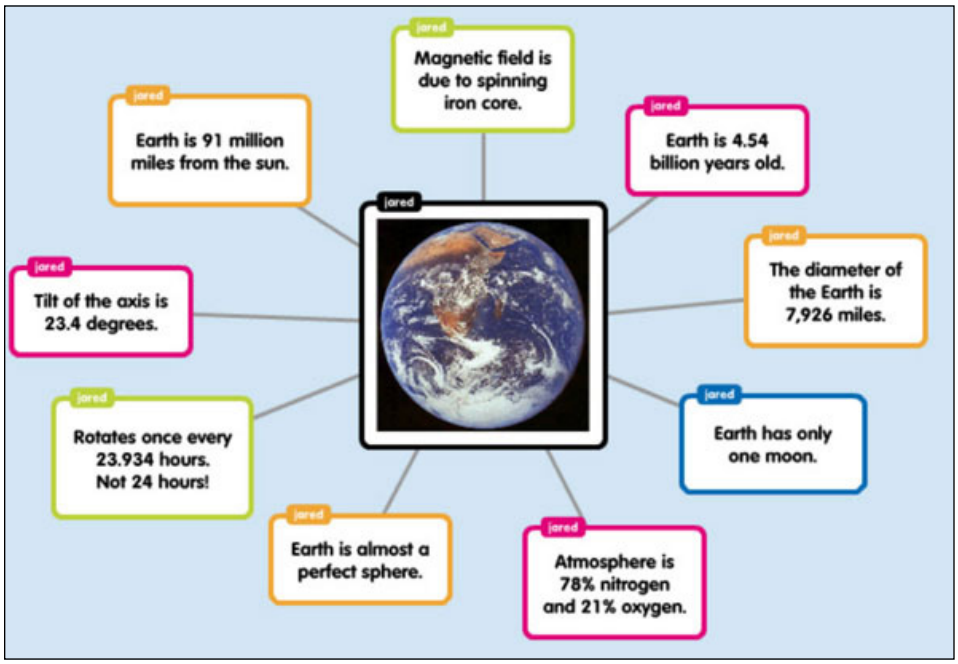


Google Classroom

Tab Resize



Popplet

Session Buddy allows a student to save open tabs and name a session so when they return to Google Chrome at a later time, they can open the same session. It supports planning, organizing and research. Since Session Buddy works within the Google Chrome environment, it means a student can log into their Google Chrome profile on any computer anywhere, click the extension and recall their browser experience. This is an incredible support for older grades as research becomes more intensive.

Tab Resize allows a student to split their screen, which supports workflow, planning and organizing. Students can have a reading document open on the left or top of their screen and have a creation or writing document open on the right or bottom. This is a great support for students who have difficulty with organizing work and flipping between different browsers. Tab Resize allows the student to drag and drop tabs or content from within a tab from one browser to the other.

Read & Write for Google (RW4G) provides support for reading, writing and study skills. The RW4G toolbar offers text to speech, speech to text, voice note, audio and picture dictionaries and screen mask. Also, it highlights tools that organize and curate words into a new document, vocabulary lists that curates highlighted words to a table into a new document with the definition of a word, picture definition and space for a student to add notes. RW4G is an essential tool for students in junior high through high school.

Mindomo creates graphic organizers that can be added to Google Docs to support planning and organizing of writing.

Popplet is a web-based tool for creating mind and concept maps. It's simple to use and allows for text, drawing, images and videos. Save the finished poppet as a JPEG and place it at the top of a doc ument to support the writing process.

EquatIO is a Google Chrome browser extension that allows students to type, handwrite, or dictate math equations, formulas on a computer or Chromebook. Students can then add a math expression with a click of a button to a Google Doc or Form.

GSuite and iOS offer cloud-based solutions for users. iOS often offers the most accessible support for the youngest learners with "slide to learn" ease. The integrated camera and simple content creation tools such as Book Creator make it a favorite tool in primary grades. The seamless collaborative features, integration of calendar with Google Docs and Slides

Read & Write for Google

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Mindomo

EquatIO

along with added accessibility in both areas from Read and Write for Google allows for supported organization, peer editing, support with working memory and behavioral regulation.

Leveraging digital tools allows for the support of Executive Function, amongst many other learning challenges in our classrooms. As we consider Universal Design for Learning in our learning environments, it becomes increasingly important for students to have access to the tools that support their needs, access their strengths and share their voices.

For more resources check out atsupportocsb.weebly.com and @nancykawaja on Twitter ■

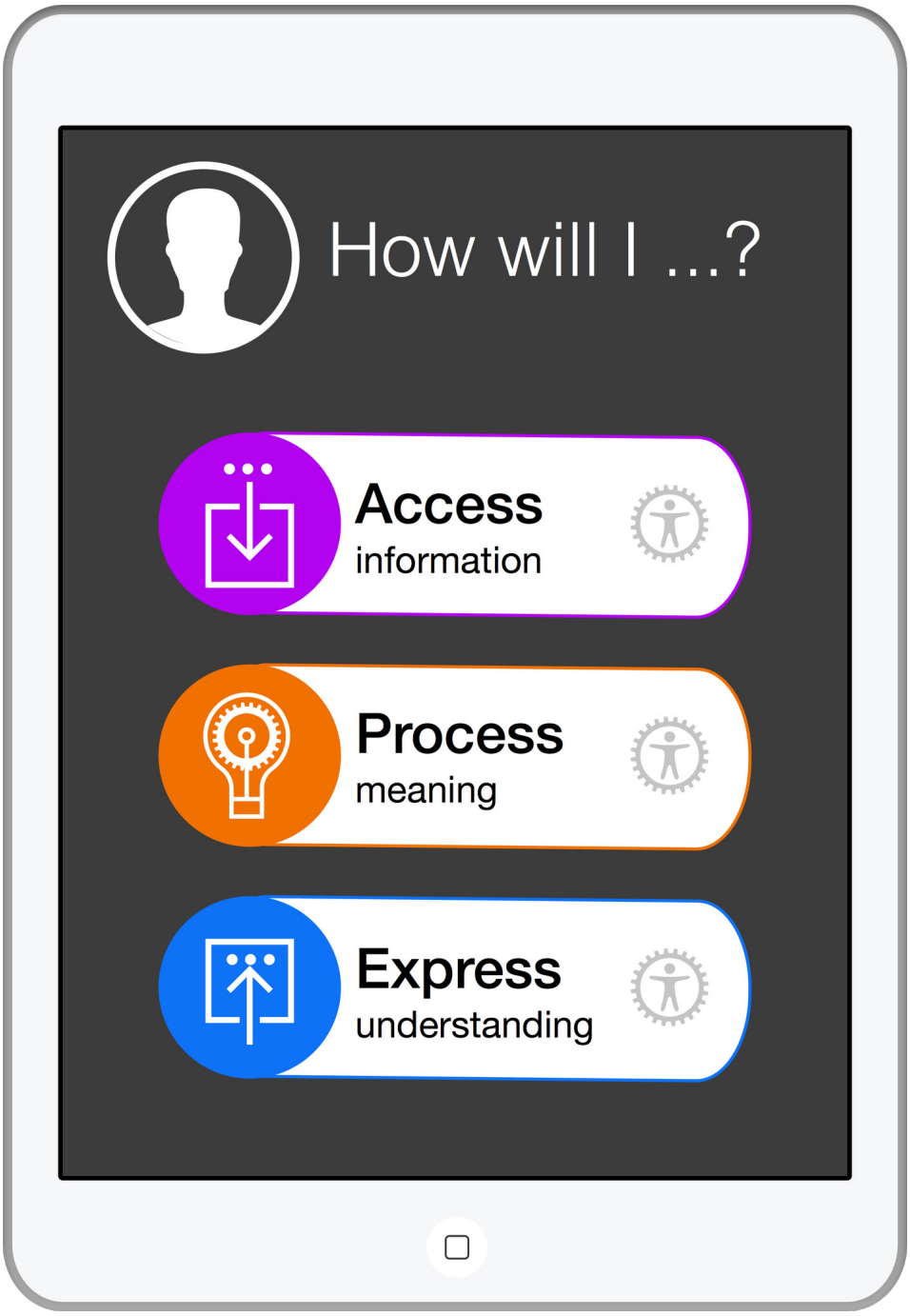

Image Created by Greg Alchin, ADE

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Girls with Rett Syndrome Connecting Through Communication:

Eye Gaze Technology is Making this Possible!

INTRODUCTION

Over the past few years, more girls, teens, women and even boys with RTT* across North America and other parts of the world have continued to gain independent access to their "voices" through eye gaze technology. Awareness around the potential that this method of access to a dynamic display communication device offers to an individual with RTT at any age has reached new levels globally. In spite of this positive shift over the past few years, many are still faced with challenges due to questions about cognitive ability and communication intent, reduced expectations for communication, "mastery" requirements in targeting buttons or selections upon command across repeated trials, and difficulties with securing funding through various sources. Individuals with RTT who have their own eye gaze systems often don't have the opportunity to achieve their true communication potential using eye gaze technology given they are limited to fewer choices on a page and are unable to engage in a conversation using what is available. In addition, many only have access to their "voice" at designated times throughout the day. Expectations for communication as documented in goals for Individualized Education Plans (IEPs) are typically based on making choices and interactions with adult communication partners. There are rarely opportunities for peer interactions in inclusive settings integrated into these goals. In spite of these challenges, when a girl with RTT has independent access to a robust setup on her eye gaze system that supports conversation, language, literacy and reflects her unique interests, she is able to initiate and connect with a variety of communication partners while her personality and abilities shine through.

Image 1: Photo of an 11-year old girl using a Tobii Dynavox I-15 set up with the Dynamic Communication Book and Lariviere's Music Video Player during her session with Judy at the 2015 Southeastern Rett Syndrome Alliance (SRSA) Conference in Alabama.

Eye gaze technology is truly changing girls' lives - it's enabling them to deepen their connections with family, friends and other communication partners. Girls are independently accessing their eye gaze systems in unique and creative ways

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to engage in conversations using their "voice" in conjunction with their natural modes of communication (Lariviere, 2014). These often include, but are not limited to, eye contact with their communication partners, often to express agreement or affirmation, as well as waiting for a response to what they said, depending upon the context. They also communicate through head nods or turns, gestures, facial expressions, eye blinks, vocalizations, hyperventilation and body movements, including reaching, touching or proximity to another person or an object in their environment. The specific communication gestures a girl uses are unique to her communication repertoire and can be dynamic as these may expand over time. In order for "knowledgeable" communication partners to interact and connect with a girl with RTT when she uses eye gaze technology as one of her modes of communication, they need to acknowledge, respond and give meaning to her selections on her device and to the various forms of communication she uses in conjunction with it at any given time (Erickson & Lariviere, 2016; King-DeBaun, 2016). When a girl with RTT initiates a conversation about a topic using eye gaze technology, it's especially important to follow her lead. At these times, a girl's interaction is driven by her emotional connection with her communication partner and her self-selected topic based on her interests. In these moments, her apraxia fades away, her sensory system is in a "regulated state," and her true abilities unfold before your eyes. I share this inspirational story about Emma to show how eye gaze technology is truly enriching the lives of girls with RTT.

This article is based on experiences and research with girls and women with RTT using eye gaze technology. However, this same information applies to boys with RTT and individuals with related disorders including CDKL5, MECP2 Duplication Syndrome, and FOXG1 Syndrome who are also using eye gaze technology for communication and literacy learning. When these individuals are identified as also having Cortical visual impairment (CVI), modifications are made to the button colors, symbols, and layout of pages used on eye gaze systems to accommodate for their vision needs.

CONNECTING WITH FRIENDS THROUGH MUSIC

Emma is a 12-year-old girl fully included in her community school, which she started attending in second grade. Emma uses a Tobii Dynavox EyeMobile (consisting of a EyeMobile bracket with a Microsoft Surface Pro and Tobii PCEye Go) that is either mounted on her wheelchair or on a tabletop stand. As a typical tween hanging out with her friends, at home or school, she played music on her Tobii using her music video player (as shown in Image 2). When playing her music, Emma often selected a lyric video of Rachel Platten's "Fight" song. She also accessed the comments in her music video player (as shown in Image 3) to communicate, "This is my fav!" or "I love this song." She showed her friends through her repeated selection of this song and her comments about it that it was very meaningful to her. As Emma's mom shared, the "Fight" song brought Emma strength through some of her difficult times, including her g-tube surgery."

Last summer, one of Emma's best friends went on vacation to New York. A couple of weeks before they left, her friend's mom asked for a picture of Emma. She said it was for their personal use. Emma's mom didn't ask questions, as they are close friends and sent them a picture. When they got to New York, Emma started receiving text messages of her friend holding up Emma's picture at different sight seeing highlights in New York, such as the Empire State Building. It meant the world to Emma and her family that she was being included and essentially on her friend's family vacation. Emma also received some fun pictures, including one where her friend came across a giant Minion character on the street. She took a picture of herself holding Emma's picture with the Minion, because she knew Minions "cracked Emma up" and she often played Minion videos on her Tobii. During one of their mornings in New York, they attended the Today Show Summer Concert Series, and as fate would have it, Rachel Platten was the performer. They told Emma's family they were going to be attending so Emma, her mom and younger sister watched for them! As a complete surprise to everyone, after the show, they were able to meet Rachel as they happened across a "meet and greet" with Rachel. She shared Emma's picture with Rachel and told her how much she enjoyed her music and what the music meant to her friend, Emma. Rachel asked Emma's friend to give her a hug from her and they took a picture together, with Rachel holding Emma's picture. It was an amazing connection for Emma and her friend, a beautiful connection and a special life experience.

All of these pictures were programmed on Emma's eye gaze device on her "Summer Hot News" page with "disappearing hot spots" so these incredible memories were captured forever. Embedded within her "Summer Hot News page," are ways for Emma to talk about and share this story with others about how one of her best friends took her on her family vacation to New York. Emma has been able to use eye gaze technology to connect with her classmates at school and form friendships while independently sharing her interest in music that is intrinsically meaningful to her. As Emma's mom expressed, "Emma's friends would not have known that she loved Rachel Platten's "Fight" song so much if she didn't have it on her Tobii and a way for her to get to it when she was with her friends." This heart-warming story highlights an area that requires more focus and attention across home and school settings; supporting social interactions around a girl's interests to build connections and social closeness with communication partners, including peers.

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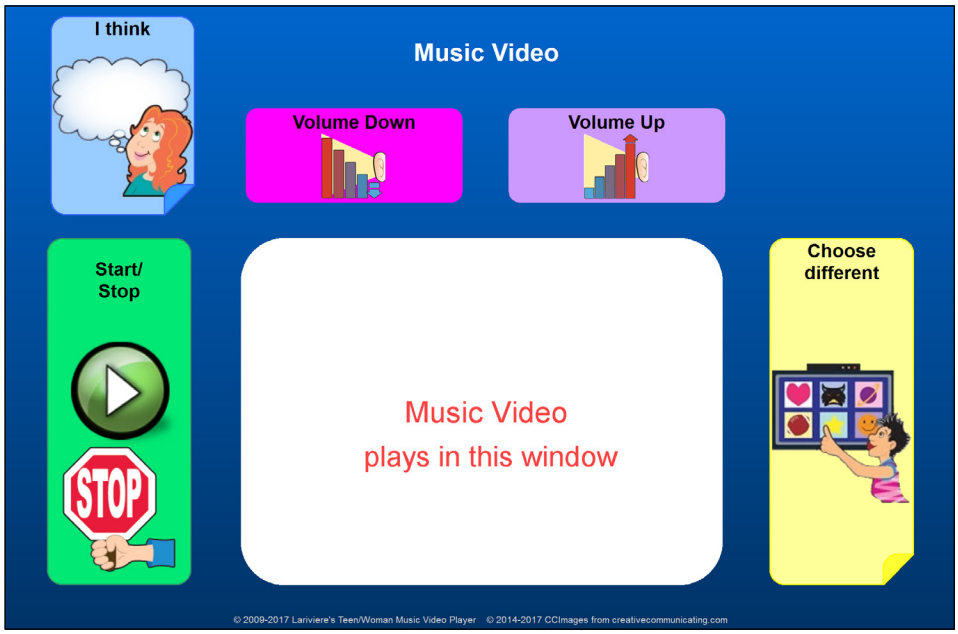

Image 2: Lariviere's Teen/Young Adult Music Video Player with CCImages from www.creativecommunicating.com

Image 3: "Comments" from Lariviere's Teen/Young Adult Music Video Player

SOCIAL NETWORKS

"Social Networks: A Communication Inventory for Individuals with Complex Communication Needs and their Communication Partners" is a tool that provides a framework for school teams, including parents, to visually map out a girl's Circle of Communication Partners (CCP) and the multiple modes of communication, including eye gaze technology, she uses with these communication partners (Blackstone & Hunt Berg, 2012). Within Social Networks, the young or school-age girl/teen/young adult is in the center of five other communication partner circles. The first circle that surrounds the girl consists of her "life-long communication partners" and includes family members with whom she lives (Blackstone & Hunt Berg, 2012, p. 10). The second circle consists of close friends and relatives and "… represents individuals with whom someone spends leisure time, shares mutual interests, plays and confides" (Blackstone & Hunt Berg, 2012, p. 10.) The third circle includes acquaintances, such as neighbors, bus drivers and classmates with less frequent social interactions. The fourth circle represents communication partners who are "paid workers", in that during the time they interact with a girl, they are getting paid (Blackstone & Hunt Berg, 2012, p. 11). This circle includes teachers, paraprofessionals, therapists, consultants, caregivers, physicians and often represents the majority of communication partners with whom girls with RTT interact throughout their school day and afterwards during their private therapy sessions or medical appointments. The fifth circle is comprised of unfamiliar communication partners who come into contact with a girl when she is out with her family in the community or as a teenager and young adult, who goes shopping, eats at restaurants, participates in community events and attends college.

Social Networks brings the importance of connection through communication to the forefront. This framework assists in identifying those communication partners who are closest and more permanent in a girl's lifetime, specifically her family members, close relatives and friends. It also recognizes the central role that a girl and her family play in identifying current and potential communication partners across the first three circles. As a result, their participation in setting goals is essential to ensuring their daughter has successful opportunities for connecting through conversations with a variety of communication partners in school, but also at home and in their community.

Social Networks also highlights the essential component of training all existing and potential communication partners so they become "knowledgeable" communication partners. This is supported by reports of parents in the Netherlands who completed an online survey documenting their experiences using eye gaze technology as one means of AAC with their children with RTT. The researchers

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concluded, "there is a clear need to build the knowledge and skills of everyone in the individual's social network if complex communication technology is to be used to maximum effect, e.g., therapists, educators and other care givers as well as close family members" (Townend, Marschik, Smeets, et al., 2016, p. 109.) Parents, sibling(s) and close relatives who represent a girl's life-long communication partners need training and support to know how to integrate the eye gaze system into a girl's existing ways she naturally communicates, recognizing it's not a replacement for what she already uses, but another way for her to communicate through independent access to her "voice" (Erickson, Geist, & Hatch, 2017). Classmates who are initially acquaintances represent "potential friends" with whom girls can form lasting friendships. Eye gaze technology gives a girl a "voice" in the classroom through which she can be viewed by her teacher, paraprofessional and classmates as a valued and contributing member of the classroom community.

Research relating to children with complex communication needs "suggests that parents, peers and caregivers can improve the quality of their interactions with people who rely on AAC through…training programs" (Blackstone & Hunt Berg, 2012, p. 10.) Studies focused on outcomes related to training communication partners of individuals with complex communication needs who use AAC show that "when training occurs in natural environments, changes have been observed after only a few sessions and can be maintained over time" (Light, Binger, Agate & Ramsay 1999 and McNaughton & Light 1989 as cited in Blackstone & Hunt Berg 2012, p10).

EYE GAZE TECHNOLOGY RESEARCH IN GIRLS' HOMES

One research study involving girls with RTT and their use of eye gaze technology to interact with their parents in their home environments achieved similar results (Vessoyan, Steckle, Easton, et al., 2016.) The four girls in the study were between the ages of 9 and 15 and had Tobii Dynavox eye gaze systems with pre-programmed customized communication pages for use at home and school. As part of their standard clinical practice for any individual who receives an AAC device through Thames Valley Children's Center's Expanded Level Clinic with Assistive Devices Program (ADP) of Ontario Ministry of Health and Long –Term Care, the researchers provided training to the girls' parents in the operation of the eye gaze system. They also provided functional communication training to the girls' parents in their natural environments. During the first home visit for the study, the researchers and one parent set two goals collaboratively and then the researchers scaled the goals using the Goal Attainment Scale (GAS). Girls' interactions with their parents using their Tobiis were video recorded during two home visits one week apart after six months from the initial home visit. The second visit was to ensure each girl's interactions with her parent were representative and not influenced by other health or sensory regulation issues (Steckle, April 13, 2017, personal communication). Follow-up visits were made at three and six months after the first initial six-month follow-up to document maintenance of goal achievement. These sessions were also video recorded. All four girls demonstrated progress in their goal achievement and three out of the four girls demonstrated maintenance over a six-month period. During their presentation at ISAAC 2016, the researchers shared some of the parents' comments about the differences they had seen, which included, "Has improved peer relationships" and "Helps with inclusion." Emma's experience at her school and with her friends also provides evidence of these same reported findings. In terms of the "biggest benefit of having the device," one parent commented, "Giving her a voice or a say, empowering and valuing her," and "Getting to know our daughter and her personality." Another parent indicated the following benefit of "Knowing more about daughter's thoughts e.g., you expect her to say something and she picks a different message," which supports the notion that I have always said that communication partners are not "mind readers." This same parent added, "Other people recognize that she is intelligent and has thoughts." The researchers also asked parents to share what other communication partners had said about the girls' communication using eye gaze technology, two of which included, "Enlightening to see her capabilities," and "Surprised to see her normal intelligence." (Vessoyan, Steckle, Easton, et al., 2016).

This represents a groundbreaking study for girls with RTT and their use of eye gaze technology. It capitalizes on how girls naturally use their eye gaze systems with their "lifelong communication partners" at home. It provides evidence to support the success that girls experience while using eye gaze technology to connect and engage with their communication partners when training and support has been provided. In addition, this study accommodated for variations in a girl's communication by completing videotaped data collection across two scheduled sessions a week apart in order to capture accurate data when measuring goal achievement. The girls' parents were encouraged to maintain a diary throughout the study to document what their daughters communicated "in the moment" within the natural context of using eye gaze technology for independent access to their voice. Although there are inherent challenges with conducting a long-term study in a natural setting and the interpretation of the data, this represents a promising starting point for future research.

COMMUNICATING "WHAT THEY KNOW" THROUGH LITERACY AND LANGUAGE

Girls with RTT are also using eye gaze technology to show communication partners, with whom they have a connection, what they already know and can do in terms of reading and writing. In almost all situations, girls demonstrate higher literacy levels during engagement and

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social interaction in authentic literacy activities than through traditional "testing" across repeated trials for data collection. (King-DeBaun, 2016; Lariviere & Norwell, 2016). For example, parents of a nine year old girl, Kylie, shared that while she was playing Trivial Pursuit with her family, Kylie independently navigated to her "Vowel First" alphabet pages on her Tobii I-12+ to give the initial letter clue of "m" in response to "a white liquid." Kylie's mom followed her lead and confirmed that she was saying "milk," and modeled to her that the second letter was "i." Kylie immediately navigated on her Tobii to the letter grouping, "i j k l m n" and selected "l" followed by selecting the "abcd" grouping and selected "c," which resulted in her phonetic spelling of "milk" as "mlc." In the moment, Kylie initiated spelling "milk."

I had the opportunity to further assess Kylie's literacy abilities and provide training to her family members about how to engage and support her communication and learning in these areas. As part of my standard practice, I asked her mom about her interests; essentially what intrinsically brings Kylie "joy" and "makes her heart sing." She shared that anything relating to animals and being outdoors, nature, including trees, butterflies and books about fairies. She also shared that Kylie was now horseback riding with her younger sister and was "absolutely loving it." Based on this invaluable information, I reviewed books from Level A of Reading A to Z to find one that incorporated any of these interests. The book I set up for Kylie in Tobii Communicator 5 using my book template was called, "What Makes Me Happy." I ended up replacing one of the pages in the middle of the book with a picture of a girl with a horse wearing a purple halter to support her engagement with the text and its direct relation to her life experiences. Using my customized book template, I programmed "hotspots" over the top of the text and on various objects and people in the photos using transparent buttons. I also configured highlighting in Tobii Communicator 5 with the feature, "highlighting button under cursor" during gaze interaction (as shown in Image 4). With this setup, I could "see" and "acknowledge" where Kylie was looking given a red outline would be displayed on the hot spot. I also used

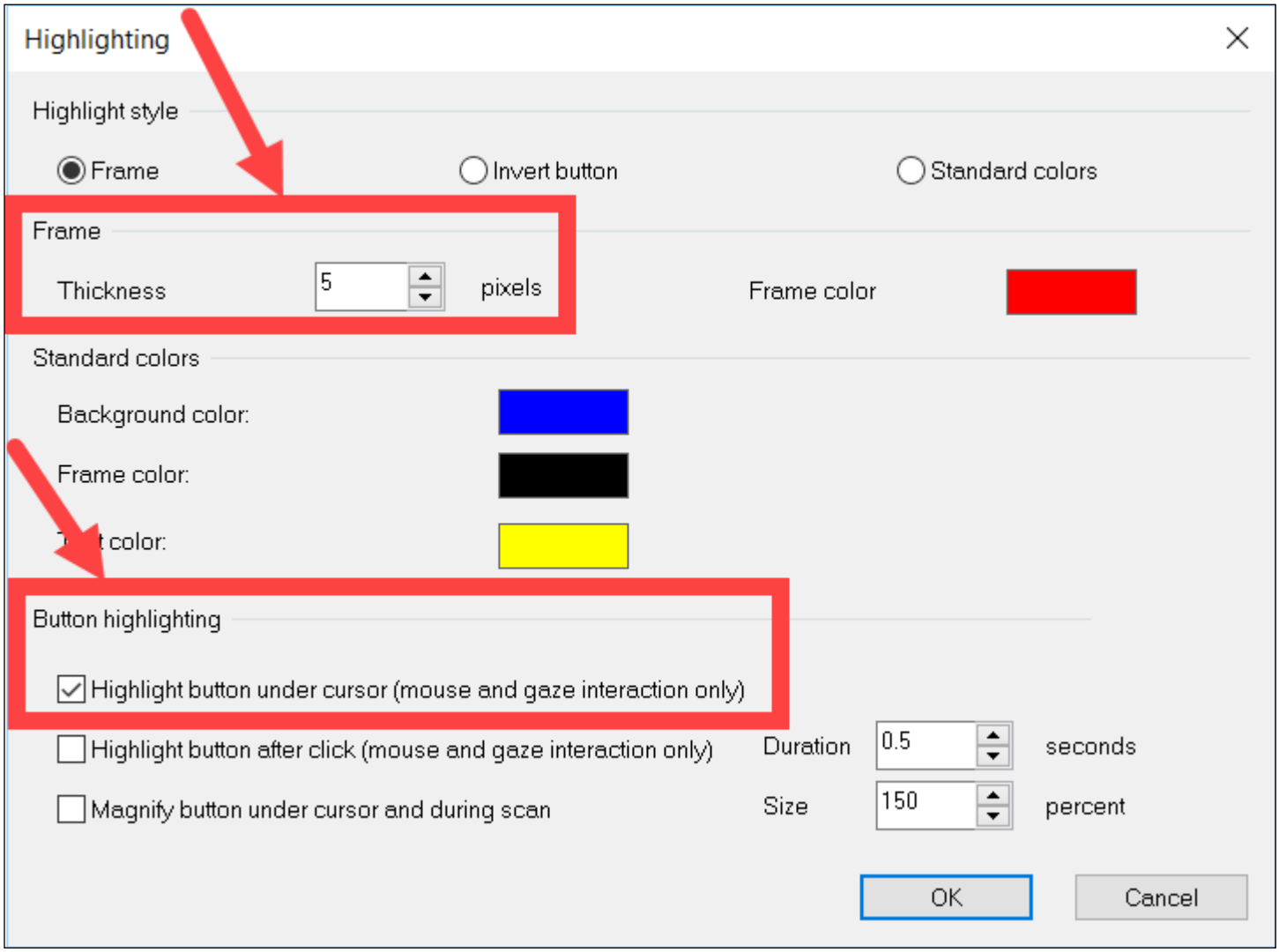

Image 4: Screenshot of Highlighting Settings for showing "Hot Spots" on text and pictures with a red outline during gaze interaction when a girl looks at these using Tobii Communicator 5.

Image 5: Screenshot of Lariviere's adapted version of the "I think" page for reading from the Dynamic Communication Book for Girls developed by Pati King-DeBaun and set up in Tobii Communicator 5.

Tobii Dynavox's Gaze Viewer to record the heat mapping and gaze plot of where Kylie naturally looked in conjunction with the audio, while actively engaged in her first Guided Reading lesson. In addition, I activated the "Live Gaze" feature to visually show a trail of red dots, tracing Kylie's eye movements in "real time" across each page of the book. Two video cameras, one positioned from an angled front view and another from the Tobii view, recorded the multiple modes of communication Kylie used in combination with her selections on her Tobii to interact with her communication partners during guided reading, working with words, writing and self-selected reading activities as outlined in the Four Blocks Literacy Model (Erickson and Koppenhaver, 2007; Cunningham, Hall, and Sigmon, 1999). Kylie's mom participated alongside her throughout the day while her nanny observed, and then her dad and younger sister joined in the afternoon.

As soon as the book was set up on her Tobii Dynavox I-12+, Kylie immediately looked at the picture on the title page of the book. As soon as I told her that I would read the title of the book to her, Kylie quickly navigated to the "I think" page (as shown in Image 5) and looked at the comment, "That would make me happy," and then looked at me. I acknowledged that I saw her looking at this comment, after which she then selected "That would make me mad." She then focused her visual attention on "Makes me" in the title of the book so that the hot spot over these two words was highlighted by a red outline (as shown in Image 6). Using her Tobii, Kylie quickly (within 30 seconds based on videotaped evidence) showed us that within the context of this book, she recognized these words. It's important to note that Kylie was very creative and clear in using what was available to show how she made this connection.

After showing Kylie the sentence pattern of the book, "____ makes me happy" and the location of the word that would change on each page of the book, we started a "picture walk" through the book. I taught Kylie the reading strategy of decoding unfamiliar words by looking at the picture and the initial letter(s) of the word and using the "voice in her head" to say the letter sounds. To minimize the influence of her motor apraxia on her eye movements, I naturally talked about the picture (without naming it) and the new vocabulary word at the beginning of each page of the book. Initially, I pointed to these items on her Tobii I-12+, and waited for her visual attention to these rather than directing her to look at them. Kylie showed me that she learned this motor plan by first looking at the picture on each page and then up to the first word in the sentence (an example is shown in Image 7.) Kylie's literacy abilities naturally unfolded before our eyes; she used her Tobii in every way possible to show her communication partners what she already knew and learned throughout the day.

USING EYE GAZE TECHNOLOGY TO SHARE A NEW INTEREST BASED ON LIFE EXPERIENCES

Girls continue to demonstrate how smart they are as they expertly maneuver through the different components on their eye gaze systems to communicate something that is "on point" within the context of a conversation or completely accurate in terms of sharing information about something that happened earlier. During a recent visit to a 12-year-old girl's school, she creatively wrote about a self-selected topic that was meaningful to her using words with "hot spots" on the text and pictures in a book she independently accessed on her bookshelf on her Tobii I-12. When talking with her mom in the parking lot just prior to seeing her, she shared how she has used her language system in Tobii Communicator 5 to generate novel messages within the context of her older brother getting ready to visit a university in another state where he had been accepted. This girl has always had a special relationship and connection with her brother, one of her life-long communication partners. While her mom and dad were talking with her brother about packing, this girl used her family pages in the "Pati-Judy" pages to say her brother's name, after which she navigated to her language system and used core words to generate the novel message, "Think not want he go." Her brother had to explain to her that he would be back home in a cou-

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Image 6: Screenshot of the title page of Level A Book, "What Makes Me Happy," from Reading A to Z with "hot spot" over "Makes Me" highlighted in Lariviere's Book Template programmed in Tobii Communicator 5.

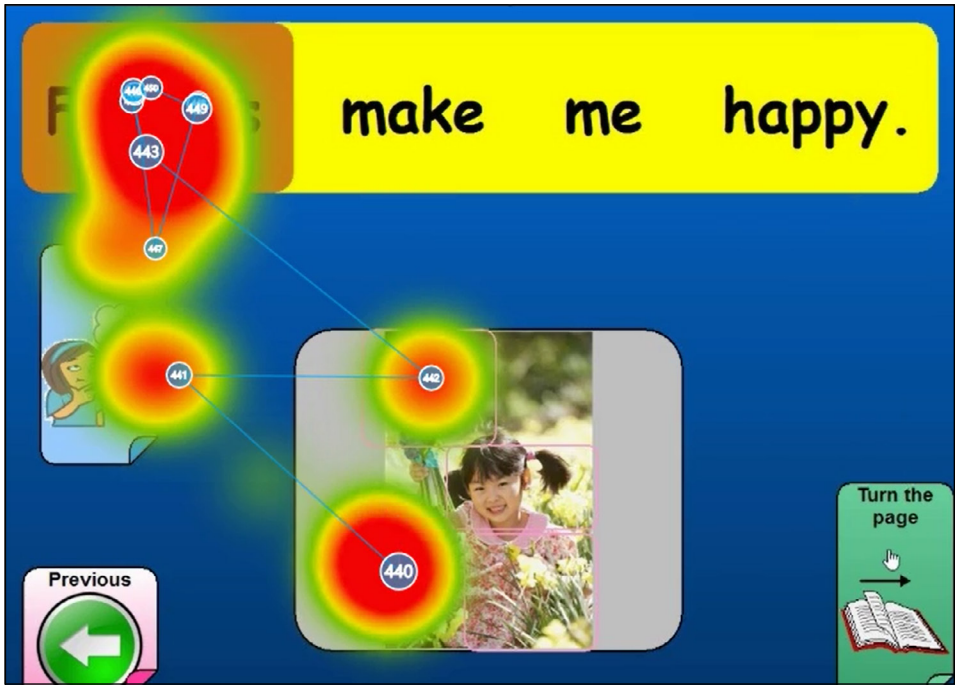

Image 7: Screenshot of Recorded Heat Map and Gaze Plot using Tobii Dynavox Gaze Viewer showing how Kylie was looking at the flowers in the picture and then up to the word Flower in the sentence during Guided Reading Lesson with Level A Book, "What Makes Me Happy."

ple of days. She was already anticipating and experiencing deep emotions about him leaving home in the fall.

When working with this girl at school, she initiated going to her Bookshelf where she selected the Level J book from Reading A to Z, "What Pet Should You Get?" which her teacher had modified to, "What Pet Should I Get?" This book she initially read repeatedly for different purposes during Guided Reading Lessons, but now it was one she read independently. Given this girl now sits in an upright position in midline following recovery from her recent scoliosis surgery, I needed to re-evaluate her natural gaze pattern when accessing her books. Using my customized book template that I revised for this girl based on her natural gaze patterns and ease of access, I previously programmed "hotspots" over the top of the text and on various objects or people in the photos. While reading the words in this book and naturally activating the "hot spots," over these, she consistently demonstrated that she could easily track the text beginning in the middle to the end of the line across three lines of text. However, she was observed to rarely activate the "hot spots" on the words on the left side. Once the text was repositioned and the page properties were modified (as shown in Image 8), she immediately showed through various "hot spots" that she could visually access the words at the beginning of each line. When asked if she wanted to write about this book, she communicated, "yes" by looking at me and raising her eyebrows. She then quickly showed me what she wanted to write by looking at the words in the book and activating the hot spots over these words and the specific pet in the picture on the first page of the book. First, she looked at "I" from the title page and then turned the page to complete the first sentence. She wrote, "I wanted to have a dog," (as shown in Image 9) followed by "Pets make good friends" (as shown in Image 10).

Upon further interaction with her, the paraprofessional and I learned she really wants a "helper" dog so she can use her Tobii to call it and have someone to do things with her. When I shared this story with her mom, she explained that one of her friends with RTT has a service dog. Every time they get together, her friend brings her dog with her. She skillfully and creatively communicated and wrote through her independent navigation and selections on her Tobii that she has figured out that having a dog will enrich her life, once her brother attends a university away from home.

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These two examples mirror the comments parents reported about the impact of girls' use of eye gaze technology from their own perspective and that of others (Vessoyan, Steckle, Easton, et al., 2016). By integrating a girl's interests into authentic reading and writing activities, her true communication abilities and literacy skills shine through. This approach enables her to establish an emotional connection with the content and her communication partner. When eye gaze technology is used as one of the tools for presenting the content and opportunities for interaction are embedded into the pages, the focus is on connecting and teaching rather than testing. When the effects of a girl's apraxia are minimized, she will naturally show you what she already knows and is learning "in the moment" during her spontaneous self-initiated selections using her eye gaze system in conjunction with her natural modes of communication. (Lariviere & Norwell, 2016; Lariviere, 2014).

As Pati King-DeBaun (2016) states, "Success snowballs. As students perceive themselves to be successful communicators, they are more likely to participate in more challenging tasks, including the development of literacy and language skills." (King-DeBaun, 2016 p. 9). All three of these girls connected through communication given they had "enough conversational and social language… to be able to establish friendships and relationships" (King-DeBaun, 2016, p. 8) within their social network by sharing interests that were meaningful to them. These stories, in combination with recent research, show how eye gaze technology is truly enriching the lives of girls with RTT, their families, friends and educators and professionals who are devoted to "making a difference" in the lives of all individuals with RTT and related disorders.

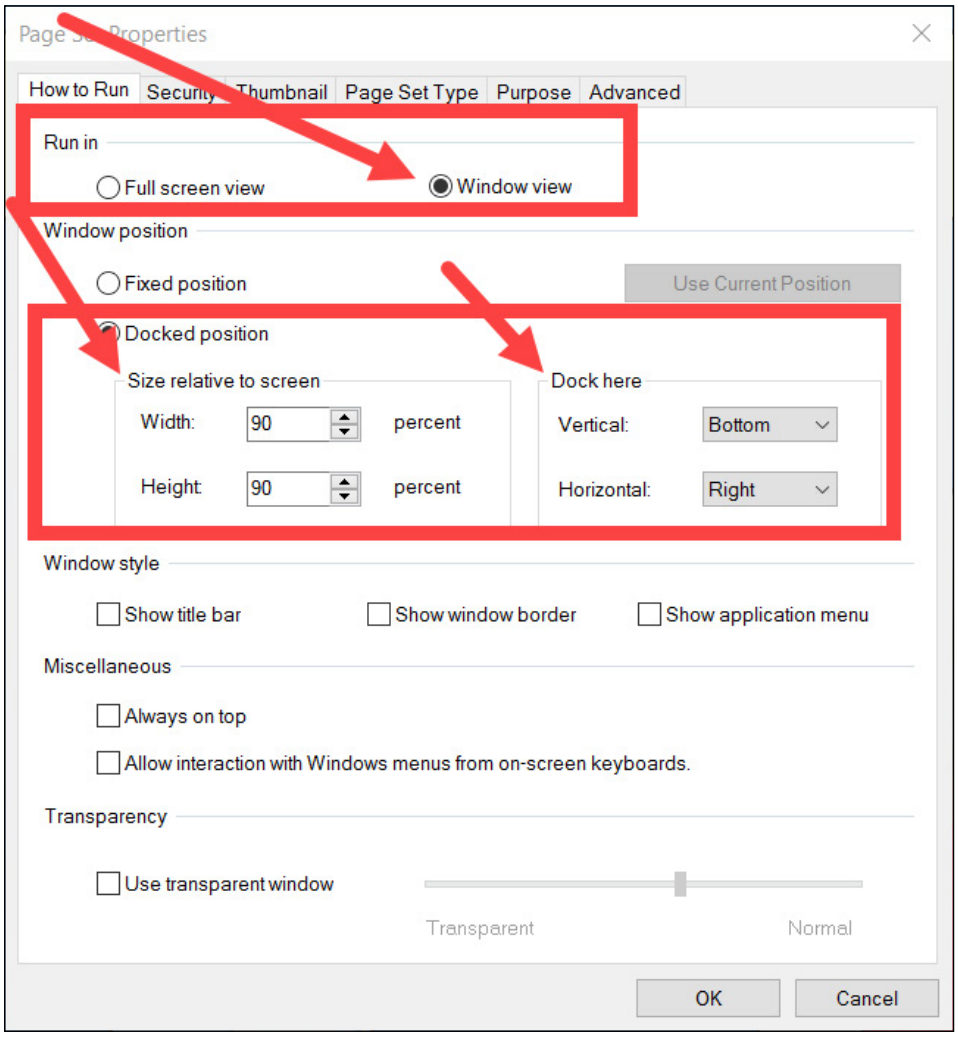

Image 8: Screenshot of Changes made to Page Set Properties of Lariviere's Customized Book Template set up in Tobii Communicator 5.

Image 9: Screenshot of first page of Level J Book, "What Pet Should You Get?" from Reading A to Z with the order of "hot spots" over words activated when writing I "wanted to have a dog" in Lariviere's Book Template programmed in Tobii Communicator 5.

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Image 10: Screenshot of first page of Level J Book, "What Pet Should You Get?" from Reading A to Z with the order of "hot spots" over words activated when writing "Pets make good friends" in Lariviere's Book Template programmed in Tobii Communicator 5.

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ESSENTIAL COMPONENTS OF A CUSTOMIZED SETUP FOR EYE GAZE TECHNOLOGY

All individuals with Rett syndrome, regardless of age or ability, need independent access to a "robust" customized setup that supports their ease of access based on their natural gaze patterns and their vision needs. Essential components include ALL of the following:

- The Dynamic Communication Book – also known as the "Pati-Judy" pages for conversation. Updated versions with new colorful images for school-age girls, tweens, and teenagers/young adults are now available. (as shown in Images 11 and 12)
- A language system with core words, expanded vocabulary and context-specific vocabulary to support language and literacy and modeling by "knowledgeable" communication partners.
- Vowel-first Alphabet in Lariviere's Copyrighted Eye Gaze Layout and a full alphabet with word and phrase prediction.
- Alphabet exploration incorporating age-respectful music/videos focusing on letter names and sounds incorporating content of interest for girls and women at emergent literacy levels.
- News pages with a combination of larger photos with disappearing "hot spots" and messages for sharing life experiences and making text-to-self connections during literacy lessons.
- Music video and music players

with extensive selections as music represents a "universal language" to use with communication partners and for enjoyment and sensory regulation; incorporating videos with lyrics supports literacy.

- Bookshelves supporting emergent or conventional literacy levels along with self-selected reading of books based on interests and independent reading level.
- Access to "webcam" for taking "selfies" and photos with communication partners.
- Independent access to customized page sets for using environmental controls in eye gaze system for turning on and off lights and accessing favorite channels on TV, etc.
- Independent access to a cell phone for calling and texting friends (when peers start having access to this form of communication.)
- At an appropriate age, access to customized setups which support access to and connecting with communication partners through social media.
- Also consider the creation of a girl's own unique voice for her eye gaze system using 2 to 3 recorded seconds of her own clear vocalizations for a BeSpoke Voice or a matched Legacy Voice through VocaliD

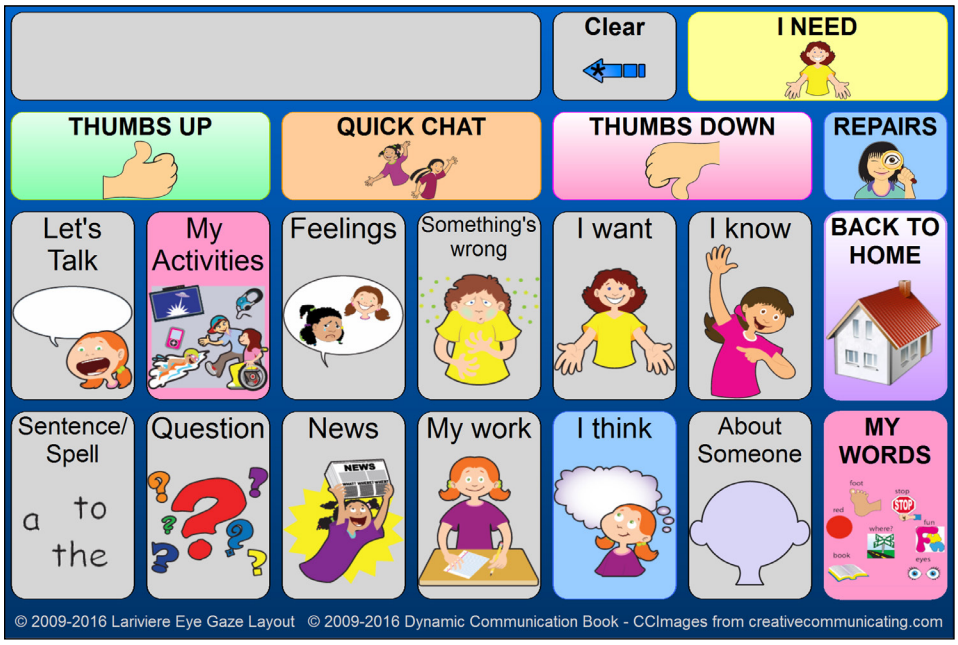

Image 11: Screenshot of Updated Dynamic Communication Book for Girls with new CCImages from creativecommunicating.com set up in Communicator 5.

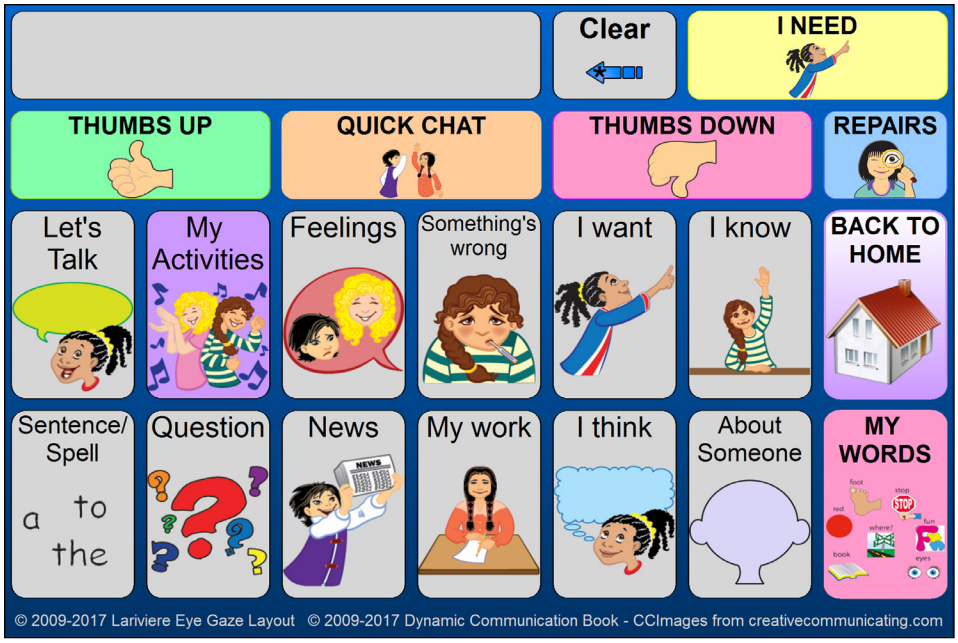

Image 12: Screenshot of "New" Dynamic Communication Book for Tweens with new CCImages from creativecommunicating.com set up in Communicator 5.

RESOURCES

Attainment Company, Inc.'s Social Networks Package www.attainmentcompany.com

The Dynamic Communication Book – New Content and Images for Girl (school-age), Tween, and Adult Versions for Tobii Dynavox's Communicator, also known as the "Pati-Judy" pages

www.creativecommunicating.com

Reading A to Z – Resources and Leveled Books for Guided Reading www.readingatoz.com

Assistive Tech 4 ALL, Inc.

www.assistivetech4all.com

Lariviere's Music Video Players and Music Players for Girls, Tweens, and Adults for Tobii Communicator 4 and 5

Music Player for Girls, Tweens, and Adults for NuVoice TM Software for Prentke Romich Company Devices

Lariviere's Book Template with integrated "hot spots" for supporting Guided Reading

Tobii Dynavox I-series, Tobii Dynavox EyeMobile (now Tobii Dynavox EyeMobile Mini), Tobii Dynavox Gaze Viewer, and Communicator www.tobiidynavox.com

Prentke Romich Company (PRC) Accent TM 1400 with NuEye TM Tracking System and NuVoiceTM software www.prentrom.com

Rett University - Online Courses http://rettuniversity.org

VocaliD – for creating an individual's own unique digital voice for "speaking" using his or her AAC device https://www.vocalid.co ■

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Writing with Children with Rett Syndrome:

Effective Foundations for Ideation and Mechanics

I can distinctly remember one pivotal moment and one delightful life change that affected how I will forever view writing with Children with Rett Syndrome. Curious? I hope so, but you'll need to wait a bit, as I first give you a sense of what I mean when I say children with Rett Syndrome.

"Rett Syndrome is a debilitating neurological disorder that predominantly affects females. It is the leading genetic cause of severe impairment in girls, brought on by a single gene mutation that leads to underproduction of an important brain protein." (GP2C)

This group includes children that cannot speak, and cannot use their hands to hold a pencil. They often have trouble regulating their attention, behavior, sensory system and even their own breathing. Their severe Apraxia (motor disorder making difficult the motor planning of actions requested of them) makes for consistent inconsistency in their responses which affects any type of "objective" assessment. They are often erroneously viewed as "too cognitively impaired to_____."

In other words, the kiddos that would be least likely to have a writing goal on their I.E.P. In the many countries outside the U.S. that I have visited, that don't go to school to learn but instead to Day Care Centers to be cared for. Cared for lovingly, but not educated and certainly with no expectation for being fully communicative and literate. Though to be honest, many "Life Skills" special education classrooms I visit in the states are called educational settings, but are not that dissimilar to the day care centers I have seen around the world. Of all the complex kiddos out there, I believe the most misunderstood are those with Rett Syndrome (RS). Intelligence trapped within a very uncooperative and puzzling body confounds any data-driven system in which they are to be educated. This group of girls, women and a few boys propelled me to think about learning in a totally different way and challenged me to acquire skills that I couldn't have even imagined when I graduated from college 41 years ago. Though, the steepest part of my learning curve in writing began not that long ago.

It was October of 2013, and I was fortunate enough to be sitting talking with David Koppenhaver after a session at Closing the Gap. David is the co-founder of the Center for Literacy and Disabilities, currently a **Professor in the Department of Reading Education and Special Education (RESE) at Appalachian State University** and literacy researcher for kiddos with special needs including those with complex disabilities. We were discussing the kiddos we work with and specifically what was happening with my kiddos with RS and writing. At that point, I thought I pretty much had it all together, as I was knowledgeable technology-wise and could create fun, engaging writing activities in Classroom Suite, Clicker, etc. My girls were engaged in this writing

SUSAN NORWELL M.A., ATACP, Susan is a teacher who has worked with a wide array of students, including those with Rett Syndrome, Autism and Multiple Disabilities for the last 41 years. She has spent the last 31 years in private practice working primarily with children with Rett Sydnrome, Autism and other complex disabilities.

Susan is Co-Founder of Rett Univerity which represents a 5 year dream of being able to provide systematic training for parents and those working with individuals with Rett Syndrome. She is thrilled to see this dream actualized with GirlPower2Cure and envisions people being able to more consistently unlock potential for individuals with Rett Syndrome in the future!!!

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process and in addition were learning to decode, read and making progress in their communication. David pressed me about how much time they were spending with alphabetic writing. How much of their writing allowed them to use the entire alphabet to generate their own ideas versus the preformatted ones I was giving them in my templates and engineered writing activities? This was a pivotal moment for me as I struggled to answer his "Why aren't you?" question. I remember thinking how exhausting this would be for the girls and voiced my concerns about their fatigue levels, apraxia, etc. I must admit, my concerns were not greeted with much enthusiasm and understanding on David's part. Thinking back, who was **I** to argue with David Koppenhaver? I left that discussion with a lot to think about, but with a commitment to giving my girls with RS access to the entire alphabet with regular writing practice. I have never turned back, in fact it was just the tip of the writing "iceberg" for me.

At the same time, my life changed drastically as I became a very hands-on "Mimi" to my 18-month-old granddaughter. Raising our four children had been great, but in retrospect, keeping my head above water took precedent in those days versus thinking about their development in any long, thoughtful and generative kind of way. Mix together my granddaughter, my more "in the moment" life perspective and a wider range of experience and her development was as if I was seeing it all for the very first time. Each growth, milestone and new skill kept me awake at night trying to figure out how to help my kiddos with RS learn and experience this growth in a similar way. When she began playing out simple scenarios with her dolls, I could see the potential for story writing in her play. Play became essential in the work I did with the girls. At 18 months she tried to share what she had done with her "Papa" the day before using her gestures and a few words, I could envision a narrative that would someday take shape. I began to research and model and teach narrative construction via the Tobii for my clients. At two as she sat next to me on the couch while I wrote out a grocery list and picked up a pencil to write one too, I saw a budding author! At this point David Koppenhaver was looking smarter than ever! Later, when she told me stories for me to write down, something clicked as I saw her ability to retell an experience and slow down to allow me to write it all out. Now my clients regularly got the chance to tell me things via their devices and I wrote them down, urging them to slow down so I could keep up. Then Maddie's scribbling lists, began to look like words and she started writing her own stories and at nine she has not stopped. That same pattern happened with my young kiddos with RS; first random letters, then their name slowly emerged to completion. It was my older students, writing for the first time and expressing feelings, questions and observations that impressed on me the absolute necessity of writing as a **communication** tool for those who use AAC.

These experiences and connections, in their entirety, served to help me connect the dots between the mechanics of writing and the ideation of writing. If you google "Writing Development" you will get hundreds of articles on the development of what writing **looks** like over time for a typically developing young child. How a child's writing starts out as strokes on paper, gradually begins to take the shape of writing, and how alphabetic sound knowledge begins to influence what a child writes to represent their ideas and how it develops more accurately over time (Schickedanz 1999). My experiences with Maddie and connecting all those dots, led me to see that the mechanics of writing are just a small piece.

Looking for research on writing for kiddos with Complex Disabilities and one finds the results are slim. Research on writing with those with Rett Syndrome is non-existent. Leaders in the field of special education who are working with more generalized complex children are doing plenty of "in-the-trenches-research." They are getting great results and leading the charge to bring writing to all children non-dependent upon perceived cognition. More formally, there is some growing research on literacy knowledge with children with special needs that can help support us in this journey. As with any child, limited exposure and instruction in reading and writing may impact levels of literacy knowledge. (Koppenhaver & Yoder, 1993). Increasing their exposure and instruction should make a difference. In a small study of children with autism, child-directed experiences with print with supportive adults made a difference that could be seen over time (Koppenhaver & Erickson, 2003). A study involving girls with Rett Syndrome and story-book reading with their mothers using rudimentary communication technologies yielded improved literacy knowledge (Skorko, Koppenhaver, & Erickson, 2004). Furthermore, adolescents with multiple disabilities (deaf-blindness and AAC needs) displayed increasing literacy knowledge when given alternative pencils and consistent opportunities to write about topics of their own choosing (Hanser, 2006). This body of research is growing slowly but combined with discussion around "the least dangerous assumption" (Jorgenson, 2005) and "presuming competence" (Biklen & Brurke, 2006), it adds up for a change in our priorities thinking about all children with complex disabilities, including those with RS.

Development of writing, as it relates to language development and other literacy skills, is often researched as it relates to children that are members of less advantaged families. Retrospective studies that compare the early experiences of successful readers and writers with those of their non-successful counterparts inform this discussion and point to the significance of robust language development and later success in reading and writing. Readers should not see this as a sequential process of

first language development and then writing development. It's in fact an interdependent process as both are developing together in the young child (Ehri 1975). This gives pause to the notion that children with Rett Syndrome need to show competence in their letters, sounds, and identification of key vocabulary before they would be deemed ready to learn to write. A good vocabulary can help a child better understand a book read to them, but reading them the book can also help them learn new vocabulary to better understand the book. This is particularly significant as it relates to our girls with RS who are often acquiring eye-gaze devices to support their communication but not necessarily at the same time a typical developing child would begin to speak. They are often stuck in repetitive vocabulary "finding" activities that have no efficacy in the research (see Romski, et al., 2003, for a review on naturalistic language teaching strategies) and held out of more engaging literacy-based activities due to ill-conceived prerequisites skills not supported in the research.

Combine the direction the research was taking, the pivotal moment with David, living with my granddaughter and experiences writing with my kiddos with RS and more connections were made as to the foundations for writing. I realized that all of the building blocks that Maddie attained so effortlessly and made her a writer needed to be a purposeful, strategic focus for my girls with RS. The foundational blocks to writing that related to ideation and language were just as essential as giving them access to the alphabet and letting them just write and they were not going to happen accidentally. The more I challenged myself and my students the more the foundations crystalized and became more apparent to me.

My work within schools on behalf of my students with RS made the writing roadblocks more apparent and the need glaring for teacher instruction that would support them to champion writing for their students with RS. My students presented with definite writing roadblocks, but the teachers' challenges, deleterious assumptions and lack of effective educational strategies around kiddos with significant challenges were often more significant in their influence. This is most often no fault of the teachers. It is very hard to learn what you have not been taught and this applies to our students, as well as the teachers that serve them. In my opinion, a great number of university systems are lagging in building competence for those that will work with our most challenging kiddos, including those with RS. Early childhood special education classrooms that focus on cute art projects with tables devoted to "IEP Goal Work", need to understand writing foundations as an integral part of their curriculum **and** their IEP's. As such, there does not need to be an "IEP work time," as it will be embedded in all they do. Special Education rooms for elementary students and beyond, need to capture their student's excitement and interest as they make sure the foundational pieces for writing are in place and, if not, how to design age appropriate experiences to make sure they are. Finally, the push for inclusionary practices needs to be organized and supported in the learning of all future teachers. In my experience with kiddos with RS, those who are fully included in general education classes can write words that are understandable to convey ideas. They have not all had an interactive role in their instruction, but just **witnessing** solid literacy instruction, has made them better writers than kiddos the same age in Special Education Classrooms. Something needs to change.

ESSENTIAL MOTOR STRATEGY FOR SUCCESS FOR KIDDOS WITH RETT SYNDROME

The graphic below delineates an essential concept that should serve as a driving force if kiddos with Rett Syndrome are ever to make progress beyond what their bodies will allow them to demonstrate. Too often assessments are set up to test the motor deficit, versus utilize the most effective strategy around the motor issue to effectively evaluate the conceptual knowledge. When the conceptual, academic, learning task is high, the motor demands need to be low. There is a tendency for students with RS to lower the cognitive demands to meet the students' motor abilities which leads to boredom and disengagement.

(See Image 1 - Motor Demand)

Success calls for us to thoughtfully balance the cognitive demands of a task with an individual's limited motor skills, motor planning and apraxia. Working to reduce motor demands to the simplest element and making a consistent motor

Image 1 - Motor Demand

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plan means automaticity can be achieved over time allowing for higher level skills to be taught and evidenced. If we strive to hit the "cognitive sweet spot" then students will use all they have in their power to meet us. If we lower tasks cognitively, to match their limited motor, their interest wains which often is interpreted as lack of ability. This is why it's essential to build robust communication systems for our students so they can communicate when they are bored with us!

I believe an essential component to expressing what students with Rett Syndrome know and are thinking is to keep the motor plan for skill expression consistent. Partner Assisted Scan (PAS) reduces the motor demand to a simple "YES/NO" which stays in the same location for every task. The child with RS only needs to focus on the cognitive task and relax a bit knowing the "YES/NO" will always be in the same place waiting for them to access it when the correct answer is offered. Children with RS typically use eye-pointing to access the "YES/NO" but often have other ways of communicating YES/NO that should be honored as their motor abilities fluctuate requiring a back-up plan if one method does not work. It's essential in my work with schools to help them recognize the girls' "best YES" which can be as simple as a look to the speaker for early success. I have found the girls to be very relieved to also have the YES/NO setup pictured below, as it gives them an easy alternate when their bodies fail them. I have a significant number of girls that do best by moving their **eyes only** to the YES or NO held in front of them. I know this doesn't seem like it has anything to do with writing, but if we don't get the access figured out – they will never write with an ABC Flipbook dependent on the "YES/NO" within Partner-Assisted Scan (PAS). I typically sit to the "YES" side so it is easy to look at me or look at the "yes." I have found this to be a successful way to shape the look to me, onto a look to the "yes" in a natural and not forced way. My dear friend Judy Lariviere, pointed out to me that some of her girls can't look to the left. So, in this case we might reverse the "YES/NO" and our positioning to better support their communication.

(See Image 2 - Board Image)

The board is Velcro sensitive on both sides so the back can be used as a "staging area" for answers, letters, etc. The front is for the options to be placed one at time to elicit a "yes" or 'no" response.

FOUNDATIONAL SKILLS THAT SUPPORT WRITING

In classrooms and clinics that continue to spend an inordinate amount of time on things of little value (color identification, pointing to symbols, hand-over-hand art projects) focusing on skills that will have a positive effect on later writing ability is essential. If a nonverbal student can write, they can say whatever they want. Full and robust communication should be at the top of every to-do list for students with RS but to achieve full communication they need to write.

I define the essential Foundational Skills for writing for Students with Rett Syndrome to include:

1. **Play and Interaction** for children to practice building simple story lines within their play.
2. If students are to write effectively they need access to as **robust language system** that allows them to tell us a variety of thing we can write down.
3. Students with RS need to be **read to and be engaged in dialogic reading** as they build vocabulary and experience the components of a good story.
4. Their robust language system needs to support and allow for **focused instruction and modeling of narrative construction**.
5. Modeling of language is the foundation for good AAC learning, but in addition our students **need to see writing modeled using their pencil** and ours. (Hanser & Musselwhite, CTG 2013)
6. Purposeful instruction to build **Phonemics Awareness** including rhyme, letters sounds and **Making Words**.
7. Students with RS **need multiple experiences learning to use the tool they will use for writing**. Many errorless writing opportunities, will build their confidence in the tool they are using and in themselves as writers.
8. **They need authentic writing experiences** that ask them to use writing to give an opinion, make a prediction, contribute to a list and a myriad of other opportunities that should include student directed writing.

It is imperative to understand that these are not step-by-step guidelines. They all occur at the same time, interacting and supporting the learning in each area, just the way these skills develop for the typically developing child.

PLAY AND INTERACTION:

Play is foundational in the life of the young child and is often neglected for children with RS due to their poor hand use. If attempted, it's often in a rote, hand-over-hand fashion that has no impact on developing **their** ideas, sequencing **their** own actions or building **their** ability to pretend. Instead, it's often reduced to a "following directions" task as the partner verbally gives the child ideas they are to carry out and helps them to motor through the task. Narratives are said to be developed through early engagement in conversation and play (Proctor & Zangari 2009). I observed this early on in Maddie's play. Her 18 month to 2-year play scenarios were initially very short stories, maybe two or three actions long, with language to narrate. By interacting with her as an additional player and not a director of her

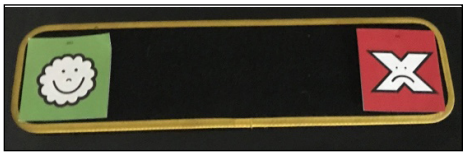

Image 2 - The board above is Velcro sensitive on both sides so the back can be used as a "staging area" for answers, letters, etc. The front is for the options to be placed one at time to elicit a "yes" or 'no" response. Communication Symbols ©1981-2015 by Mayer-Johnson LLC a TobiiDynavox company.

play, her stories became more complex and sophisticated. The significance of play cannot be dismissed for kiddos with Rett Syndrome just because it is much harder to do. The following scenario describes a play interaction with a very little girl with Rett Syndrome.

Scenario:

Jane is 20 months old diagnosed with RS. She is not mobile and has very limited hand use except patting indiscriminately. She does have an excellent "look to me" for affirmation and a "look away" for negation. She is bright-eyed, has great affect and fully interactive within age-appropriate activities. We are playing dolls for the **first** time. My tobii C-12 is in front of her with a topic specific page for doll play and we have a wooden doll with magnetic clothes.

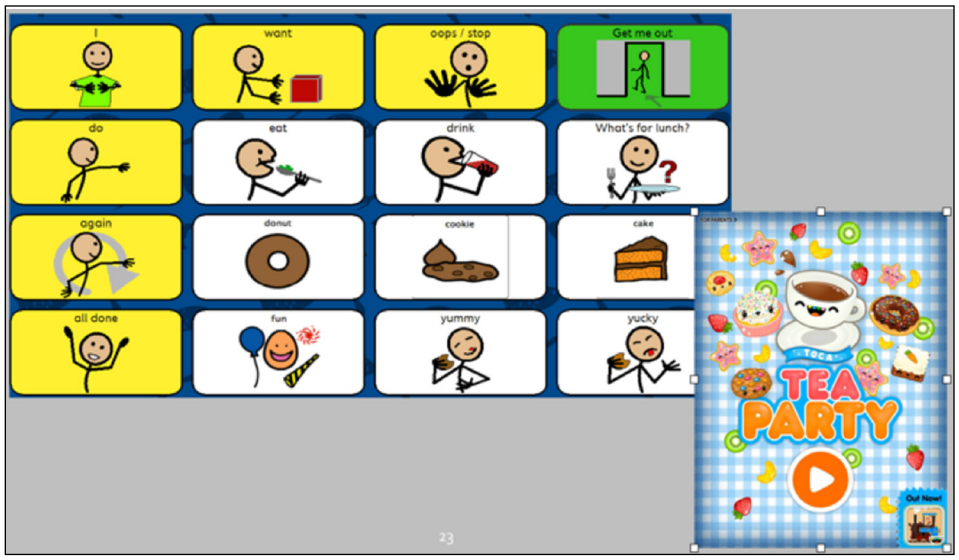

Image 3 - Grid create in SonoPrimo within Communicator a product of TobiiDynavox using Symbolstix Icons Copyright SymbolStix, LLC. 2017. All rights reserved. Used with permission. Tea Party is a Toca Boca App for the iPad.

Jane combines eye-pointing (to tell me which dress she wants when asked) and initiates a gaze to the doll to indicate I should put it on. When I stop to explain to her mom that we always want to honor her independent gestures and not just "make her" always use the Tobii, Jane totally takes over.

Jane: She makes the baby cry by activating the Tobii button for crying.

Susan: "Oh your poor baby. She's crying."

Jane: "Get the blanket."

Susan: Oh maybe a blanket will make her feel better.

Jane: Let's sing to her.

Susan: Now that's a great idea

Jane: Let's sing Twinkle, Twinkle

Susan: I love that song. (Of course I sing)

Jane is totally in control of the above interaction communicating her own ideas. When I ask if she wants help to put the dress or the blanket on, she indicates "yes" and then the hand-over-hand support is based on her ideas, her sequence, her pretending and not mine. I happen to love that she interrupted our grown-up talk by making the baby cry. Who could ignore that? And this would be a very appropriate play scenario for a 20-month-old before they hopped on to something else. The only difference might be that they would initiate with motor actions and then narrating. Jane must do the opposite as her motor skills are very limited.

A few months later, Jane is playing Tea Party with her mom and me. We are utilizing the Toca Boca App shown below and the grid I designed with SonoPrimo's core words as the base. This script would be much longer to transcribe, showing that Jane's play is becoming more sophisticated at the same time her communication is growing. She responded to PAS to choose the table cloth for the table by first looking to the cloths to indicate interest and then to me to offer choices. Once given choices she clearly indicated "yes" for the one she wanted. When the plates came up she chose instead to stare at the candles in the middle of the table, and gave a definite "yes" to lighting them. Then, she looked at the plates she wanted. Active decision making and directing her own play is what will help her develop the ability to tell stories later and understand that she even has a story to tell. The other important benefit of play is that it's a wonderful way to model language on a device and increase vocabulary use while engaged in a natural occurring activity. I was happy I stayed awake a few nights when Maddie began playing to make sure this happened for my kiddos with RS. Jane proceeded to tell us she wanted a "drink" that was "yummy." As she chose things to eat via eye-gaze on the device she then initiated by eye-pointing where they should go on the iPad. She repeatedly asked for a "donut" and when I modeled "I want donut" she said, "donut want." We were all having fun playing while Jane was learning new language, new ways to combine ideas and developing a longer story that combined would be laying important foundations for the future.

(See Image 3 - Play Grid)

Even though play is more difficult for children with motor difficulties, technology has made more play with fewer motor demands possible. I have a few parameters in apps that have made a difference in engaging my kiddos with RS at all ages. Apps need to have content that is age appropriate, and items that are clearly delineated so they are possible to access with a combination of PAS and eye-pointing. The eye-pointing is essential as the PAS is dictated by the partner. Being able to read the eye-pointing of the kids due to enough spacing between items allows the partner to follow the **kiddo's** initiation. Initiation is essential to ideation

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and it is ideas that form the base of all effective writing. Apps should also have a lot of great action, for a little bit of motor effort! Sound effects are great and bright colors help to focus attention, though too much action, noise and visual clutter can be overwhelming. I typically give the apps to my grandkids and see if they like them. If they get bored, my kiddos with RS will too.

Jane's play scenarios would be simply written down so her mom could record them into her device for her to retell. Being able to see her play written down helped Jane understand how what she could do and say could be part of a story and she loved to retell those stories to others utilizing her device.

ROBUST LANGUAGE SYSTEM

Without a robust language system, individuals with RS will not have access to the language they need to be fully expressive. What they can say and the conversations they create will affect the stories they later tell and then write. The question I typically ask parents and professionals is: "Can you have a conversation with their language system?" If not, then the girls will not be able to either. While this is not the total focus of this article and I am barely touching this big topic here, I want to be clear that without a robust language system, the girls will not be able to learn to communicate across all the functions of communication that we take for granted. They need to be able to combine individual icons or words to create a novel idea to:

- Affirm
- Negate
- Greet
- Describe
- Direct others
- Comment
- Construct a narrative
- Request

A truly robust system will allow for play, interaction, dialogic reading and narrative construction. It will allow for easy access to recorded stories for social situations that are often time dependent. It will allow the girls to have it all, and make the decision of **what** they want to use **when**, to get **their own** idea across. Look at the tea party grid below that Jane quickly shifted to at 30-36 months as the one above did not allow for enough language. She could combine more words for novel utterances, her partners had significantly more language to model and Jane didn't even know she was working because we were "just" playing.

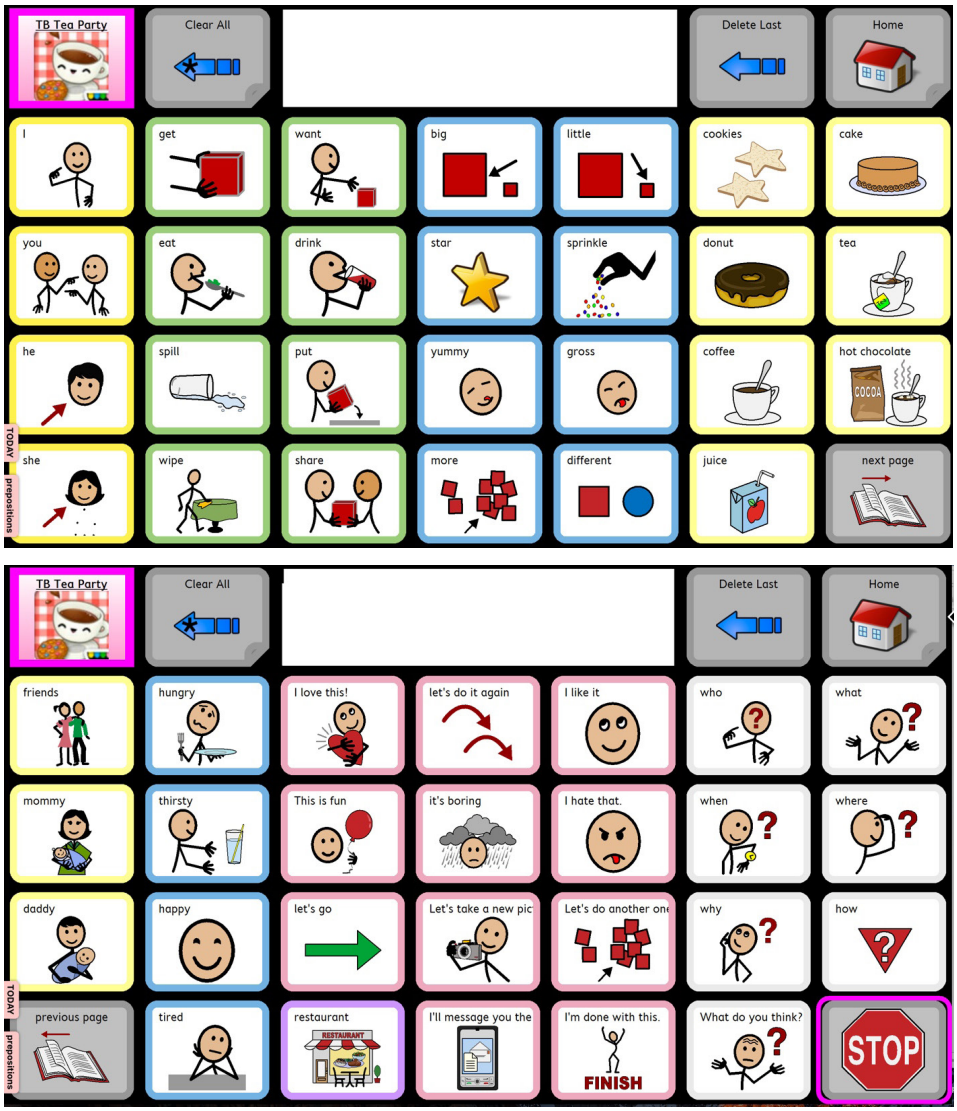

Image 4 - Toca Tea Party - Created by Kate Ahern with Adaptations by Susan Norwell in SonoFlex within Communicator by TobiiDynavox using Symbolstix Icons Copyright SymbolStix, LLC. 2017. All rights reserved. Used with permission

(See Image 4 - Toca Tea Party)

Robust language systems provide for the growth in language development that grows exponentially in typically developing children. I have always noticed an uptick in use when I give a kiddo with RS an additional or upgraded version of their language system. They need more options and more ways to grow their language as having the same options for communication, though counter-intuitive if you are not presuming competence, is boring and reduces use of the device.

The next edition of Solutions will contain Part 2 of Writing with Kiddos with Rett Syndrome and elaborate on the rest of the foundational skills.

Please feel free to contact me at susannorwell@rett-u.org with any questions or comments.

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OTHER RESOURCES

Readers are encouraged to review the website www.rett-u.org for further information on Rett Syndrome and specific information on educating them. ■

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35th ANNUAL CONFERENCE

Closing The Gap

OCTOBER 18-20, 2017

Preconference Workshops

Monday and Tuesday, October 16-17, 2017

MINNEAPOLIS, MINNESOTA

Assistive Technology in Special Education, Rehabilitation and Everyday Living

Mark Your Calendar Plan To Attend!

Early registration, parent, student, group and other discounted rates available

The Closing The Gap Conference is truly more than a conference

it is a network of invaluable resources – teachers, therapists, clinicians, parents, end users and manufacturers – all emphatically working together to change lives with assistive technology. The 35th Annual Closing The Gap Conference promises nothing less than excellence!

- ✔ **17 PRECONFERENCE WORKSHOP** Day-long workshops, conducts by nationally recognized leaders in the field, providing in-depth professional skills necessary to successfully implement assistive technology in the lives of prersons with disabilities.
- ✔ **THREE DAYS OF PRESENTATIONS AND HANDS-ON LAB OPPORTUNITIES** Sessions describing and/or demonstrating successful strategies and practical applications of assistive technology for persons of all ages with disabilities
- ✔ **COMMERCIAL EXHIBITS** Extensive exhibition area displaying and demonstrating state-of-the-art assistive technology products and implementation strategies.
- ✔ **CEUS AND ACADEMIC CREDIT**

ADMINISTRATORS PARTICIPATE FREE

This year, when an additional staff member registers for the conference. When any school district or hospital / clinic staff member registers for a preconference workshop or the three- day conference, one administrator (Special Education Director, Principal or Hospital / Clinic Administrator) from that organization can attend the conference, Wednesday through Friday, and the exhibition preview, Tuesday evening, for FREE! Limits apply.

$30 RETURN DISCOUNT

A $30 "RETURN" DISCOUNT is available to ANY past conference registrant and must be used by **JUNE 30, 2017**.

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

If registering online, you will be required to enter code **RETURN** at checkout.

TVI DISCOUNT - Save $30

A **$30 discount** is available to teachers of the blind and visually impaired. This discount can be used for any preconference workshop OR conference registration and is INADDITION to any and all other applicable discounts. If registering online, you will be required to enter and apply code **TVI** at checkout. Position will be verified with employer.

LEARN MORE AND REGISTER ONLINE: WWW.CLOSINGTHEGAP.COM/CONFERENCE/

Conference - Wednesday, Thursday, Friday, October 18-20, 2017 Includes Preview of Exhibits – Tuesday Evening, October 17 AND Continental Breakfast Wednesday and Thursday, October 18 & 19

Registration Received	On or Before June 30	July 1 - September 7	September 8 - October 5	October 6 - Onsite
Standard Rate	**$470**	**$520**	**$545**	**$570**
Group Discount - 5 or more **Group Discount - 8 or more** *All group registrations must be received at the same time.*	Groups 5+ Deduct $30 Groups 8+ Deduct $50 Groups 20+ Deduct $70	Groups 5+ Deduct $30 Groups 8+ Deduct $50 Groups 20+ Deduct $70	Groups 5+ Deduct $30 Groups 8+ Deduct $50 Groups 20+ Deduct $70	Groups 5+ Deduct $30 Groups 8+ Deduct $50 Groups 20+ Deduct $70
Parent Rate *(A letter describing your child's disability must accompany registration)*				**$290**
Full-time Student Rate *(Proof of full-time student status must accompany registration)*				**$315**
Presenter Rate	**$365**			**$415**
Exhibitor Rate	**$365**			**$415**

Single-Day and Exhibit Hall Only Registration	Price
Thursday Only - October 19	**$290**
Friday Only - October 20	**$125**
Exhibit Hall Only - Tuesday evening through Friday, October 17-20	**$125**

Preconference Workshops - Monday and Tuesday, October 16-17, 2017 Includes Preview of Exhibits – Tuesday Evening, October 17	Price
Monday, October 16 *(Some preconference workshops carry an additional fee for materials)*	**$285**
Tuesday, October 17 *(Some preconference workshops carry an additional fee for materials)*	**$285**
BUNDLED PRICING! Monday and Tuesday Bundle $80 savings *(PC-1 through PC-16 only)*	**$490**
Sponsored Preconference Workshop - PC-17, Tuesday, October 17 *(PC-17 not applicable for bundled pricing)* **$125**	

PRECONFERENCE WORKSHOPS ANNOUNCED!

Preconference workshop registration fee - $285; Registration includes the Preview of Exhibits on Tuesday evening.
Bundled Pricing Two workshops for $490 - $80 Savings (PC-1 through PC-16 only)

COME, NETWORK, LEARN – Each workshop is conducted by a nationally recognized leader in the field, providing in-depth professional skills necessary to successfully implement assistive technology in the lives of persons with disabilities.

PC-1 Two-Day Introductory PODD Course (Official PODD Course) *Linda J. Burkhart, B.S., Augmentative Communication Specialist*

PC-2 State-of-the-Art Classroom Rubric/Tool: Autism and Intellectual Disabilities *Mo Buti, M.Ed-BD, M.Ed-Admin, QIDP, Instructional Expert for People with Autism*

PC-3 Comprehension Instruction for Students with Significant Disabilities: Beyond "Wh" Questions *Gretchen Hanser, Ph.D., Literacy and AAC Consultant; Caroline Musselwhite, Ed.D., CCC-SLP, Assistive Technology Consultant; Erin Sheldon, M.Ed.; Deanna K. Wagner, M.S., CCC-SLP*

PC-4 Expanding Environments with AT and AAC, using access, integration of systems and more technology itself throughout the student's classroom day - "wired" and "wirelessly": a Hands-On *Karen M. Kangas, OTR/L, ATP*

PC-5 Practical Strategies for Effective AAC Implementation *Lauren Enders, M.A., CCC-SLP, Assistive Technology/ Augmentative Communication Consultant*

PC-6 Access to All Things Chrome *Mike Marotta, ATP, ATACP, Technology Specialist; Kelly Fonner, M.S., Educational/Assistive Technology Consultant*

PC-7 Early Literacy Success: Students Who Have Complex Communication Needs - A Make-and-Take Workshop *Pati King DeBaun, M.S.,Speech Language Pathologist and Consultant*

PC-8 Full STEAM Ahead: Making Science Content Accessible to All *Luis Perez, Ph.D., Inclusive Learning Consultant; Mark Coppin, M.Ed., ATP, Director of Assistive Technology; Nancy Kawaja, Itinerant Resource Teacher Assistive Technology*

PC-9 Creating Assistive Technology Solutions in Minutes: Part 2 - A Make-and-Take Workshop *Therese Willkomm, Ph.D., ATP, Associate Clinical Professor and Director of ATinNH*

PC-10 Using PowerPoint to Promote Literacy, Language and AAC in the Classroom *Carol Goossens, Ph.D., AAC Consultant; Caroline Musselwhite, Ed.D., CCC-SLP, Assistive Technology Consultant; Gretchen Hanser, Ph.D., Literacy and AAC Consultant; Laurel Buell, M.Ed., OTR/L; Jeanmarie Jacoby, M.Ed., Special Education Teacher*

PC-11 Never Give Up: Finding and Supporting Access to AT and AAC for Students with Complex Bodies, including access, seating, postural control and sensory processing *Karen M. Kangas, OTR/L, ATP*

PC-12 What's App-propriate When and Why for Supporting Writing in Students with Disabilities *Brooke Hardin, M.Ed., Adjunct Professor; David Koppenhaver, Ph.D., Professor and Graduate Reading Program Director*

PC-13 "Help! I'm an AT Specialist and I Can't Get Up!" Creating Manageable School-Based AT Services *Keri Huddleston, M.A., CCC-SLP; Jennifer Whalley Payne, M.Ed., Assistive Technology Specialist; Elizabeth Echebarria, M.Ed., Assistive Technology Specialist*

PC-14 Chrome, Google and Collaborative Tools: AT and Support Always at Hand *Dan Herlihy, AT/ Technology Resource Specialist*

PC-15 Teaching Scanning Without Sacrificing Literacy *Michele Bishop, B.A., Assistive Technology Provider and Clinical Educator*

PC-16 Getting to the Core of Communication *Kelly Key, M.A., Assistive Technology Coordinator; Deidre Dobbels, M.S., Speech Language Pathologist*

Sponsored Preconference Workshop by Attainment Company

Sponsored workshop registration fee - $125; Registration includes the Preview of Exhibits on Tuesday evening. *Bundled pricing not applicable.*

TUESDAY, OCTOBER 17 8:00 AM - 4:30 PM

PC-17 Results Focused Workforce Initiatives: School - Home - School, *Janet Estervig*

Attainment Company

LEARN MORE AND REGISTER ONLINE WWW.CLOSINGTHEGAP.COM

product spotlight

Far More Than A Wheelchair

WHAT IS UPNRIDE

UPnRIDE is a wheeled robotic device, providing upright and seated mobility both for wheelchair users, and for anyone who is unable to, or has difficulty standing or walking.

UPnRIDE offers numerous medical, psychological, and economic benefits, ensuring safety while standing, sitting, and shifting between positions, in practically any urban environment.

UPRIGHT MOBILITY OFFERS A WORLD OF BENEFITS

Discover a safe, healthy, affordable solution, with better quality of life

INCREASES INDEPENDENCE

Automatic balancing assures safe ride uphill, downhill, and on slanted surfaces, in both standing and sitting positions – suitable for most wheelchair users.

DIMINISHES VISIBILITY OF THE DISABILITY

Provides eye-level view in social interactions, enhancing dignity, social inclusion and self-esteem, and heightening quality of life.

IMPROVES HEALTH

Standing up vertically – a vital medical necessity – counterbalances the impact of prolonged sitting, enabling functional activities, and enhancing overall health.

REDUCES MEDICAL COSTS

Reduces secondary complications of long-term sitting, lowering the need for hospitalization, medications and physiotherapy – a significant saving for health insurers, users, and their families.

A LIFE-CHANGING SOLUTION FOR A GROWING POPULATION OF WHEELCHAIR USERS

Millions of disabled people and seniors worldwide suffering from impaired walking, are confined to a sedentary lifestyle in a wheelchair, causing health deterioration, poor quality of life, and high medical expenses – a burden for the disabled, their families and health insurers. Numerous studies have demonstrated the physical and mental health benefits of wheelchairs with a standing position, which enables users to mobilize body parts, and reduce falls when reaching for high objects.

As the number of wheelchair and scooter users grows, due to both increasing accidents and aging populations, many seek a smart mobility device that will provide fully-functional standing and sitting mobility, improve health, enhance social inclusion, and reduce healthcare and living expenses.

LEARN MORE

Touch Accessible Platform Interactive Technology

TAPIT FEATURE HIGHLIGHTS

TAPit is the first ADA compliant interactive learning station designed to recognize the difference between an arm resting upon the screen and a finger or assistive device intentionally tapping an image.

False touches are a thing of the past with TAPit

The TAPit platform is within reach for people using wheelchairs, walkers or other mobility devices, providing full access to the screen with easy adjustments that adapt to individualized needs.

With the touch of a button, the TAPit platform can move up or down and the 42 interactive LCD panel can be tilted from 0 – 90 degrees.

ACCESSIBILITY

The TAPit system provides a touch accessible interactive learning platform that supports shared occupational therapy and academic goals to become a transformative tool for therapists and educators. It minimizes barriers and

maximizes flexibility by adapting to a person's individual needs.

FINE MOTOR DELAYS

Anyone can operate the screen using a finger, assistive device, or reach stick. Large icons help them select the correct target to make their choices. This helps to accommodate their lack of precision and accuracy in directing the mouse pointer, also aiding with involuntary arm movements. The work area is designed to ensure that the majority of users are able to reach the entire surface.

VISUALLY CHALLENGED

The TAPit platform works with any software on your computer allowing teachers and therapists to resize text and graphics, adjust brightness or contrast controls, and enlarge images or change background colors within seconds. The low-glare, matte finish display is shadow-free, providing optimal viewing for low-vision users.

HEARING IMPAIRED

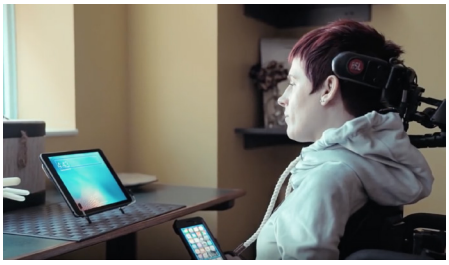
Finger touch input keeps hands free of pen tools that interfere with signing. Interactive media keeps users engaged. They can read from the board and sign at the same time, increasing opportunities for communication.

DEVELOPMENTAL DELAYS

The TAPit platform offers ongoing visual reinforcement to complement lessons and improve functional capabilities. While their eye movement increases, users with ASD, ADD, etc, can track content with greater ease. The physical interaction and visual stimulus offers an additional sensory channel to help process information.

LEARN MORE

Introducing The New Tecla-E!



Take control of your environment and smart devices, hands-free.

Tecla-e is the newest version of tecla. The cloud-connected assistive device provides users with control of their smart-devices and environment.

Tecla-e is for anyone who cannot easily use a smartphone, tablet computer or household technology independently. This includes those with limited upper-body mobility resulting from spinal cord injuries, multiple sclerosis, ALS, muscular dystrophy, cerebral palsy, brain injuries, or stroke.

Whether you want to send and receive emails or text messages, browse the web, watch videos, launch and use your favourite apps, read a book, change the TV channel, adjust the room's temperature or make a phone call — tecla-eprovides you with hands-free access to do it.

WHO IS TECLA FOR?

Tecla is for anyone who can't easily use a smartphone, tablet or computer. This includes those with limited upper-body mobility resulting from spinal cord injuries, multiple sclerosis, ALS, muscular dystrophy, cerebral palsy, brain injuries, or stroke.

HOW DOES TECLA WORK?

Tecla allows an individual to interact with their iOS and Android devices, computers, and smart home systems — hands-free. This includes the iPhone, iPad, iPod Touch, and Android smartphones and tablets, and smarthome automation systems. It works with all assistive switches on the market including buttons, sip-and-puff controllers, head arrays, joysticks and the driving controls of a wheelchair.

WHAT DOES THIS MEAN?

This means you can use Tecla and your smart devices literally anywhere you are. Use it from your wheelchair during the day, or from your bed at night. Tecla moves with you. Unlike other assistive devices that aren't portable, Tecla adapts to where you are.

FEATURES

Multiple Device Control

Multiple Device Controltecla-e can connect with and control up to eight devices

Built-in Button

Tecla-e has a light touch button built-in for those with moderate mobility

App Enabled

Companion apps to set up and control your devices

Long Lasting Battery

Long Lasting BatteryBattery lasts 48 hours with continuous use

Remote Monitoring

Family and caregivers can monitor a user via tecla-e

Built-in Sensors

Sensors track location, temperature, and activity

- Simple remote interface for those unfamiliar with technology or with cognitive issues
- Simple access and control of internet-enabled appliances (lights, doors, TV) via IFTTT
- Upgradable firmware
- Compatibility with industry standard switches and wheelchair outputs
- Companion apps for iOS and Android (for set-up, on-screen remote and device monitoring)

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BUILT-IN BUTTON

Tecla-e itself is a light-touch button switch that can be used to control your devices. It requires about 200 gr of force for activation. Due to the built-in radios, it should not be positioned close to the user's head.

MULTIPLE DEVICE CONTROL

Tecla-e can pair with up to eight (8) Bluetooth devices and the user can switch between them by pressing and holding one of their switches. Compatible devices are:

- iPhone, iPad and iPod Touch (iOS devices with Switch Control)
- Mac Computers (macOS with Switch Control)
- Apple TV (tvOS with Switch Control)
- Android devices (with Switch Access, we recommend Pixel devices)
- Samsung devices (with Universal Switch)
- Windows computers (compatible scanning software required)

INTERNET-ENABLED APPLIANCE CONTROL

Tecla-e can control Internet-enabled appliances via its WiFi connection, this is done through smart home platforms/services. Tecla-e currently supports devices through IFTTT and devices controlled by Logitech's Harmony Hub.

REMOTE MONITORING

Tecla-e has GPS, temperature, motion and light sensors. The information gathered by these sensors can be uploaded to the cloud and accessed through the Tecla apps for iOS and Android. The user can make this information available to family and caregiver who have also downloaded the app for extra peace of mind.

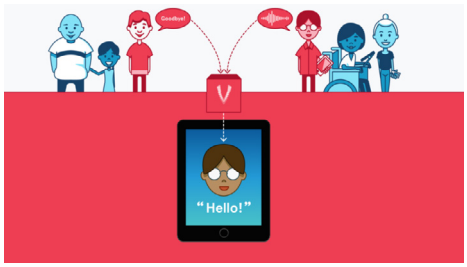
APP ENABLED

The new Tecla app for iOS and Android has three functions:

1. Hardware Set-Up: You can use the app to customize how your tecla-e works.
2. Soft Remote: The app has a fully customizable remote, where you can create buttons for phone functions (direct dials, text messages, etc) or to control your Internet-enabled appliances.
3. Remote Monitoring: Sensor information from the tecla-e hardware (GPS, motion, surrounding temperature and light conditions) can be accessed through the app. This information can be shared with family and caregivers that have downloaded the app and created an account.

LEARN MORE

Humanizing the Voice Inside Any Device That Speaks



VOCALID REDEFINES HOW WE INTERACT WITH INTELLIGENT DEVICES — AND EACH OTHER

Over ten million people are unable to speak. Over 500 million everyday devices and applications are narrated by a voice. All of them choose from the same few generic, mechanical voices.

But our voices are not identical. Our voices are our identities.

ABOUT

Over ten million people live with voicelessness. Much like Stephen Hawking, they rely on text-to-speech devices to express themselves. Yet, young or old, male or female, shy or outgoing — they all speak with similar voices.

Add to that the hundreds of millions who use generic sounding virtual assistants, GPS navigation and screen readers. Digital voices must evolve.

VocaliD is the voice company that is bringing speaking machines to life. We leverage our voicebank and proprietary voice blending technology to create unique vocal persona for any device that turns text into speech.

WHO WE ARE

VocaliD is the company for all things voice. We're on a lifelong mission to map the vocal genome.

At VocaliD, we believe that voice is an essential part of identity. It can convey your age, size, lifestyle, personality, and so much more. Founded in May of 2014 and based in Belmont, Massachusetts, VocaliD empowers the preservation, restoration, and creation of vocal identities.

We're deeply passionate about celebrating and harnessing the diversity of human voice—our world-class team has spent decades at the frontier of speech science and technology.

Today, our voicebanking platform boasts over 20,000 members from over 110 countries contributing upwards of 6 million sentences, to power voices as colorful as humanity.

HOW IT WORKS

Say goodbye to uniform voices.

Until now, the creation of synthetic voices began with auditioning a voice actor. They recorded speech in a professional studio for days or weeks. An army of engineers and linguists then spent three to four months laboring over the recordings to synthesize a voice.

DIGITAL VOICES WERE EXPENSIVE AND GENERIC — UNTIL NOW.

Now, any voice can be heard.

By crowdsourcing the collection of voices, anyone can record from the comfort of their own home. Share your voice with others, or bank it for yourself.

Over 14,000 speakers from over 110 countries have contributed over 6 million sentences to our growing spoken repository, The Human Voicebank.

(Re-)discover your voice.

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Even if you're unable to bank your voice, we can reverse engineer it with just three seconds of sound. Our algorithms use that sample to find a matched speaker within the Voicebank and blend your vocal DNA with their recordings.

The result is a personalized digital voice that preserves the match's clarity, and conveys your unique vocal identity.

IT'S NOT JUST A SPEECH GENERATING DEVICE, IT'S YOUR VOICE.

Millions of people rely on synthetic speech to communicate everyday. Yet, they're given a limited set of generic, robotic sounding voices. Voices that don't fit their body or personality.

We wouldn't dream of fitting a little girl with the prosthetic limb of a grown man — so, why then the same prosthetic voice?

BESPOKE EMPOWERS PEOPLE TO SPEAK AS THEMSELVES.

- A young girl should be able to sound less like Stephen Hawking, and more like her own age, gender and personality.
- A spouse should be able to express his hopes, thoughts, and feelings to his loved one as himself.
- A job candidate should be able to speak with her own voice to connect with potential employers and colleagues.
- A parent should be able to hear their child speak in a voice they recognize as their child's own.

LEARN MORE

Brili – Real-Time Activity Guidance For Kids and Monitoring For Parents

Brili is the ultimate system to help families with children stay on task and on time every day.

Easy setup, guidance, rewards, voice prompts and real-time monitoring: it's got it all.

FOR KIDS - LEARNING INDEPENDENCE AND TRUST

- Game-based timeline allows for fun and fast learning
- Kids stay motivated and on track
- Kids see and understand the passage of time without the need to read
- Reassuring repetition and success

INTERACTIVE REWARD SYSTEM

- Kids can see and control how much time they earn for preferred activities
- Kids earn point-based rewards

PREDICTABLE TRANSITIONS

- Kids anticipate upcoming task transitions
- Helps reduce stress and anxiety

BUILDING POSITIVE BEHAVIOUR

- Helps build independence, control, confidence and competence
- Kids get the chance to succeed and please their parents
- Helps kids with attention challenges to focus on task completion
- Develops good habits through practice and sequencing

SPECIAL NEEDS SUPPORT

- Brili works for every child, though it can be particularly beneficial for kids with special needs:
- Learning and behavior differences
- ADHD / ADD
- Autism / ASD / Aspberger's

FOR PARENTS - REASSURING PROGRESS

- Real-time feedback highlights immediate results
- Tracks rewards that parents and kids agree to

POSITIVE OUTCOMES

- Relieves parents of the need to constantly remind kids
- Reduces parent-kid conflicts by limiting negative interactions
- Family members are less stressed and communicate more positively
- Helps reduce overall anger and frustration

EASE OF USE

- Intuitive routine input and progress monitoring

CONSISTENCY

- Helps parents stay consistent in following their kids' routines
- Assists with planning kids' routines to ensure success

Real-time activity guidance for kids and monitoring for parents.

Visual, audible and even spoken voice prompts help kids stay on task.

Brili's Parent Mode lets you set up routines and monitor progress from anywhere – in real time.

Experts know structure and consistency set kids up for success—especially when learning or behaviour challenges such as ADHD or autism spectrum disorders are present. Brili founder Pierre Séguin and his son faced similar challenges.

After extensive consultations with psychologists and behaviour experts—and through trials of existing solutions—two things became clear: that routines can be hugely successful and; that the tools available at the time just didn't do enough. So he and his team created Brili—the first interactive platform that guides kids through everyday routines—employing best practices of game design and child psychology. It's fun for kids, simple for parents, and takes stress away from families.

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