

Closing The Gap

Solutions

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Awe and Wonder 2+2=5: and Synergetic Approach

Whether in a self-contained classroom, fully included in general education, or a little bit of both, our students have individualized ways they communicate and access curriculum. We need to help students learn to communicate, be independently mobile and learn to access curriculum in "real time," within their classroom setting, with their peers, in their complex bodies. This is when and where genuine, authentic, meaningful learning takes place. This type of learning uses the synergetic approach.

In Brené Brown's book *Atlas of the Heart*, (Brown, B., 2021) she discusses "Wonder" and "Awe". She likes Ulrich Weger and Johannes Wagemann's explanation that "Wonder inspires the wish to understand; awe inspires the wish to let shine, to acknowledge and to unite." Brown goes on to say, "Wonder fuels our passion for exploration and learning, for curiosity and adventure." And that "awe-inducing events may be one of the fastest and most powerful methods of personal change and growth." As practitioners we need to stay curious about our students and try things that are not planned or scripted but mutually created.

To do this we need to allow students to get creative and communicate their ideas. When students are set up with a reliable access method and tools to accommodate alternative access to mobility, communication and curriculum, students begin to shine. Once the stage is set, if you step back for a moment, you fully appreciate the value of each person - students, parents, and educators. It is truly a sight to behold - Awe and Wonder!

Awe and Wonder come together when all the adults - teachers, specialists, and parents - work together. The results are exponential. In our case, we had a speech pathologist, and occu-



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MELANIE THOMPSON is an occupational therapist and assistive technology Professional. She has been working in AZ for the last 20 years specializing in treating kids with complicated bodies. Her knowledge in seating and positioning, assistive technology, and motor skills development has allowed her to teach kids how to "walk and talk" in different ways. She has taught at Indiana University, NAU, and Midwestern university regarding AAC, assistive technology, powered mobility, and positioning. She has also presented at Closing the Gap (2016, 2017, 2022) as well as ATIA in 2019. Melanie Thompson is on the board of Believe Beyond Ability and is the director of Gye Di. Both are non-profits that are aimed at providing opportunities to children with special needs through the use of technology and play. Melanie was also the recipient of the NBCOT Impact award in 2022 for the impact that she has made on this field and the community of families that she serves.

pational therapist and at least two students working together and constant communication with parents. But 2 specialists plus 2 students did not equal 4 people working together. It equaled so much more. When collaborating, you are required to observe from another's view point and use critical thinking skills to create innovative solutions. Students led the way with their choices which immediately increased participation. Literacy, motor and curriculum were incorporated into these student driven ideas. Gains were made in measurable areas but more importantly, each one had a sense of belonging to a group invested in letting each one shine. We call this collaborative model a "Synergetic Approach."

Mindset requirements for Synergetic Approach:

- We respond to everything the student does and says, assuming it was intentional.
- We believe what they say.
- Refusal is an option.

The synergetic approach has several guiding principles that stay true no matter what the theme of the week or month may be.

The first principle is that the professionals are working with the *whole child* and not domain specific and therefore domain driven. Whether in a self-contained classroom, fully included in general education, or a little bit of both, our students have individualized ways they communicate and access their curriculum. We know that working on communication in a silo doesn't translate well to any classroom setting and addressing motor skills in isolation doesn't magically translate to accessing curriculum. We also know that these areas are not linear. We aren't asking students to master communication or motor skills before they are expected to demonstrate learning in the classroom. We need to help students learn to communicate, be independently mobile and learn to access curriculum in "real time," within their classroom setting, with their peers, in their complex bodies. This is when and where genuine, authentic, meaningful learning takes place. This type of learning is synergetic and requires the expertise of each professional simultaneously. (Angsuwatanakul, T., & Sitthikongsak, S., 2019) This article is focusing on the synergetic approach with children with complex bodies and those that need alternative access to communication, curriculum and mobility.

The second principle is that we provide support so that the student is as *independent* as possible. This creates some "do's" and "don'ts".

- DO establish optimal seating and positioning for the student to have a high level of alertness and enough core support to move a body part with consistency. Consistent access doesn't mean 100%, but it does mean that is intentional rather than a reflexive movement. (Nelson-Wong, E., Smith, K., & Kerr, S., 2021)

- DO establish an access method that the child can execute independently which allows for students to maintain agency over their bodies at all times. (Light, J., & McNaughton, D., 2014)
- DON'T use "hand over hand" or "hand over head". (Holyfield et al, 2017)
- DO provide adequate wait time which varies from person to person and even time of day for the same person. (Light, J., & Kent-Walsh, J., 2019)

The third principle is that each learning opportunity is *engaging*. Engagement requires as much student choice as possible. If the team is choosing a theme, there must be choices within each activity for the student to experience learning in a unique and personal way. Student choice allows for decision making where there is no "right" answer. Anything they choose, we will run with. Student choice requires the professionals to be skilled in a variety of assistive technology tools and augmentative and alternative communication, high and light tech, so that they can adapt participation "on the fly" with clear educational intent. (Reeve, J, 2009)

Addressing the needs of the whole body, adapting the experience for maximum independence and creating engaging experiences are required for an optimal learning experience.

Tools and foundational skills you may want in your toolbox for this approach:

(The following tools were used to assist those that are unable to point, write with their hand or verbalize responses.)

- Establish a "yes" and or "no"

Talking buttons or other single message buttons can be used to teach yes and no. We place a talking button to the right or left of a temple to establish a universal head turn/shake to say "no" and a switch at the top of their head to establish a universal head nod or look up for "yes." If they have another way they are already gesturing for "yes" and "no" we will accept that. If they have just one of these (e.g. Shake head for "no" but no headnod) then you can tell the student that no response/passive will be a "yes." We have teachers post the student name, what their "yes" looks like, what their "no" looks like and level of prompting required (independent, verbal, tactile, requires light tech buttons or symbols or high tech devices.) Now anyone can enter the activity and engage with any student at any time.

- Establish a way to make a choice from a closed set of options.

Single message buttons can also be used for choice making. For example a switch can be recorded with "That's the one." The student is then given at least three choices verbally. For example, when completing an art project the student could be asked, "Do you want to use the switch adapted scissors, rip the paper



or leave it whole? Hit the switch when you hear the one you want. Scissors...(wait 3-5 seconds)...rip the paper...(wait 3-5 seconds)...leave it whole." Cycle through those until you get a decision.

- Create opportunities for variety

A switch adapted spinner can be used when you have choices and there is no wrong answer. For example, "Let's see if we change the first letter of the word how it changes the meaning of the word. Hit the switch to spin the letter machine." The spinner is set up with a variety of letters such as T, F, H, R, P and B. Whatever the spinner lands on is the letter we change in the word to make a new word. This is not a choice but engaging participation in a challenging phonological awareness task.

- Switch adapt activities

Switch access requires a suitable switch (mechanical or proximity) and either adapted equipment, battery interrupters, or bluetooth access to switch settings.

- iClick / Power Link: Tool to make most things you plug in switch accessible including blenders, fan, glue guns, and even laminators.
- BlueTooth switch access to the iPad: The bluetooth interface used the most in our practice is the Applicator by Predatorian because you can set the interface to operate on "single shot" mode so if a student is heavy handed and has trouble coming off the switch it will only send one switch selection to the iPad regardless of how long they stay on the switch.

- Light Tech AAC (no voice output)

For switch users:

- Partner assisted scanning with vocabulary presented on paper: A printed board with pictures or even a list of words can be presented verbally and students indicate the word or idea they want by hitting the "That's the one" switch or indicating "yes."
- Alternative Pencil: Letters are presented verbally with a visual they are pointing at and students indicate the letter they want by hitting the "That's the one" switch or indicating "yes."

For Eye Gaze users:

- Eye Gaze Board: We use a black board with a center square cut out of it with at least four items on each corner of the board. The student is then asked to look at the symbol they want. Symbols or letters are placed around the board and the instructor is facing the student to look through the opening to see where the student is gazing.

High Tech AAC: Speech Generating Device with alternative

access including switch access, eye gaze, or facepointing. Our students often come with their own or school provided AAC system. As long as the student can access the device independently and the language system is robust enough to allow for participation, we use any and every AAC device! We "love the one they are with." (Stills, S., 1970)

Alternative Seating: Students need the opportunity to engage in their education out of their wheelchair. A variety of seating positions are required to increase functional ability and participation in children. (Tung, I. C., Lee, C. Y., & Liao, H. F., 2020)

THE SYNERGETIC APPROACH IN ACTION:

ART: Our first series was based off of the books in the "Scribble series" by Diane Alber. (Alber, D., 2018). Each book offers the opportunity to discuss emotions, teamwork, and our need to feel validated and included with others. These stories give us the platform to use her characters such as Scribble, Sticks, Spot, and Splatter to create our own characters through adapted art. We built in opportunities to increase literacy skills by naming their Spot, describing what their Scribble is doing, and how our friends can help our Splatter to work together to make a masterpiece. We incorporated motor skills through activities such as using a switch adapted pourer to make our colorful popsicle Sticks, grasping and manipulating the Stick while painting, and then using those sticks to create the final masterpiece of a bird house. The students used their AAC devices to create stories about their Scribbles. Was it a boy or girl? What letter does their name start with? What does Scribble like to play? What does Scribble like to eat? This errorless storytelling allows our students to build their vocabulary through exploration of their AAC devices, and allows the beginning of writing tasks by them communicating what they are thinking and imagining. It is errorless because we are providing an opportunity to teach them what the vocabulary means, and we are not testing them to see if they find the "right word"! It is often observed that the students tell stories of things they know, and will relay experiences of things they have seen or heard through these imaginative writing experiences. This demonstrates their level of understanding and problem solving skills. The stories and art work provide numerous ways to adapt the activity to meet the needs of the students you serve, as well as ways to include the academic, literacy, and motor skills needed to achieve their stated therapeutic goals.

FLAT STANLEY (Brown, J., & Nash, S., 1964) is a book commonly introduced in the third or fourth grade. In this story, Stanley was crushed by a bookcase, and his body is now flat like a pancake. This new shape allows him to go on many adventures. For example, Stanley can now hang up like a piece of art in the museum to catch the art robbers, and he can fit down a drain to help find a woman's lost ring. Many schools already use this story to allow their students to create their own flat characters, and then send them off in the mail to a friend or family member to have an adventure. The family member would then document



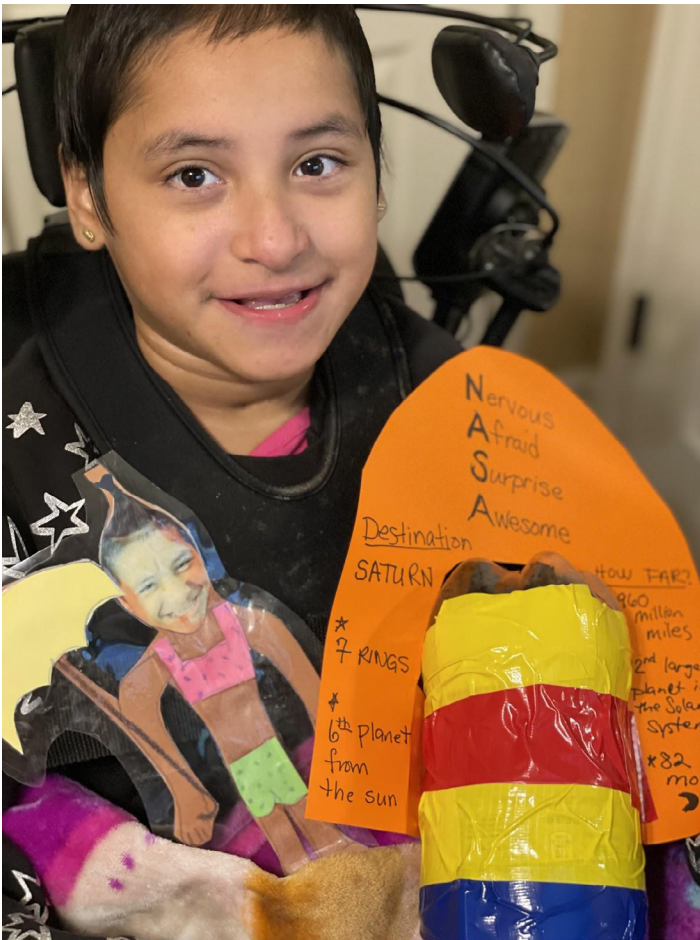


Image 1: Flat Stanely

these adventures and send them back to the school for all of the kids to share the adventures they had experienced.

We used this book to allow our students to create their own flat characters, and had them “Make your own” adventure. Our students all picked an adventure they wanted to go on, which gave us a way to provide student led activities over the coming weeks of therapies. Our students each picked adventures they wanted to learn about, such as having a smoothie shop, going to the beach, and learning about NASA (See Image 1). With this platform, we incorporated a variety of literacy skills and motor skills, while providing academic structure. The students had a flat character that was left at therapy for their experiences, as well as one that was left at home to go on adventures at home. For example, the first week of adventures was a camping adventure. The students used a powerlink connected to a fan, which makes blowing up a tent switch accessible. The students used another fan with red, yellow, and orange streamers attached to simulate a campfire where we told stories and roasted marshmallows. We provided opportunities for the students to spell out their names using the keyboards on their AAC devices, and wrote that on the marshmallows, and compared how big and little the names were to each other. The students used their AAC devices to create their own ghost stories to tell around the

campfire. To increase engagement and follow through at home, their families were given the homework of creating an opportunity for their flat character to do a camping adventure at home. Some families this meant putting up a tent in the backyard. For other families this meant making a pillow fort in the living room with the siblings. For all families, this meant follow-through with therapeutic activities and creating opportunities for movement and play that every other child would have had the experience of.

OLYMPICS: Is there a better way to include motor skills than to introduce the Olympic sports? The Winter Olympics provided an opportunity for our students to learn about the different sports, as well as the people and cultures that the competitors came from. Each child was created a story of their own Olympian, and selected which country they came from. This was an opportunity for all students to learn about those different countries, where they were located, and how they would be getting to China to compete in the Olympics. Each week we introduced a new sport within the Winter Olympics. This provided an infinite number of opportunities to work on motor skills, switch access, and positioning for optimal access to their environments. Each week they added to the story they were creating about their Olympian. What was the food they would eat just before competition to give them strength? Did they have a lucky item or ritual to calm their nerves? Did their Olympian place within their event? The students participated in learning about the country they represented in ways such as listening to their national anthem, creating the flag for the country, and finding facts about their country to share. The students each used a switch adapted laminator (attached to a powerlink) to create flags to attach to their wheelchairs. We wrapped up the Olympic series by bringing all of the kids together to an ice skating rink to experience our own Olympics. Each child represented their country, and engaged in games such as a passing of the Olympic torch. They were awarded the medals within their chosen sport, and they “skated” on



Image 2: Winter Olympics Ice Skating

the ice with all of their fellow Olympians (See image 2). We had a completed version of their Olympic stories including an About the Author section for each child, which was illustrated based on the student's descriptions of their Olympic characters. This was laminated and presented to each child, but is soon to be a published book written completely by non-verbal authors. At the end of this unit, students identified themselves and readers, writers and athletes!

PURPLE PEOPLE: The World Needs More Purple People is a book written by Kristen Bell and Benjamin Hart (Bell, K., & Hart, B., 2020). It walks the readers through the steps of what it takes to be a "purple person." This book and corresponding activities could be adapted for a variety of ages and is covered over months of time. There are five steps to becoming a purple person:

1. Ask Questions
2. Laugh
3. Use your voice
4. Work Hard
5. Be you

This is how we broke down these steps.

ASK QUESTIONS: Students were asked to submit three burning questions and instructors picked one from each student and covered a question a week with hands-on learning. Because peers asked the questions we already have higher buy-in than if the teacher had planted a question. Each question should be considered and one of their three questions is selected based on appropriate content and the ability to expand that question to meet math, science, reading, writing and social studies curriculum. For example one question was "What is a hiccup?" A model was built with a straw and two balloons to simulate the lungs and diaphragm. There are a variety of superstitions and cultural beliefs around the meaning behind hiccups. In some Indian cultures, they believe every time you hiccup someone is thinking about you. And then there are all the rumors and tried and proven ways to get rid of hiccups to explore. That is just one question that covers every area of the curriculum if you stretch it. Students got brave asking hard questions and families reported an increase of asking questions at home. Staying curious is a huge part of education so let's take the time to teach kids how to ask questions and find answers.

LAUGH: In the words of Mary Poppins, "In every job that must be done, there is an element of fun" (Travers, P. L., 1934). Laughter should be included in every activity that is done. But we used this as a week of planning and time to give the kids the opportunity to come back with their personal questions. Since we did not have their questions to start, we chose to use this week as an opportunity to spend laughing! We had performed adapted magic tricks, told jokes, and played pranks on each other. This was done through a variety of access methods such as using

their AAC devices, a step by step for jokes, and switch adapted pie face game.

USE YOUR VOICE: Throughout this week (and all other weeks), we talk about using our voice. Sometimes that is through light tech and high tech and other times is an "inside voice" which is a voice inside your head. We are explicit in talking about how we need EVERY voice...even those we disagree with.

WORK HARD: With a population of kiddos that often need people to serve them, we felt that this was an opportunity for them to work really hard to serve others! We validated that our students work very hard everyday, but this lesson was a chance to give back to those that serve our community. Our students were provided with two opportunities for them to choose from. One group chose to make cookies to give to the local firemen. They used switch adapted pourers and a powerlink to access a switch adapted mixer to make different flavors of cookie dough. The students then took a trip to our local fire house to give cookies to the firemen. In turn the firemen gave us a tour of the fire station. Our students used their communication devices and step by step communication switches to ask the firemen questions that they had come up with within our therapy sessions, which changed the way the firemen conducted the tour for us because they could see they had educated questions and ways of communicating.

The other group chose to make dog treats using the same equipment as previously listed. This group of students packaged these treats into goodie bags, and give these treats to an animal rescue. In turn, the animal rescue brought two special needs puppies they were currently fostering for our students to hold and play with. Again, our students had prepared questions for the owner of the rescue and had questions they wanted to ask about the organization and animals that they help save. Everyone knows the joy and rewards from giving back, and we used this principle as a chance for our students to work hard and give back to their community.

BE YOU: In the book, they begin the 5th principle to becoming a purple person is actually to paint yourself purple! You turn the page and it says, just kidding, 5th principle is to just be you, because you are the only you there is! As a group of interdisciplinary therapists, we could not ignore the direction to paint yourself purple! So we proceeded to have the messiest and craziest therapy day we have ever had! Parents were forewarned, so everyone came in clothes that are old and can be ruined. We used the switch adapted pourer to fill balloons with purple paints and to create purple "Believe" art. We then went outside and used a variety of ways to bust open those paint filled balloons on tarps. We worked on bilateral coordination and upper extremity use, and had ways for them to sway at the balloons on the tarp to create our own adapted art. We then poured different shades of purple paint and another tarp and proceeded to teach our kiddos how to roll down a hill. We LITERALLY painted ourselves purple, but in turn created artwork on these tarps that





Image 3: Switch adapted sorting hat.

have since been repurposed in other ways as art and keepsakes.

HARRY POTTER (Rowling, J. K. (1997): In case you were thinking, “My kids are older than your students and therefore what you have discussed already is not age-appropriate”...fear not! The beauty of adapting curriculum and books to meet the levels of your students means that you can grade activities up and down depending on the individual needs of your students. We dove head first into the first Harry Potter book using the illustrated edition to allow for large and high contrast visual aides to go along with the story. We divided this into a 12 week lesson plan, which gave us enough story line to allow for experiences and motor skills each week. Week by week, this book came alive by creating experiences for the students to engage in the same activities that we had read about.

The students got sorted into each of the houses using a switch adapted sorting hat (See image 3). They engaged in Professor Snape’s potion class by using a switch adapted pourer to pour water over dry ice within their cauldron. They learned how to perform the “Wingardium Leviosa” spell and levitate a feather. The students learned how to fly on brooms using a green screen, and engaged in a Quidditch match on a hoverboard. They created their own spell of love and protection using their AAC devices to express who and what things make them feel safe and loved, like Harry’s parents loved him. They used high tech and low tech keyboards to create their own spells to transform their parents into animals within the transfiguration class. Harry Potter created an opportunity for students of many ages to learn literacy skills in an error free environment because they can create any spell they desire.

Each week kids were highly motivated to engage in motor skills because they were so engaged within the activities. Every switch adapted activity was more than just hitting a switch, it was learning about the science of dry ice or how to make unicorn blood (aka glittery slime). As magical as Harry Potter is, the true magic was what was happening when the students were home each week in between sessions. The follow through and buy in from our families is something that is unmeasurable. A family of a 6-year-old was concerned that Harry Potter may not be appropriate given her daughter’s age because mom herself was a preschool teacher. Within the first week, mom had purchased the illustrated version and it was a nightly ritual that dad and daughter would read the book together, even sending pictures from when she was in the hospital where they were reading together. Families would show how they came home and shared the experiences with the siblings, making their own potions and spells at home. Harry Potter was an imaginative, fun, and special way of recognizing things that make us similar, celebrating the things that make us unique, and how to put a little more magic in our lives!

PLANNING TIPS AND TRICKS

Find your team! The benefits of using a book as a theme is that it provides some direction for each person within the team. With classroom sizes and caseloads, no one really has time to spend large amounts of time planning. This synergetic approach is a fluid way that everyone on the team can know what the theme and content will be, and can not utilize this to create their own activity that will supplement the tip that is being covered. If there is an opportunity to spend 15 min of collaboration, this system will easily allow each discipline to look at the next 6 weeks of questions, chapters, or topics, and determine how they can contribute motor skills, language skills, and academic skills to this theme to make it a cohesive and exciting activity. If planned together, planning for the quarter can be accomplished quickly and easily and allows each person to know what they are bringing to the table without spending a ton of hours or funds! Feel free to use this planning tool to get you started. <https://bit.ly/synergeticplanningdoc>

Shaping Learning Opportunities Through Co-Treatment Toolbox	
Today's Date:	
• Planning for individual student _____ (Student initials)	
Planning time: Identity partners, meeting times, extension activities.	
Who	
When	
Classroom Activity	Main classroom goal, standard, and/or theme for the week:
•	Literacy
•	Science
•	Math
•	Art
•	SEL
•	Other
Write focus area(s) from above here:	Opportunities for individual student choice within this focus area:
Therapy goals addressed:	



Materials: Supplementary items (switches, activity specific symbols, etc.) List/check and describe	
Powerlink	
Access to alphabet	
Switch(es)	
Activity specific vocabulary	
Core vocabulary board	
Easy Holds	
Other:	








Student Response Toolbox: Planning for multiple students. How will the student respond?				
Student:	Yes/No	Multiple Choice	AAC System-high tech	AAC System-low tech
Example: John	Look up- yes Look left- no	PAS	Accent eye gaze	Low tech eye gaze board

Planning Sheet - <https://bit.ly/synergeticplanningdoc>









Remember to include all domains in your planning and participation of professionals. The team should include speech language pathologists, occupational therapists, physical therapists, general education teachers, special education teachers, paraeducators, vision specialists and other student specific support staff.

Perhaps most importantly, include parents to create carryover to home. Be sure to share successes with teachers and families for increased buy-in. You will be shocked at the level of buy-in you experience when students and adults experience belonging to a group that is invested in bringing out the best in each other. Then, you will sit back and truly experience "Awe and Wonder."

Technology			
Picture	Name	Link	Cost
	Jelly Bean Switch	Jelly Bean	\$65
	CandyCorn Proximity Switch	Little Candy Corn	\$195

	Step by Step with levels	Step by Step with levels	\$195
	Talk Buttons	Talking Buttons InclusiveTLC	10 for \$80.00
	Battery Interrupters	Amazon.com : Battery Interrupter for Adapted Toys, Size "AA" or "AAA"	\$10.95
	Applicator	APPLICATOR InclusiveTLC	\$165.00
	Low Tech Eye Gaze Board	Eye Talks Non-Voice Communication Board Enabling Devices	\$27.95 - \$179 (or make your own)
	Switch Adapted Pourer	Enabling Devices - Pourer	\$155-219
	Switch Adapted Scissors	Enabling Devices - Scissors	\$79.95



	Switch Adapted Spinner	Enabling Devices - Spinner	\$129
	Reusable Gear Twist ties	Amazon - gear twists	\$8.97
	Eazy Holds	Amazon - Eazy Holds	\$35
	Power Link	Ablenet Power Link	\$330
	iClick	Inclusive TLC - iClick	\$299
	Modular Hose Switch Mount	Modularhose.com	Variable
	Gooseneck Phone Holder	Amazon - switch holder	\$13.50
	Diane Adler	Website to all her stuff	Variable

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RECENTLY ADDED WEBINARS



Pairing Core Vocabulary With Shared Reading For Early Language & Literacy Success!

By Deidre Dobbels

Loung children with communication impairments are at risk for a variety of difficulties including: frustration, aggression, decreased problem solving skills, withdrawal, resistance to new experiences and delayed literacy development. Nearly 10% of preschoolers will present with a communication disorder between the ages 3-6. It is no longer considered best practice to “wait and see” if a child needs Augmentative and Alternative Communication support or tools, and research has confirmed that utilizing AAC will not stunt or negatively impact future verbal skills. With increased access to AAC supports from low-tech to high-tech, as well as access to a plethora of free supports, AAC must be explored early on in a child’s experience.

This webinar will begin by identifying crucial early language and literacy milestones. It will then move into the appropriateness of utilizing core vocabulary to ignite language skills in non or minimally speaking preschoolers. Participants will be encouraged to utilize core boards provided in the resources to frame every day interactions, allowing them to provide verbal and visual input to communicators using aided language stimulation. The practice of shared reading will be presented and the benefits to the approach especially for students who lack language, engagement and experiences. Participants will learn and practice using the “Follow the CAR...” scaffold as well as putting the “CROWD in the CAR” techniques to building interest, knowledge and language exposure. Finally, the premise of using core vocabulary to engage in shared reading will be explored and demonstrated. This strategy can easily be taught to caregivers and educators new to core vocabulary, be woven into already existing school/daycare and home routines and simultaneously target two important developmental skills.



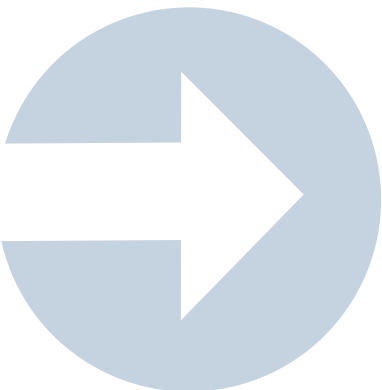
Inclusion, Accessibility and Alternative Access in the Preschool Classroom

By Mary Katherine Dally

Preschool is the first structured learning opportunity for most students. Preschool learning experiences include pretend play during centers, pre-literacy and writing skills, social interaction on the playground and following a curriculum during circle time, among others. For students with complex bodies and complex communication needs, these everyday opportunities and learning experiences within the preschool classroom can be impacted by accessibility.

Throughout this webinar, experience ideas to increase accessibility for preschool students, supporting multiple access methods in the classroom such as switch access, partner assisted scanning, eye gaze and tactile learning for visual impairments. We will discuss how to interpret and support a total communication approach by assigning meaning to play and communication for some of our youngest learners. Come experience and discuss opportunities for alternative access methods to be embedded within pretend play centers, during playground time, within reading and writing centers and circle time with the ultimate focus for inclusion. This webinar will incorporate ideas to design your own accessible areas within the preschool classroom using every day, common items based on student needs.

What is preschool without a social experience? The final portion will focus on supporting peer interaction, inclusion and acceptance when using alternative access methods through a play-based approach. The research points to a decrease in AAC acceptance as students age, therefore, early exposure to AAC use and universal design for learning can support an inclusive environment from the moment children enter preschool. We will examine classroom opportunities to construct peer interaction with AAC users and devices. Whether you work with touch, switch, eye gaze, partner assisted scanning, or head pointing as access, all are welcome to attend this webinar to increase inclusion and accessibility for our youngest learners.



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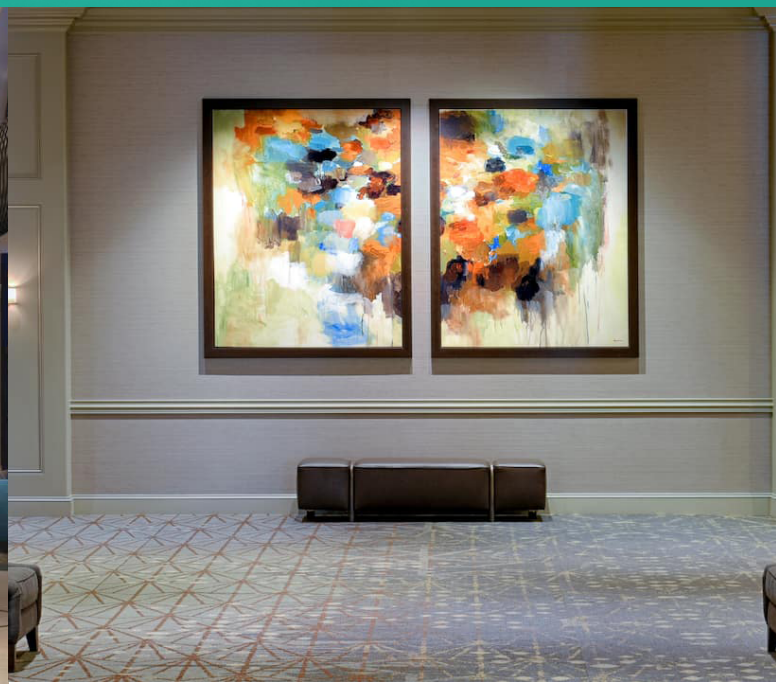
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The Next Generation of Tactile Symbols: 3D-Printed Blissymbolics

ABSTRACT

In this article we introduce you to a new generation of tactile symbols that are perfect for use with non-speaking individuals who are blind, deaf/blind, or visually impaired, as well as students with complex communication needs. The symbols benefit from two different technologies: 3D-printing and Blissymbolics. 3D-printing makes it inexpensive to create these rugged tactile symbols with fidelity. Blissymbolics provides a rich, conceptual language for the development of communication skills with modest cognitive and tactile requirements. This article highlights the experiences shared by teachers of students with visual impairments (TVIs) and speech-language pathologists (SLPs) – how they collaborate and use these tactile symbols with their students. Along the way, we tell you how the public can get free access to these tactile symbols and supporting materials.

This article begins by establishing a baseline understanding of visual impairment and of traditional tactile or tangible symbols. Then, we credit the Project Core team from the University of North Carolina for their creative insight, before going into some depth regarding how their effort falls short of an optimal tactile symbol system.

On the other hand, we believe we have created an optimal system based on Blissymbolics, so we spend some time introducing you to the language of Blissymbols and to our Bliss Tactile Symbols. We've built an entire ecosystem around our tactile symbols, and we want you to know how you can obtain these free resources for your own use.

Note that we are describing more than just ideas in this article, so we share our experiences using these tactile symbols in the classroom.

Finally, we describe a special DIY device that gives our tactile symbols a voice, called the Voice It, as well as some 3rd-party tools and services for managing our symbols in the classroom.



KEN HACKBARTH, is the president of Volkswitch.org – an organization devoted to the democratization of assistive technology by leveraging the power and promise of 3D printing. Prior to his current position he worked for almost three decades as a systems architect for AT&T Bell Laboratories and its subsequent divestitures. He has Master of Science degrees in both Evolutionary Biology and Systems Engineering from the University of Arizona and a Master of Education in Special Education, with a concentration in assistive technology, from Bowling Green State University.



ANITHA MUTHUKUMARAN, is a teacher of students with visual impairments (TVI) working in the Douglas County School District in Colorado. She is in her 11th year of teaching and prior to this career, was a software engineer working in a large bank in the Midwest. She's also a 5th year special education doctoral student completing her dissertation at the University of Northern Colorado. Her main area of research interest is exploring how technology plays a role in implementing an inclusive classroom for children with visual impairments and/or blindness.



SHANNON PAIGE, is a US Navy veteran, a speech language pathologist, and a member of the QIAT leadership team. She is currently the Education Project Manager of the Texas Technology Access Program through the Texas Center for Disability Studies at the University of Texas. She has worked in rehabilitation, public schools, private practice, and as an education service center specialist. She has over 20 years of experience supporting assistive technology with an emphasis in the area of augmentative and alternative communication (AAC).



HEATHER WILLIAMS, is an Education Specialist and Assistive Technology and AAC Specialist. She has been teaching life skills, total communication, and advocacy to transition age students with Multiple Disabilities for twelve years. Heather began her career working with disabled people as a community support facilitator in Scotland in 2000. As a Transition Skills Education Specialist Heather teaches young adults and their families through practical application and collaboration that advocacy and communication are basic human rights and are the foundations of a safe and successful life, lived as independently as possible.



INTRODUCTION

Students with visual impairments and additional disabilities often need a communication system using concrete or abstract symbols. Tactile symbols of core vocabulary words are often used for students with cognitive, motor, or speech impairments. Teachers of students with visual impairments can create 3D-printed Tactile Symbols unique to their students' communicative abilities.

As shown in Figure 1, according to the Office of Special Education Program (2022), of all students, ages six through 21, who received special education services under the Individuals with Disabilities Education Act in the school year 2019-2020, 0.4 percent received services under the category of visual impairments or blindness. Note that in Figure 1, "Other disabilities combined" include deaf-blindness (less than 0.05 percent), developmental delay (2.6 percent), hearing impairment (1.1 percent), multiple disabilities (2.0 percent), orthopedic impairment (0.6 percent), traumatic brain injury (0.4 percent), and visual impairment (0.4 percent).

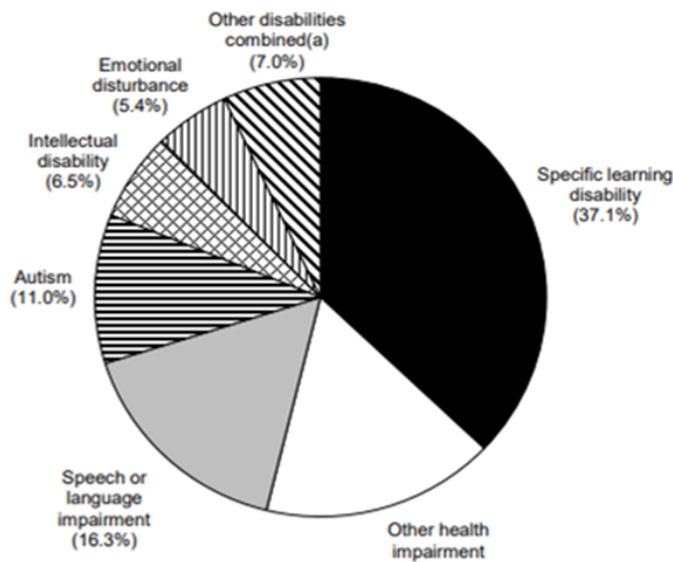


Figure 1 - Percentages of Students Receiving Special Education Services.

The term Visual Impairments includes both low vision and severe visual impairment which ranges from partial to total blindness. Students with visual impairments receiving special education services vary in how they access their learning materials. As depicted in Figure 2, according to the annual quota census by American Printing House (2020) in the year 2019, approximately 8.2% were braille readers, 33.3% were print readers, 10% were auditory readers, 30.4% were non-readers, and 18.1% are pre-readers. Symbolic readers are students who do not currently demonstrate traditional print or braille reading potential. Non-reading students are either students not working on or toward a readiness level or students who do not fall into any of

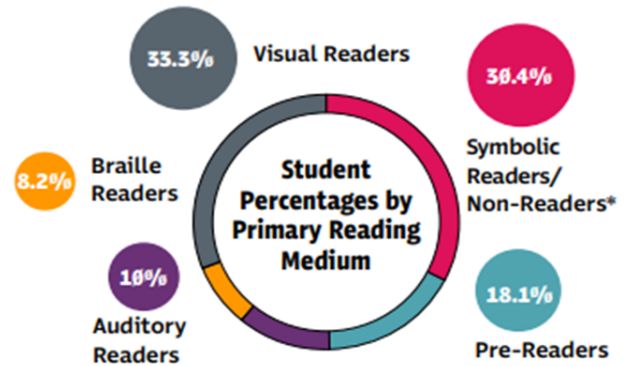


Figure 2 - Divergent Access Needs of Students with Visual Impairments.



Figure 3 - Blissymbols for Symbolic Readers.

the above categories. Based on the above statistics, even within the category of visual impairments or blindness, students differ in how they access their learning content through braille, print, symbolic, or auditory modalities. Considering the divergent access needs of students with visual impairments, when materials are presented in more than one sensory modality (visual, tactile, and auditory), they open up the world for these students to more communication and access.

As shown in Figure 3, when instructional materials are presented in multiple formats, ALL learners can access those materials seamlessly. The idea is for our Bliss Tactile Symbols to be accessible to not only low vision, tactile and auditory learners but to ALL symbolic readers with or without visual impairments. Symbolic readers can access Blissymbols visually (students with low vision), via tactile means (students with significant vision loss), or auditorily (students with physical disabilities who cannot access through vision or tactile means).

TRADITIONAL TACTILE SYMBOLS

You've all seen Tactile Symbols before – even if just in pictures. They're used by individuals who are blind or visually im-



paired and can help them express their needs and desires, as well as gather information about the world around them. They can also be useful when working with individuals who need help with executive functioning, have autism, or don't respond to traditional systems.

The symbol can incorporate a physical object like a ribbon or simply have a unique tactile profile. Figure 4 shows two examples of traditional Tactile Symbols. The first is a plastic starfish glued to a card with the word "star" printed on the front. The second is seven raised dots on a card labeled "snow".

Traditional Tactile Symbols are typically constructed by gluing a physical object to a rigid backing. The physical object may be closely associated with the symbol's referent. For example, Figure 5 shows a plastic spoon glued to a piece of cardboard to represent the concept "to eat".

It's much more difficult to create effective symbols for concepts that are less tangible. Figure 6 shows a tactile symbol with a raised circle as a representation of the concept "yes". Less tangible concepts tend to be modeled very differently by different tactile symbol designers.

Physically large concepts tend to be modeled by choosing a small component of the larger concept even if that small component is unrepresentative of the overall concept. For example, how should a tree be represented? By a leaf? By a piece of bark? Similarly, complex or multi-component concepts are often modeled by selecting a single component of the concept. Figure 7 shows a traditional tactile symbol incorporating half of a tennis ball and labeled "gym" – but is a tennis ball really the best representation of gym class?

Traditional tactile symbol sets rarely represent more than one hundred concepts. When a symbol set is assembled for a small number of concepts, there is little or no motivation to base the design choices on a set of rules. Without rules, there's little conceptual carryover from one symbol to another. Such symbols must, by definition, be learned through rote memorization.

Probably the most revealing aspect of traditional Tactile Symbols (just like popular graphic image sets) is the fact that they always include a text label. Ostensibly the text is there to help communication partners – because without the text, it's unlikely that anyone would connect the symbol to the concept. Only by first reading the label, can someone "back into" the referent – sometimes not even then. Figure 8 shows a card with a piece of string glued horizontally onto it. Why would you intuit that this shape represents the concept "to want"?

Figure 9 shows eleven traditional Tactile Symbols from two different, popular, symbol sets. Some symbols are relatively intuitive – for example, using an arrow for the concept "to go". But why would a beaded triangle represent the concept "more"? We're sure you can rationalize a cross representing "help" – especially a red cross (though this cross appears to be made of brown sandpaper). Consider how much cultural knowledge you have to have amassed in order to make the connection between a



Figure 4 - Traditional Tactile Symbols.



Figure 5 - A Symbol for a Tangible Concept.



Figure 6 - A Symbol for a Less Tangible Concept.



Figure 7 - A Symbol for a Complex Concept.



Figure 8 - An Inscrutable Symbol.

cross and the concept “to help”?

The symbols on the right are, at least, internally consistent. They appear to use a small piece of rope to represent the concept of “now”. But where do you go next if you want to extend the set to represent a new concept like “to want”? The consistent theme is immediately lost. Imagine trying to intuit the meanings of these symbols without their text labels. Then remember that the individual relying on the tactile shape can’t take advantage of the partner text.

PROJECT CORE’S 3D-PRINTED TACTILE SYMBOLS

Let’s now look at a breakthrough in the creation of Tactile Symbols. Project Core is a program of the Center for Literacy and Disability Studies at the University of North Carolina-Chapel Hill. They have established a Universal Core Vocabulary as part of their Universal Core Communication System. In support of their Universal Core Vocabulary, Project Core developed a set of thirty-six, 3D-printable Tactile Symbols. This was a brilliant idea!

Figure 10 shows an early example of their symbol for the concept “to go”. It has a raised arrow from left to right, the word “GO” engraved, and braille bumps for the letters: “g” and “o”. All these features are located on the face of the symbol.



Figure 10 - Project Core “to go” Symbol.

Project Core makes these symbols freely available to the public as STL files. An STL file is a common input to the 3D-printing process. Because the symbols are 3D printed it’s easy to produce exact copies of their designs. Though printed from plastic, they’re very robust and sturdy.

Unfortunately, there are several issues associated with the approach taken by Project Core:

- The STL files cannot, reasonably, be modified, if desired.
- There is no support for extending the set, if needed. There are thirty-six, and only thirty-six, universal core words and 3D symbols.
- Including braille and engraved text along with the raised shape, unnecessarily complicates tactile processing of the symbol. The braille, in particular, is very scratchy and off-putting.
- If you look at the complete set of symbols, there are no obvious features that tie together related concepts, other than their word class. Learning one symbol provides no advantage in learning the next or a related symbol.
- Often, there’s no obvious relationship between the raised shape and the symbol’s referent. Figure 11 shows an image

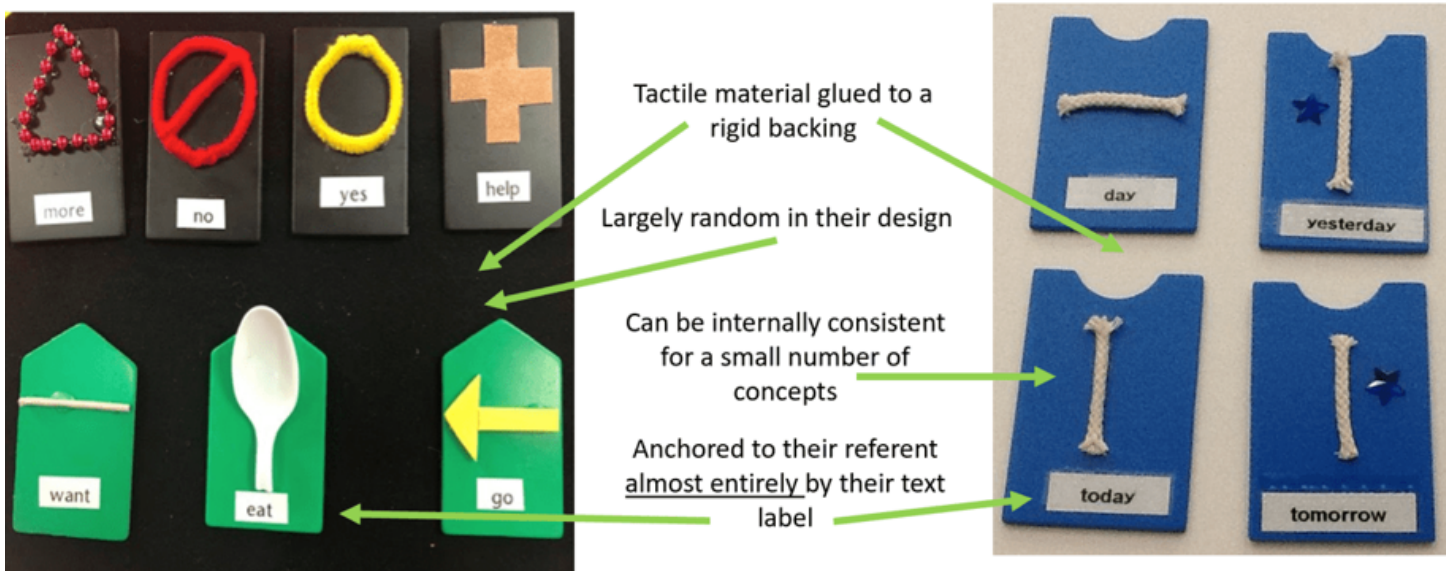


Figure 9 - Two Popular Tactile Symbol Sets.





Figure 11 - Project Core “more” Symbol.

of their current symbol for the concept “more”. What is the connection between three raised bumps and the concept “more”?

- Without clear tactile relationships and carry-over, these symbols must also be learned through rote memorization.

WHAT WOULD AN OPTIMAL TACTILE SYMBOL SYSTEM LOOK LIKE?

If the previous tactile symbol systems are non-optimal, what would an optimal tactile symbol system look like?

1. The symbol system would utilize a conceptual language. As a result, there would be no required intermediate conceptual transformations like tactile shape to sign language to concept, or tactile shape to Braille letter to English word to concept.
2. It would be made of simple elements – thereby lowering the tactile and cognitive load (just a few lines and curves, basically 2-dimensional).
3. It would be extensible – with a generative language, you can easily create new symbols from existing ones.
4. The tactile symbol design itself would be flexible – you and your student would be in control of the amount of complexity. Yet, creating exact copies of your design would be as simple as 3D-printing them.
5. There would be a governing body to validate and ground construction of the language and specification of symbols.
 - a. The governing body would establish a set of rules to direct the design of new symbols.
 - b. The rules would be enforced to ensure consistency as well as carry-over of learning from symbol to symbol.
 - c. The governing body would be multicultural and multilingual, thereby ensuring that the symbols would be independent of culture – in other words, cultural knowledge would not be a prerequisite for their use.



Video 1 - An Introduction to Blissymbolics
YouTube link - <https://www.youtube.com/watch?v=oAAt-5Mulig>

BLISSYMBOLICS

With those characteristics in mind, take five minutes to watch Video 1 about the basics of Blissymbolics.

Blissymbols are unlike any other graphic symbol set. They are curated by a multicultural, multi-language, non-proprietary governing body – [Blissymbolics Communication International](#) (BCI for short). When a new symbol needs to be added to the language, a collection of individuals ensures that the symbol adheres to the rules of symbol design and leverages the rest of the language. What process do you think is followed when they need to add a new symbol to PCS or SymbolStix?

In 1971, Shirley McNaughton (a recent president of the board of directors for BCI) as a part of the Ontario Crippled Children’s Centre’s (OCCC) Symbol Communication Project, came across and utilized the precursor to the current Blissymbolics and used the system to create and publish *The Handbook of Blissymbolics for Instructors, Users, Parents and Administrators* in 1978. The system took off around the world.

In 2015, Isaacson and Lloyd saw something special in Blissymbolics that had them wondering about its applicability to the tactile domain (Isaacson and Lloyd, 2015).

In particular, they thought:

“Due to their simplicity, edges, outlines, and kinesthetic feedback are optimized in raised-line renderings of Blissymbols, which may facilitate recognition of tactile Blissymbols. In short, the conformational characteristics of Blissymbols results in stimuli that have minimal complexity (or low potential cognitive load) and when rendered as raised lines have characteristics that may increase the efficiency of perceptual/cognitive processes involved in communication with Tactile Symbols.”



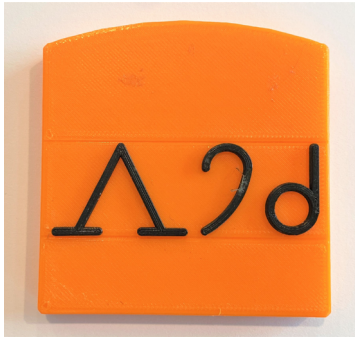


Figure 12 - Music Therapy Blissymbol.

There are many functional applications of Blissymbolics in the classroom. The simple and consistent shape-based Blissymbols can be used by students to convey complex information. For example, Figure 12 shows an image of the Bliss Tactile Symbol for music therapy. Blissymbols can be used for all curriculum subjects and extracurricular activities, as well as for communication, by combining the shapes already established in Blissymbolics. Due to their ability to be adapted across multiple subjects and situations, Blissymbols allow for a more organic language experience for students with intellectual disabilities and vision impairments compared to other traditional tactile systems. Students who use Blissymbols may have the means to be more interactive in their lessons and therefore build a stronger understanding of concepts presented, since they would have the means to answer questions with premade Bliss Tactile Symbols relevant to the lesson (similar to how sighted students have word walls and vocabulary banks). This also allows for expanding student vocabulary as the student learns symbols specific to each lesson by using tactile Blissymbols that are created easily, and 3D-printed in a few hours.

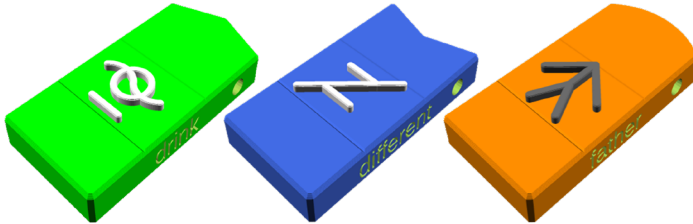


Figure 13 - Three Bliss Tactile Symbols: to drink, different, and father.

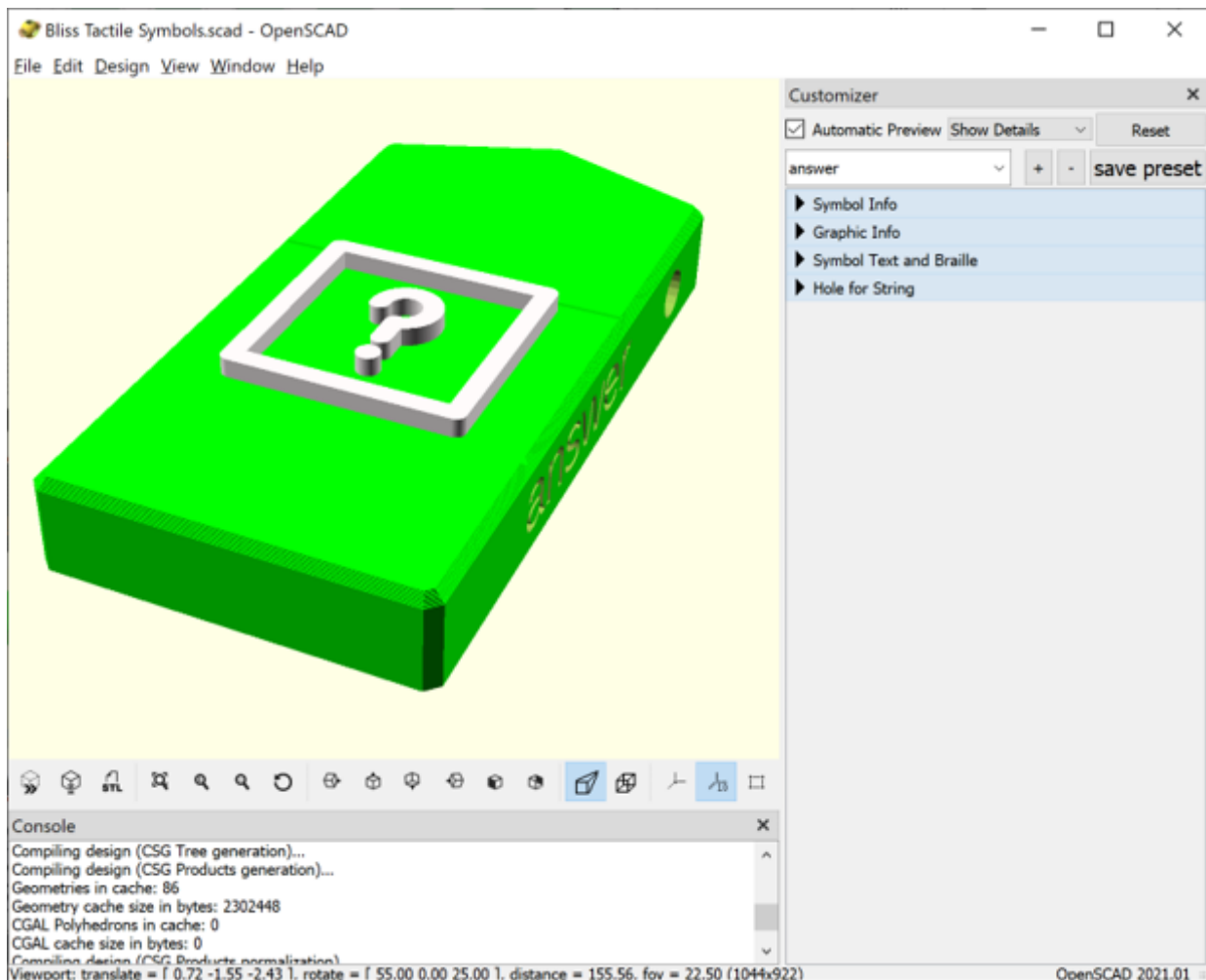


Figure 14 - Tactile Symbol Designer User Interface.

OUR BLISS TACTILE SYMBOLS AND SUPPORTING MATERIALS

As mentioned in the abstract, we've constructed an entire ecosystem around our Bliss Tactile Symbols. This takes the form of a rich set of ready-to-3D-print symbols, a symbol designer for modifying and creating new symbols, a collection of sample 3D-printable motivational and remedial tools along with a designer for creating your own, and an introductory library of explicit teaching plans to aid you in getting started using these Tactile Symbols in the classroom.

Figure 13 shows images of three of our [Bliss Tactile Symbols](#) - to drink, different, and father.

We've made [242 of our symbols](#) free for you to download and 3D-print via the Volkswitch website. They span the 36 [Universal Core Words from Project Core](#) as well as Gail Van Tatenhove's "[Core Vocabulary List for Students with Intellectual Disabilities](#)".

TACTILE SYMBOL DESIGNER

We also provide a [free tactile symbol designer](#) that you can use to modify our initial symbol set, as well as to create new symbols based on the [free graphics from BCI](#). Figure 14 shows an image of the tactile symbol designer's user interface. Modifying an existing design or creating an entirely new one is as simple as choosing options from pulldown lists and typing some text.

BLISS PUZZLES, EXPLORERS, AND CHALLENGE TILES

You can take advantage of the pictographic nature of Bliss symbols to construct motivational tools like our [Bliss Puzzles](#) - which are also 3D-printable. Figure 15 shows an example Bliss "Head" Puzzle in both assembled and disassembled form.

3D-printed [Explorers and Challenge Tiles](#) can provide scaffold

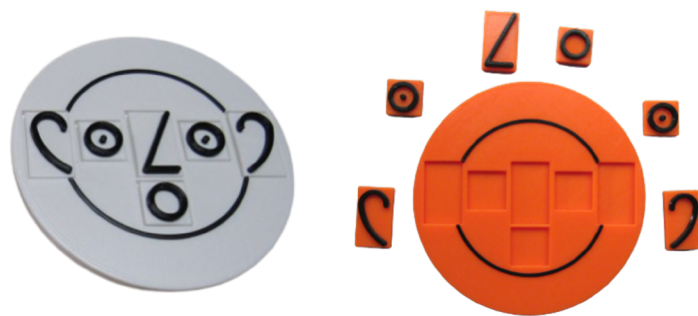


Figure 15 - Example 3D-Printed Bliss Puzzle.

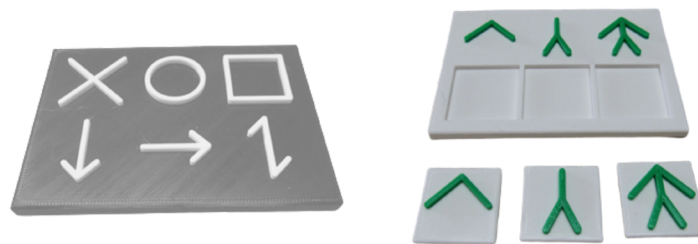


Figure 16 - Example 3D-Printed Explorer and Challenge Tile Set.

folding for children who need to build their skills from simple tactile shapes to more complex ones. Figure 16 shows an example explorer and an example challenge tile set. The challenge tile set illustrates building the symbol for father from the symbols for protection and man. We provide a free, easy-to-use [designer](#) to create these tools and the Bliss Puzzles, for yourself, based on your student's needs.

EXPLICIT TEACHING PLANS & SUPPLEMENTAL MATERIALS

You can incorporate our Tactile Symbols into your classrooms in the same way that you've previously incorporated traditional Tactile Symbols. But we've taken the extra step of developing a few, simple, [explicit teaching plans and supplemental materials](#) to help you get started. Figure 17 shows an image of a documented teaching plan and the Bliss Tactile Symbols and Bliss Head Explorer used to support that plan. Our set of teaching plans is admittedly small at this point. We'd love your help in extending the set based on your own learning and experience.

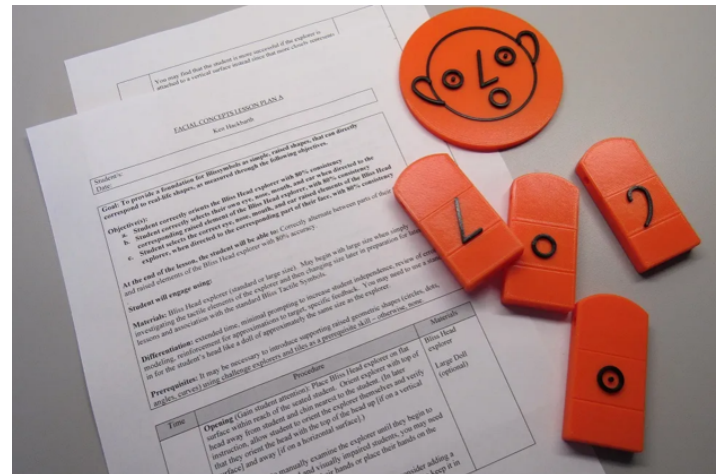


Figure 17 - Example Explicit Teaching Plan and Supplemental Materials.

DIY AND 3RD-PARTY PRODUCTS AND DEVICES

In this section, we present a collection of DIY devices and commercial offers that you might want to take advantage of to facilitate your use of our Bliss Tactile Symbols in the classroom. To be clear, we are not financially connected to any of the companies.

THE BLISS TACTILE SYMBOL CARRIER

The company, Augmentative Resources, makes several products for the management and display of communication symbols. Figure 18 shows their [Bliss Tactile Symbol Carrier](#) (\$64.00) that they created specifically for the display, management, and transport of our Tactile Symbols carrier. The carrier is shown in both closed and expanded configurations.

The carrier has a rigid spine and a padded separator that



Figure 18 - Bliss Tactile Symbol Carrier.

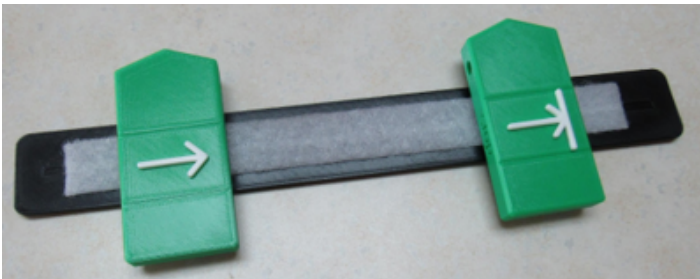


Figure 19 - 3D-Printed Message Builder with Go and Stop Bliss Tactile Symbols Attached.



Figure 20 - Trifold Choice Board with Several Bliss Tactile Symbols Attached.

keeps the symbols carrier from clacking against each other during transport. In the picture, we've used the space of the rigid spine to attach a 3D-printed "Message Builder". Figure 19 shows an enlarged picture of a Message Builder with the symbols for "go" and "stop" attached. You can download the free, 3D-printable Message Builder STL file from the Printables website. Figure 20 shows their [trifold choice board](#) (\$45.61) with six Bliss Tactile Symbols attached.

PURCHASING PRE-PRINTED BLISS TACTILE SYMBOLS

The people at the [3D Learning Shop](#) on Etsy have already made a business of 3D-printing and selling the Project Core, 3D-printed Universal Core words (approx. \$6 per symbol). You may be more comfortable purchasing 3D-printed devices and symbols rather than making them yourself. For that reason, we contacted the 3D Learning Shop about [printing and selling](#) our Bliss Tactile Symbols (approx. \$5 per symbol) as well as Voice It boxes (offer in the planning stage at this time) – and they agreed.

CREATING CONSISTENT USER-INTERFACES ON AAC DEVICES

If your favorite AAC software will allow you to place your own graphic images on one or more buttons, you can take advantage of Blissymbolics to create a consistent interface for your students. We support that effort by making the symbols for all 242 concepts in our collection accessible via a webpage. Figure 21 includes screenshots of both TD Snap and Proloquo2Go. In both instances, the default button images have been replaced with their Blissymbol equivalents.

THE VOICE IT

The [Voice It](#) can be used with our Tactile Symbols to provide a multi-sensory experience. The Voice It is a simple, DIY device that reads an RFID tag and then plays a recording associated with the word or words it finds on the tag. You can build a Voice It in less than 45 minutes using about \$130 in off-the-shelf parts and a screwdriver. RFID tags can be purchased online for anywhere from 15 to 30 cents each.

We provide free voice files for all 242 of our concepts in both English and Spanish - and adding a new concept or even a new language is a simple matter. It's also simple to extend the recordings to give a voice to just about anything from a plush toy to a children's book. Figure 22 contains a picture of an assembled Voice It box surrounded by a few Bliss Tactile Symbols.

A VIEW FROM THE CLASSROOM

Jazmin is 20 years old. Since 2019, she's attended a small, special education, public school in Woodland, CA. For the past four years Jazmin has been enrolled in the Transition Skills class, which serves students diagnosed with multiple disabilities ages 17 to 22.

She was born legally blind and has a diagnosis of intellectual disability. Her right eye is absent (anophthalmia), and her left eye is underdeveloped, small (microphthalmia), and has a coloboma (cleft in the iris, the colored part of the eye). She also has retinal dysplasia, a congenital defect of the eye that occurs when the layers of the retina do not form and attach properly during fetal development. Jazmin is bilingual – understanding concrete statements in both Spanish and English.

When Jazmin came to the class, she relied on others to provide a timed transition between lessons and activities. People did not talk with her other than to tell her what to do and to tell



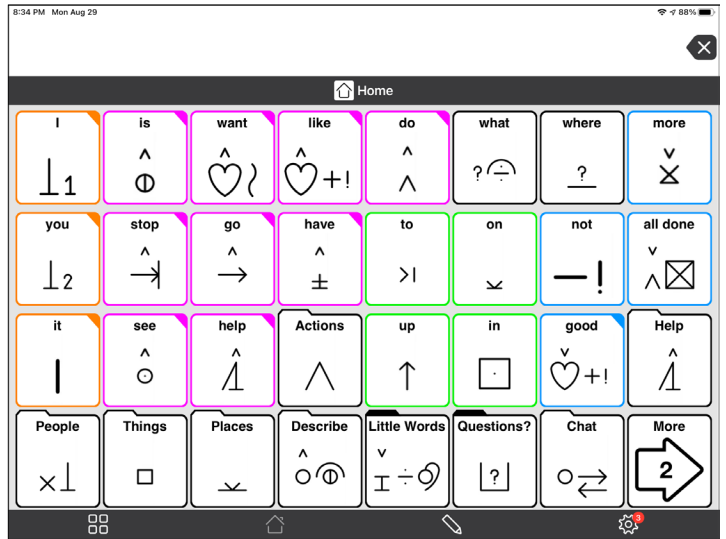


Figure 21 - Two AAC Apps with Blissymbol Button Graphics.



Figure 22 - The Voice It.

her that the timer had gone off to transition to another activity. Jazmin does not like to transition from one thing to another. In class, she rejected timers and refused to transition to a new scheduled lesson during the school day – often screaming, crying, and banging her cane on the floor for as long as 30 minutes. The VI specialist showed the classroom staff, and Jazmin’s family, traditional Tactile Symbols and how they could be used as a tactile schedule to help her to anticipate transitions throughout the day.

After two weeks, Jazmin demonstrated to the staff that she really liked the tactile schedule. She would ask for activities to put on her schedule; independently go to the place in the classroom where she kept her schedule; and carry it in her backpack when out shopping.

While she was getting used to her new system she would pull the pieces off their backing, bend them, and bite them. When she was bored or upset, she would fidget with them, pick at them, and bite them. Occasionally, the staff would accidentally take one home and wash it – thereby, destroying it in the process. Other students were interested in the symbols and would

explore them, lose them, and pull off pieces. The staff had to recreate the same Tactile Symbols for Jazmin every single week for two and a half years. If the symbols could not be replaced by the next day she would cry, scream, strike out at people, and attempt to bite. She made it clear to the staff that she greatly valued her schedule but she needed a more durable solution.

A few months ago, Jazmin was introduced to the 3D-printed Bliss Tactile Symbols as a tactile schedule. By introducing these new symbols in a familiar setting, she understood how they could help her anticipate her environment and schedule, just as before. Once Jazmin learned to use the Bliss Tactile Symbols as a tactile schedule, the classroom staff taught her that she can use the Blissymbols to help control her day.

Video 2 shows Jazmin sitting at a table with two Blissymbols (“more” and “all done”) in front of her. When she starts to vocalize that she is frustrated, the Bliss Tactile Symbols are placed in front of her and she is prompted to tell the staff how she wants to proceed. If she gives the staff member the “more” symbol she is given the option to continue the work she was doing before she became frustrated. If she continues to be frustrated after providing the “more” symbol, she is immediately handed the “all done” symbol and assured that the staff understands that she is finished with her work. She’s also given time to process her frustration.

If Jazmin gives “all done” symbol first, she is provided with a confirmation that she is finished with her current work. She is then be prompted to choose a different neutral activity – something she doesn’t mind doing – and advised that once she completes the neutral activity she can play piano – a favorite free time choice. In the video, she tells staff that she first wants to work, then play piano.

By knowing what is expected of her, and being able to anticipate future activities, Jazmin has gained significant control of her day.





Video 2 - Jazmin Beginning to Communicate with Bliss Tactile Symbols in the Classroom.
 YouTube link - <https://www.youtube.com/shorts/TttY69iumyY>

Even after three months, her Bliss Tactile Symbols have not needed to be replaced due to breakage. They cannot be bitten through or ripped, and they are durable enough to go through the washing machine and the dryer. Currently, Jazmin has mastered eleven Blissymbols that she uses to manage her daily schedule. She also uses the symbols to help her focus on transitions using first/then strategies.

The eleven Bliss Tactile Symbols that Jazmin currently uses are: Snack, More, Stop, Lunch, Piano, Walk, Work, Bus, Go, Cooking, and Music Therapy - all but Go are pictured in Figures 23 and 24.

She is not yet interested in learning which symbols are nouns, verbs, or adjectives, but she actively seeks to use this language to help her navigate her school day. Her classroom team keeps encouraging her to expand her knowledge, and she shows them when she is ready to learn more. The staff plans to introduce Jazmin to literacy skills by using the Bliss Tactile Symbols to help her answer questions about audiobooks and class lessons.

In Figure 25, Jazmin is using the premade, explicit teaching plan from Volksswitch.org to learn parts of her face. She is sitting at a table with a 3D-printed Bliss Head explorer and the associated Tactile Symbols.

Jazmin has learned to match the symbols to the facial elements of the explorer, and in turn, to relate the symbols to the parts of her own face. She had not shown that she knew the names for regions of the face before using the Bliss Tactile Symbols. Jazmin often becomes echolalic when stressed, frustrated, or tired. It took about six weeks for her to independently identify



Figure 23 - Six Blissymbols Jazmin has learned to use.

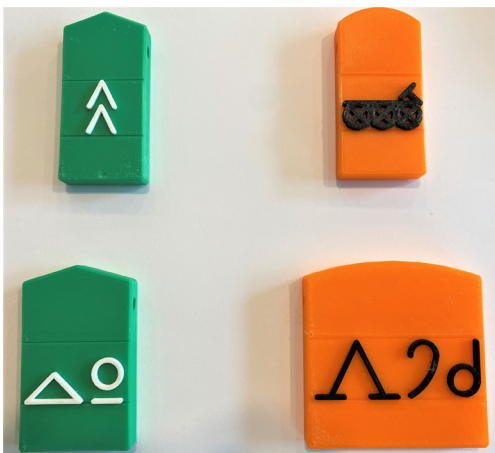


Figure 24 - Four Blissymbols Jazmin has learned to use.



Figure 25 - Jazmin during a Blissymbol lesson

regions of her face with Bliss Tactile Symbols as prompts. She enjoys matching the facial features of the explorer and to her own face – laughing when she matches correctly.

Learning the Blissymbols for facial features has made it easy for Jazmin to show others if she is in pain or discomfort – two conditions which cause her to stop communicating in a way that is easily understood. Now she will independently state a part of the face and we can focus on helping her in a more specific way. Other times, she initiates a conversation by finding a face symbol, touching her face, and saying the name of the part independently. The staff supports this by talking about that part of the face and offering more parts to talk about to practice communication skills and promote language development.

Since starting to use the Bliss Tactile Symbols in September 2022, Jazmin has increased her independent transitions between lessons, independently asks the staff if she can have a break, identifies parts of the face, initiates communication, and has increased her speaking vocabulary. She is much more confident and consistent in her communication. Jazmin has shown us that consistent, reliable communication tools such as the Bliss Tactile Symbols are a powerful way to grow one's communication, self-esteem, and independence.

FINAL THOUGHTS

The population we are targeting with our Bliss Tactile Symbols are those individuals whose current form of communication is simply not working. As a result, these individuals do not have a shared system for communication. Their caregiver or caregivers may understand certain movements, vocalizations, or simple gestures, but they may not always be around to interpret for the individual. If the current form of communication restricts future potential, then an appropriate communication system should be identified and implemented based on the individual's unique strengths and weaknesses. Despite the benefits communication systems may have for students with complex communication needs, professionals often recommend communication systems based on familiarity, past experiences, or discussions with colleagues, rather than through evidence-based practices.

A form of AAC that is often overlooked in that consideration process, and should be included, is Tactile Symbols. Until now, Tactile Symbols were created on the fly which reduced the consistency in their implementation – and they were not implemented until other communication systems and strategies had failed. The key here is to closely observe the potential communicator and look at each area to identify their unique communication profile. This can only happen via a thorough assessment to determine the individual's capabilities. This must take place before implementing a functional means of communication designed to accommodate those needs and abilities. We do not want to make the mistake of providing an emerging communicator with one type of communication system that either fails or limits their communication potential. There should often be a

set of Tactile Symbols available as an option.

Tactile Symbols improve a student's access to social interactions in the community. The symbols can be used as a communication system for individuals with dual-sensory impairments, especially since tactile perception is important and leads to the development of motor skills that encourage grasp, pincer, finger isolation, bilateral hand use, finger position, tracking, and including pre-braille skills. The Bliss Tactile Symbols can function as an AAC system and also as a supplemental tool. Think about individuals with autism that may be overstimulated by auditory information even though they are verbal communicators. These symbols are perfect manipulatives to reinforce verbal instructions when these individuals are overwhelmed by their environment. You can and should allow the individual time to look at, touch, and explore them. This reduces the load on their short-term memory. The benefit of these symbols is that you can individualize the organization and presentation layout. The symbols are concrete and can be fixed in a set position and you can choose which words are needed to support communication development. They are easily reproducible with fidelity and there are an unlimited number of options for words and word combinations.

Additionally, the Bliss Tactile Symbols can be used to help learners to be more independent throughout their day. For learners who do not easily transition between classes or lessons, the Bliss Tactile Symbols can be used as a tactile schedule of the lesson or of the day – either as a sequence of events throughout the school day or presented as 'first/then', where the student focuses on each individual transition, for example 'first PE, then Reading'; 'first Reading, then Lunch'. Not only does this afford the student agency in their day by taking responsibility for their own daily routine, but it may also help the student transition more smoothly between classes or lessons and reduce potentially disruptive incidents, since students are anticipating their own schedule and have the ability to independently remind themselves of what is coming next. Autonomy within routine can help to build confidence and self-esteem, reduce frustration, and reduce dependency on others.

The meaningful application of 3D-printing technology in K-12 schools has been rare and inconsistent despite the availability of inexpensive 3D printers since 2009 (Horvath & Cameron, 2018). Although a popular use of 3D-printing technology is building tactile models for individuals with visual impairments, teachers of students with visual impairments have not yet exploited the benefits of this technology (Yue-Ting, 2014). More often than not, technology companies design products without understanding the unique needs of non-visual learners. Teachers of students with visual impairments who are experts in the pedagogical needs of students with visual impairments can use 3D-printing technology to create Tactile Symbols for their students. By using 3D-printed multimodal symbols such as the Bliss Tactile Symbols, instructions in academic and functional sub-



jects that were previously considered inaccessible by students with disabilities can become accessible.

Blissymbols are an ideal tactile communication system in the classroom because every Bliss Tactile Symbol can be recreated identical to the last, ensuring that students who use these symbols can have a ready supply of language with fidelity, akin to speech or American Sign Language. When they can be used throughout the day, in multiple settings, and with both educators and peers, Blissymbols have the potential to be incorporated naturally into the student's communication repertoire, as people interacting with the student using Tactile Symbols will become familiar with the consistent language being used in meaningful ways to convey ideas, emotions, and information.

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The Intersection of Behavior and Assistive Technology

In today's classroom, it can feel like nothing stays the same. Each year there are new lessons, new technologies, new students, and new staff. School culture and the expectations placed on students by educators, families, and their social networks change from year to year as students grow.

However, there are a few factors that remain the same. One important constant is that student behavior needs to be discussed and considered when looking at each student's educational experience. The consideration and use of assistive technology (AT) is one factor that can play a significant role in students' behavior in our schools.

DEFINING BEHAVIOR

In most educational settings, when educators discuss behavior, the tone is negative and full of frustration. Discussions of behaviors often revolve around negative things that students are doing in the classroom that impact both their learning and that of their peers. Educators may be frustrated because they are unable to do anything to stop the negative behavior and improve student learning.

These conversations, both in and out of the school setting, have led to the belief that behavior, in and of itself, is a negative thing.

For this article, it is essential that we take a deeper look at the true meaning of behavior. According to the Oxford Dictionary, behavior is "*the way that someone behaves, especially toward other people.*"

Taking this definition further, we can consider behavior to be the actions a person, including students, take to get what they want or need.

From this standpoint, the discussion of behavior becomes less about negative and positive and more about the idea of why students are behaving the way they are.

BEHAVIOR AS COMMUNICATION

When a person behaves in a certain way, it is in order to interact with their environment or the people around them as they attempt to obtain a desirable outcome. The student who is friendly and smiles at their peers hopes to make friends and engage in social interaction. Conversely, a student frowning and looking down or away may be trying to avoid talking to others. Each is attempting to attain what they believe they want or need at the time.

In this way, we can further our discussion of behavior to consider the want or need the student is trying to communicate. Each person's behavior is communicating something. The words they say or don't say, how they carry their bodies, and the actions they take, are all ways of communicating preferences, wants, and needs.

When we consider behavior in this way, we are able to step back and look at the undesirable or disruptive behaviors that a student may be displaying and begin to look at the function of the behavior. What is the purpose of the behavior? What want or need is the student communicating through that behavior?



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Let's look at a scenario where a student is frequently being removed from the classroom. The student is described as disruptive and aggressive and even has gone as far as swearing at the teacher and their peers. However, in some situations, this student is friendly, calm, caring, and helpful. Without looking further, it would be easy to leave the discussion at the point that the student must not like that class or teacher and is being rude and disrespectful.

However, if we consider our definition of behavior and look at what the behavior is communicating, we can look further. This student is being removed from the classroom when they display these behaviors. When we look back at what happens before the behaviors start, we might realize that these behaviors always begin when the student is asked to read. The behavior appears to be communicating a desire not to be in the classroom or some level of discomfort with the act of reading.

THE IMPACT OF ASSISTIVE TECHNOLOGY

Assistive Technology (AT) is any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities.

In the school setting, AT is frequently used to provide access to the learning environment. Teams work to ensure that students with disabilities are able to interact with their learning materials in such a way that the student has access to the same education as their peers. When a student is communicating through their behavior a level of discomfort with a task they are being asked to do, it is essential to consider if the student is struggling with accomplishing the task and, if so, why? For example, are the problems due to a lack of instruction or an underlying disability?

Let's consider the situation above again. We know that this student is displaying disruptive and negative behavior when asked to accomplish tasks that require reading. In looking at the student's Individualized Education Plan (IEP), it appears that the student has a documented reading disability. The IEP includes documented supports for reading, including the support of an educational assistant to read for the student in the classroom.

Let's say that the student and the educational assistant have a good relationship. In the past, when the student was asked to complete a task that required reading, the educational assistant would sit near the student and read the content out loud. The student appeared successful with this support in previous years. However, now, the student is refusing to work with the educational assistant in the classroom, and this has become part of the disruptive behavior that is causing the student to be removed from the classroom. Moreover, the student is now in a new classroom in junior high.

The team theorized that the student might be feeling uncomfortable with the educational assistant reading to them in the classroom and decided to try introducing assistive technology as a way for the student to read the content independently. In

this instance, the student's disruptive behavior and their subsequent removal from the classroom decreased significantly, providing evidence that the behavior was communicating a level of discomfort with the previous supports and preference for the new supports put in place.

In this example, adding assistive technology in the form of a screen reading device to the student's day increased the student's ability to remain in the classroom and decreased disruptive behaviors.

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

In the example above, the student had shown success with having an educational assistant available to provide reading assistance. However, at a certain point, the student's behaviors began to communicate that the student was once again experiencing difficulty or discomfort when reading tasks were assigned.

The student *could* be successful with adult support. However, at some point, the student's behaviors began to communicate that something was no longer working.

The critical point in this scenario is that the student had progressed through multiple grade levels and was now in a new classroom in a junior high setting. From a social standpoint, the student was now uncomfortable with an adult sitting near them and reading to them during class. This discomfort was communicated by the behaviors that the student displayed when being asked to complete tasks that would require the support of the educational assistant.

There are many considerations when evaluating which assistive technology may work best for a student. Most evaluation methods ask the team to consider the environment in which the student will be expected to use the assistive technology.

As students grow and progress through their school years, the social and environmental influences on their experiences change. The classroom environment, such as desks, chairs, whiteboards, and peers, may not change drastically from elementary school to high school. However, how the lessons are taught, the expectations for student independence, and social and peer pressures change dramatically.

Assistive technology that works well for a student in an elementary school environment may suddenly feel uncomfortable to the same student in a junior high or high school setting. For example, AT that was easy to use when a student remained in a singular classroom may suddenly become cumbersome when it needs to be moved to multiple classrooms daily. In this situation, a team may discover that AT that previously was accepted and used confidently by the student may no longer be effective.

Alternatively, a student who previously may have been unwilling or unable to use AT in favor of working with an adult may welcome the addition of assistive technology to increase independence.

Social implications of assistive technology use become increasingly considered as students progress from elementary



to junior high and high school. While many tools have become available to all students due to the increasing availability of built-in AT tools on devices students use each day, other tools are more obviously unique to the student using them.

During adolescence, a student's desire for independence increases as they look for ways to move toward becoming an adult. At the same time, the student is seeking belonging, friendships, and a place in the social environment of their peer groups. In this time period, where students wear certain clothes, use slang phrases, and act in a specific way to fit in with their peers, using a unique tool can be scary, as it is a symbol of being different from their peer group.

Depending on the environment and the school culture, assistive technology can be both a tool for independence as well as a marker of dependency. The same tool that may provide increased independence and freedom from needing adult support may make students feel different, or attract unwanted attention from their peers. These competing feelings and experiences can lead students to reject AT, even if they know the tools can help them accomplish their goals more easily.

IEP teams must consider the environmental and social impacts of assistive technology use when considering what AT may work best for a student. Then the student's preferences, shared both directly and through their behavior, must be considered to determine if the AT tool is truly effective for the student.

LONG-TERM GOAL OF ASSISTIVE TECHNOLOGY

As students progress through their educational careers, assistive technology can significantly impact their independence and success. When students graduate and leave the school system, the AT introduced and utilized throughout the student's school career becomes the tool that the student is prepared to use as an independent adult.

The student's views of, and behavioral response to, using this assistive technology across environments and social situations will determine the behaviors they display towards using these tools as an adult.

Suppose a student displays behavior that communicates discomfort with using the AT, but they use it based solely on the school's requirement to do so when they leave the school. In that case, it is likely that the AT that could have benefited the student throughout their lifespan may never be used again.

Consequently, the importance of continuously listening to student preferences and comfort— shared both through communicated preferences as well as behavior— cannot be overstated.

ASSISTIVE TECHNOLOGY ABANDONMENT

Assistive technology abandonment may look different at different age levels and learning environments. Abandonment may look like the full-on refusal to use the device or tool that is being provided to the student. However, it may also look like a

student who suddenly "forgets" to charge their laptop every day before class. It may look like a student who starts an argument with the teacher and gets kicked out of class every day before they are expected to read. Or it could look like a student who graduates and never again uses the writing program they loved in school.

Often, when a student who has been evaluated for, and introduced to, assistive technology feels that the tool adds some form of barrier to their day, they will continue to struggle with the task rather than utilize the assistive technology. This becomes increasingly likely when the student feels that the environment or social paradigm does not welcome the use of AT.

In these situations, a student is not using or has stopped using assistive technology which has the potential to help them be more independent and successful in reaching their goals, both in school and as an adult.

As a result, a team might view the student's actions as simply bad behavior and stop the conversation there. This has deleterious consequences for the student, peers, and educators.

However, by looking at what the behavior is communicating, a team can work with the student to determine if the AT is no longer meeting the student's needs or if there is a way to make the tool work better. They can also consider strategies that could be used with the AT to make the student feel more comfortable and successful. Looking at the causes of the behavior, and addressing them with supports such as AT, is a win-win for students, peers, and educators.

STRATEGIES FOR BEHAVIOR AND ASSISTIVE TECHNOLOGY

When we remember that behavior is simply how a person acts to meet their needs and desires, it becomes easier to view behavior as a form of communication. and to look closer at what the student is communicating with their behaviors.

When it comes to assistive technology, a student's behaviors can show us a lot about their potential need for it, their comfort with existing AT, and the whether or not they will continue to use and benefit from the AT they used in school throughout their lives.

In addition to fundamentally changing our view of behavior and opening up deeper conversations about why a behavior is occurring, some additional strategies can be used to decrease negative behaviors and increase the use of assistive technology in the classroom:

- **Make assistive technology mainstream.** When assistive technology is an integrated part of a classroom, students are more likely to feel comfortable using the tool during class and in front of their peers. By making assistive technology an available and integrated part of the classroom environment, the potential of feeling self-conscious or embarrassed greatly decreases.



- **Communicate regularly.** Make a plan and keep communication open with the student using assistive technology. Talk with the student about what is and is not working. If students feel uncomfortable communicating discomfort directly, they will communicate this through behaviors likely deemed undesirable or “disruptive.”
- **Involve the student beyond the initial trials.** Often students who use assistive technology undergo the evaluation process at the beginning of their AT use. After multiple years of use, some teams assume that the AT that was determined to be the best fit at the beginning still remains the best fit. By continuing to involve the student in evaluating the benefits of the AT that is available throughout the school day, the student has the opportunity to advocate for the selection of tools that best meets their needs.
- **Adjust the school culture.** An educational culture that celebrates uniqueness, embraces the use of technology, and encourages problem-solving is going to be more open to students learning in unique ways. This includes the use of assistive technology.
- **Make the assistive technology available across the environment.** Ensure that whenever possible, the AT that a student uses to access their educational environment is available wherever the student would naturally be learning. When the student must leave the classroom or their peer group in order to use their assistive technology, they are more likely to feel self-conscious and communicate this through their behaviors, which educators may interpret as undesirable or “disruptive.”
- **Have a “Plan B.”** All technology sometimes fails. When this happens, a student may suddenly be unable to accomplish tasks they previously had been able to with their AT. This can result in the student struggling, feeling overwhelmed, embarrassed, or feeling self-conscious. Have a plan in place for alternative AT use, or an altogether different way of doing the task if something goes wrong.

the best opportunity to create systems of support that ensure students feel confident in using assistive technology both in the classroom and as they leave our schools to become lifelong learners and successful adults. ■

Clearly, behavior and assistive technology intersect in our schools. By considering behavior as communication and looking deeper at why the student behaves in a specific way, we can begin to understand what that student is communicating through their behavior. In some instances, this behavior may lead a team to consider assistive technology for a student. In other instances, it may give a team one clue that existing assistive technology no longer meets the student's needs; or it may provide clues that the environment is not supporting the use of assistive technology. Regardless, the ongoing consideration of student communication, both directly and through behavior, will provide teams



product spotlight

Abram's Nation – The Safety Sleeper



The Safety Sleeper® is a medical enclosed safety bed designed with love and care for children and adults with special needs who can benefit from a secure sleeping space. The enclosed design prevents users from wandering at night and keeps them safe.



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- Portable for travel so users can feel at home in any location
- Has a variety of safety features so the family can rest easy
- Built from durable materials and enhanced joints to stand up against heavy use and play
- Fully enclosed bed designed for children and adults with special needs who need extra safety at night or to prevent unattended wandering



300 Model – The Safety Sleeper® Canopy Bed for Children & Adults

- Left side entry
- End of bed entry
- Access points for medical tubing or wires
- Custom built to fit the needs of every user
- Portable for travel so users can feel at home in any location
- Has a variety of safety features so the family can rest easy
- Built from durable materials and enhanced joints to stand up against heavy use and play
- Fully enclosed to provide security and prevent unattended wandering



400 Model – The Safety Sleeper® Lift-Compatible Child Medical Bed

- One side or both side entries
- Option for complete center opening
- Designed for individuals who use a bed lift or hoist
- Access points for medical tubing or wires
- Custom built to fit the needs of every user
- Portable for travel so users can feel at home in any location
- Has a variety of safety features so the family can rest easy
- Built from durable materials and enhanced joints to stand up against heavy use and play

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Sensee

SENSEE started with the question – “Why isn’t there any braille book that everyone enjoys together?”

Enjoy Together

Sensee has been trying to build a world where the sighted and the visually impaired could see and enjoy together. And dare to solve the fundamental problems that the visually impaired faces.

SENSEE is teamed up with people who are visually impaired or who have visually impaired in their family to build a better world where everybody enjoys together.

SENSEE supplies educational products and Braille books to meet the various degrees and experiences of the visually impaired, and SENSEE Braille books provide content that everyone can enjoy together by expressing Braille, texts, and images in one page.



Braille Book - Books for Everyone

Visually impaired who reads braille and Sighted who reads letters



Coloring Book - Feel the images, Enjoy drawing

Learn the shapes of objects and animals by touch. Expand the imagination and feel the joy of drawing. Support the learning process of the blind children.



Education Tool - Education to beginners

Learning Alphabet and Numbers. Braille, the most important language for the visually impaired is now easy to learn and even enjoyable.

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