Eye Gaze Technology for Emergent Communicators

Learning Outcomes

- Identify two AAC language options or communication page sets that can be used with eye tracking technology
- State two communication partner strategies for successful communication using gaze interaction technology
- Identify three key technical features that make eye tracking technology successful for emergent communicators

Eye Tracking

Eye tracking is a combination of hardware and computer programming that is used to see where a person is looking on a computer screen. Eye tracking technology can be used to empower our users to communicate a in a new and exciting way.

Typical Eye Movements

In order to better understand eye tracking technology, we first must understand the quick and complex process of typical eye movement patterns. Eye movements are typically divided into fixations and saccades. A series of fixations and saccades is known as the scan path in which our eyes move around the environment to take in and process information visually.

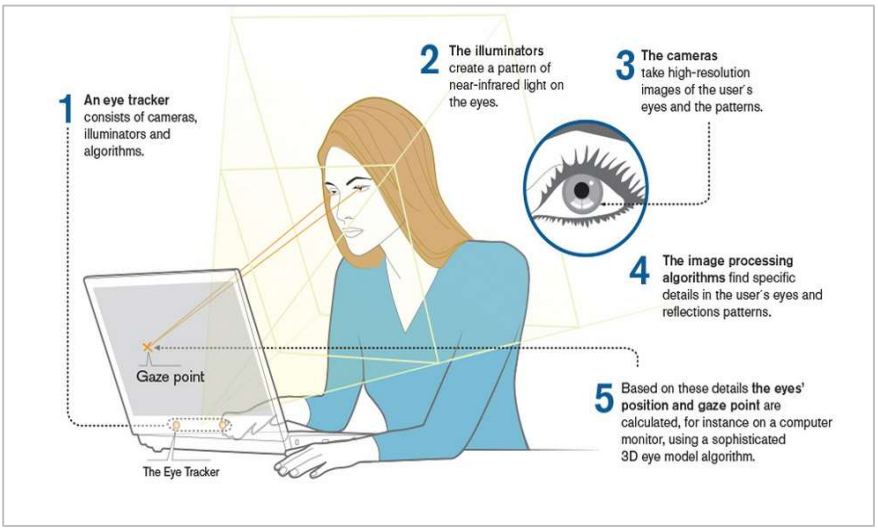
- **Fixation** – when the eye gaze pauses to absorb information
- **Saccades** – fast jumps that connect the fixations

Tobii Dyanvox Eye Tracker

Eye tracking requires an eye tracker which consists of cameras, illuminators, and programmed algorithms within the processing chip to create a 3D model of the eye which determines the eyes' position and gaze point.

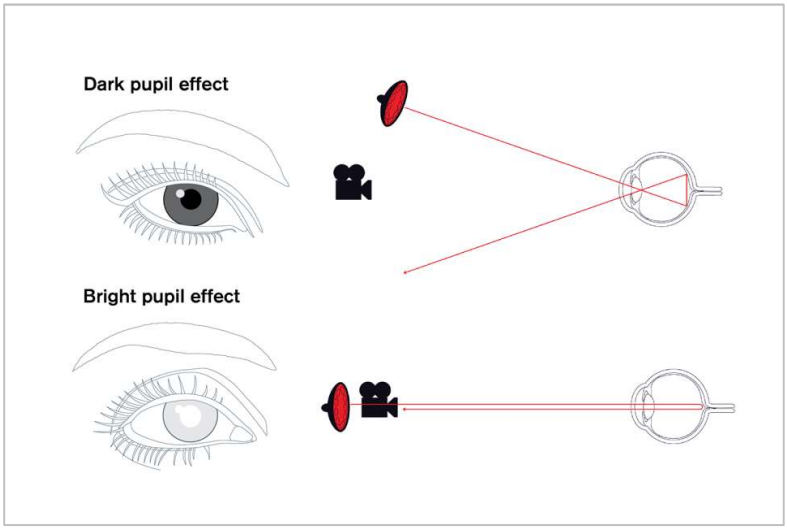
- **Illuminators** – infrared lights that point toward the eye that create glints of light on your pupil or iris depending on where your eyes are looking
- **Cameras** – gathers information, image and reflections of the eye

- **Processing Chip** – embedded eye tracking algorithms that are used to process the details of the user's eyes and reflection patterns



Tobii Dyanvox eye trackers utilize both dark pupil and bright pupil tracking techniques which is unique to Tobii Dynavox. Using both dark and bright pupil effects when utilizing eye tracking allows for the cameras to collect more data for improved accuracy.

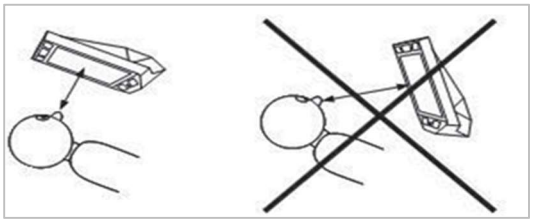
- **Dark Pupil Effect** - when the camera and light source are in different locations. Using this technique allows the camera to gather different information based on how the light is reflected on the eyes.
- **Bright Pupil Effect** – when the camera and the light sources are placed in the same location. The light sources using this effect bounce back from the eyes directly into the cameras. Using this technique provides the camera with information that is different than dark pupil effect.

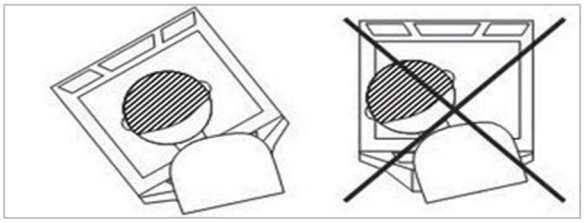


Introducing Eye Tracking

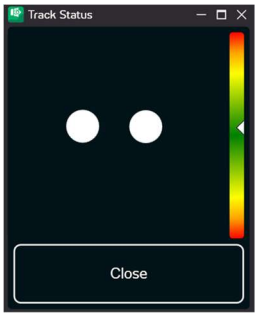
To set up an eye gaze user for success, remember these three components

1. **Positioning** – This is the most important step for setting up an eye gaze user! Move the device to meet the needs of the user in their most comfortable or natural position. The user's head should be parallel to the device.

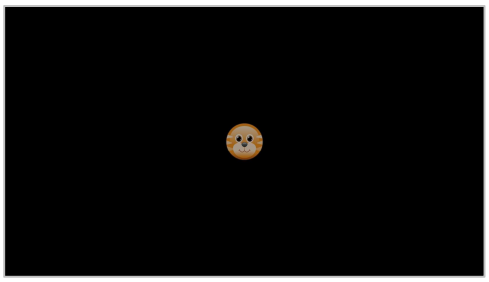


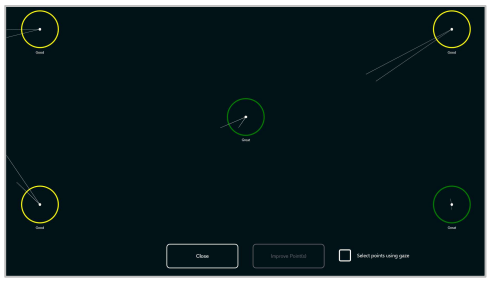


2. **Track Status Box** – An on-screen visual that allows the user and partner to see what the camera sees. Use the track status box to check positioning to ensure both eyes are visible and centered. Use the color spectrum and arrow to position the user at a consistent distance across environments.



3. **Calibration** – This process collects more detailed information regarding what the eyes look like, where the eyes are looking, and how the eyes move. Calibration is not always needed when eye tracking is first introduced, however calibration should be complete if you notice flickering of the eyes within the track status box, your patient is ready to select items on the screen or requires more precise movement (i.e.: when using a keyboard). To meet the needs of the individual, calibration can be customized by changing the number of calibration points, the stimuli used during the process or the facilitator can opt to use the step through process rather than the automatic progression of calibration points.





Note: *Calibration results may look different depending on the hardware and software*

Teaching Access Skills

Using eye gaze to access a computer or communication software requires the user to fixate on items on the screen for an extended period of time, which contradicts the typical eye movement patterns we discussed earlier. We need to give our users time to learn the access method before we introduce any language or expect our user to follow specific demands. Therefore remember

- Expect eye control to take time
- Focus on the individual needs
- Create moments of self-exploration
- Limit frustration with no fail activities

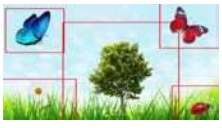
Possible Goals	Page Set Options
Demonstrates intent to communicate with a partner such as selecting single button message in a joint action routine (e.g., request repetition of preferred activity or item).	• Select 1 out of 2 • Select 1 out of 3 / Add favorite things
Demonstrates joint attention toward an object with partner.	• Farm Animal book • My favorite things book
Engages in turn-taking for one communication exchange (can include gestures, pointing, facial expression, eye movement).	• Matching games • Jigsaw Puzzles
Demonstrates joint attention toward an object with partner.	• Video activities • Music player

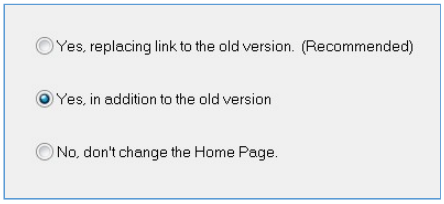
At this level our goal is to create moments where the AAC Communicator can engage in activities that create opportunities for joint attention, intentional sharing, and fun engaging routines. Communicator 5 provides you many activities, however it can be motivating to personalize an activity. By using an existing page set as a template, we can create motivating activities to more quickly engage that individual who is using AAC.

Let's Explore Personalizing a Pageset!

Let's begin by editing the "What is in my Garden" page set.

- We are going to use the "***What is in My Garden"*** page set as a template and create ***"This is My Family"*** page set.
- By using the Edit Button Tool, we can quickly change the content of this page set.

Open Page set • Add "what's in my garden" to your home page • Find it in the SCENES tab and add to home page.	
Unhide each item by selecting each blue circle • Open Page Set • You will see the different items in the garden	
Open Quick Menu • Select Edit button • All buttons, that are possible to edit, will be framed in red. • Select the button to change. (Select the blue butterfly)	

The Edit button Tool will open • In this activity we will only use the Text and Image Tab • Add an image of the primary caregiver • To take a Photo, select the (Take Photo) button • To search for an Image, select the (Browse Images) button. • To support literacy awareness, I am going to add Button Text • Once you are done, select OK	
Open Quick Menu • Select Edit Button • Select the button to change. (Select the orange butterfly) • Add an image of another important caregiver • Use the Take a Photo or Browse Images button.	
Complete the Customization for different family members • I added the image of my communicator right in the middle. (the tree picture) • Remember pets and everyone important for that communicator.	
Once you are finished customizing each image • Open Quick Menu • Choose Save As • Title new page set “This is my Family” and Save	 ***Save As***
Last Step and it’s important! • Choose “Yes, in addition to the old version” • Now you will have both the original page set and the new pageset • From your Quick Menu go to your Home Page • Select This is My Family and have fun!!!	

Partner Strategies

- Think aloud
- Look for teachable moments
- Use the pause button
- Teach in natural context
- Use a prompting hierarchy
- Provide activity focused feedback
- Repeat activities
- Balance motor and cognitive demands

Tobii Dynavox Eye Gaze Pathway

The pathway was designed to help develop skills for using eye gaze to communicate and learn. The pathway provides six steps: Screen Engagement, Responding, Exploring, Targeting, Choosing, and Full Control.

www.tobiidynavox.com/en-US/eye-gaze-pathway

Independent Living Centre WA – Unlocking Abilities Project

An online resource that provides a series of handouts to assist with introducing touch, switch, and eye gaze access methods.

http://ilc.com.au/unlocking-abilities/

Next Steps

- ✓ Try screen engagement games
- ✓ Use eye gaze for 10 minutes straight
- ✓ Contact you Solutions Consultant
    - To schedule an evaluation if you have a patient who is ready for eye gaze
    - To schedule a trial or demo to see how eye gaze works firsthand
- ✓ Learn more about eye gaze
    - Visit https://www.tobiidynavox.com/en-US/support-training/
        - Explore live and recorded webinar options
        - Explore the Learning Hub for ASHA approved on-demand trainings

Eye Gaze Technology and Emergent Literacy Skills

Literacy Development

The key components of literacy instruction include phonemic awareness, phonics, vocabulary, fluency, comprehension, and writing. Addressing each of these areas is the evidenced-based approach that supports literacy skill development for all levels of learners.

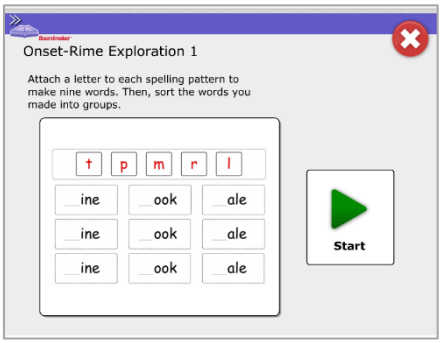
Literacy Development and Eye Gaze Users

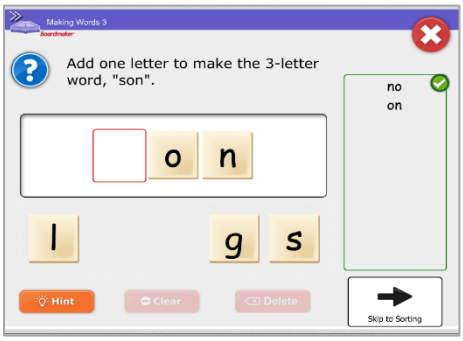
Learning is an active process; a person must interact with and manipulate the materials that support learning to read. In order to develop foundational literacy skills, one must turn pages, manipulate letters, sounds, and words, and develop the means to write. Learners with significant physical disabilities present with barriers to this active learning process.

Reading Avenue

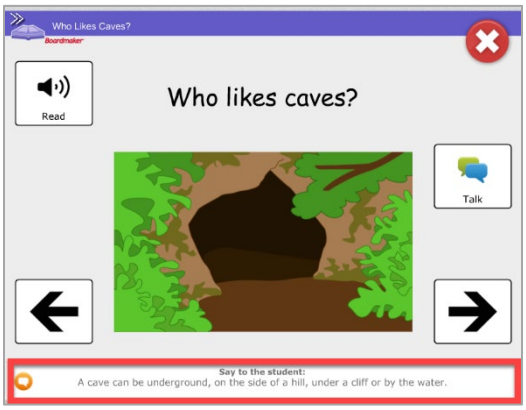
Reading Avenue is an evidence-based curriculum focused on emergent literacy skills. This curriculum provides 3 levels of instruction, allowing the instructor to match the learner to an appropriate level. It includes 120 books and over 1000 activities addressing the key components of literacy instruction. Reading Avenue is inclusive of learners with a range of physical, cognitive, and language impairments. All books and activities are accessible through eye gaze.

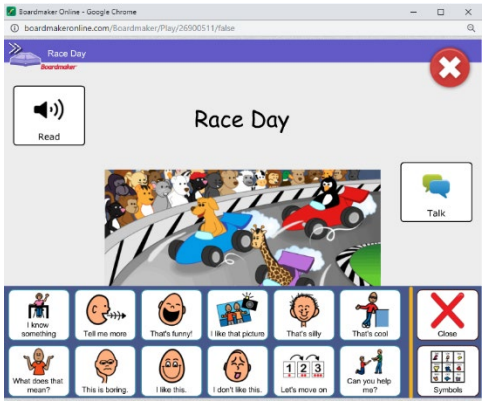
> Phonemic & Alphabet awareness – Engaging and varied activities allow for learners to manipulate letters and sounds to play with words.



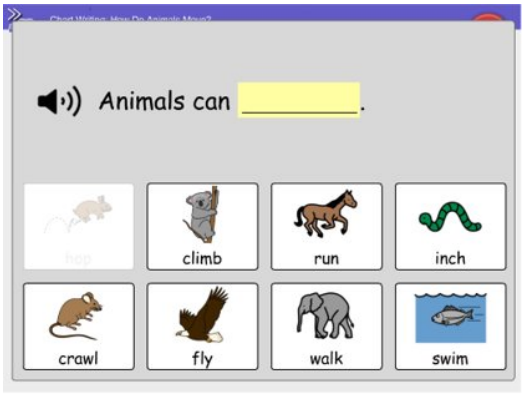


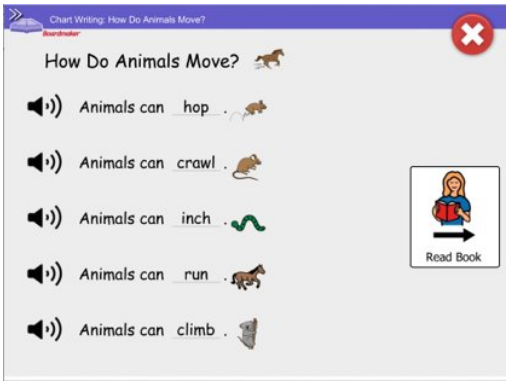
Shared & Independent Reading – Interactive books with built in activities and prompts for instructor as well as communication supports for the learner.

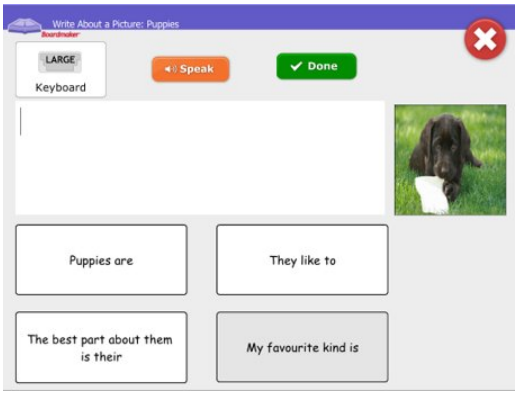




Shared & Independent Writing – Each writing activity has varied supports built in with predictive text and access to a keyboard to allow for creative spelling.







Accessing Reading Avenue

The full Reading Avenue curriculum is included with a Boardmaker Online subscription. This subscription also includes access to eye-gaze accessible templates, allowing the instructor to create their own content and activities.

www.boardmakeronline.com

The free Boardmaker Student Center App includes free samples of Reading Avenue books in addition to other eye gaze accessible games and activities. It is available for download to iPads, window devices, and Tobii Dynavox communication devices.