Speech Trek: The Next Generation!
What is ahead for the field from the perspective of technology and AAC?

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PowerPoint available at: https://tinyurl.com/ydxtb6dp

Disclosure Statement

Relevant financial relationship(s) and relevant nonfinancial relationship(s)

Financial: Dr. Satterfield is a research associate at GA Tools for Life. In the past he has conducted research for manufacturers in the AT and AAC field, but receives no compensation related to any of the products mentioned in this presentation.

Nonfinancial: Dr. Satterfield is a member of GSHA but receives no financial compensation from GSHA.

Learning Objectives

- Identify 3 trends in the current environment that will impact the practice of Speech Pathology and drive future developments.

- Describe 3 innovations that are currently in the field that will allow the field to serve individuals we have heretofore struggled to serve.

- Identify 3 innovations on the horizon to watch which could affect my practice.

- Identify 3 changes to my practice as a result of these trends and innovations that I will begin to work on following this conference.
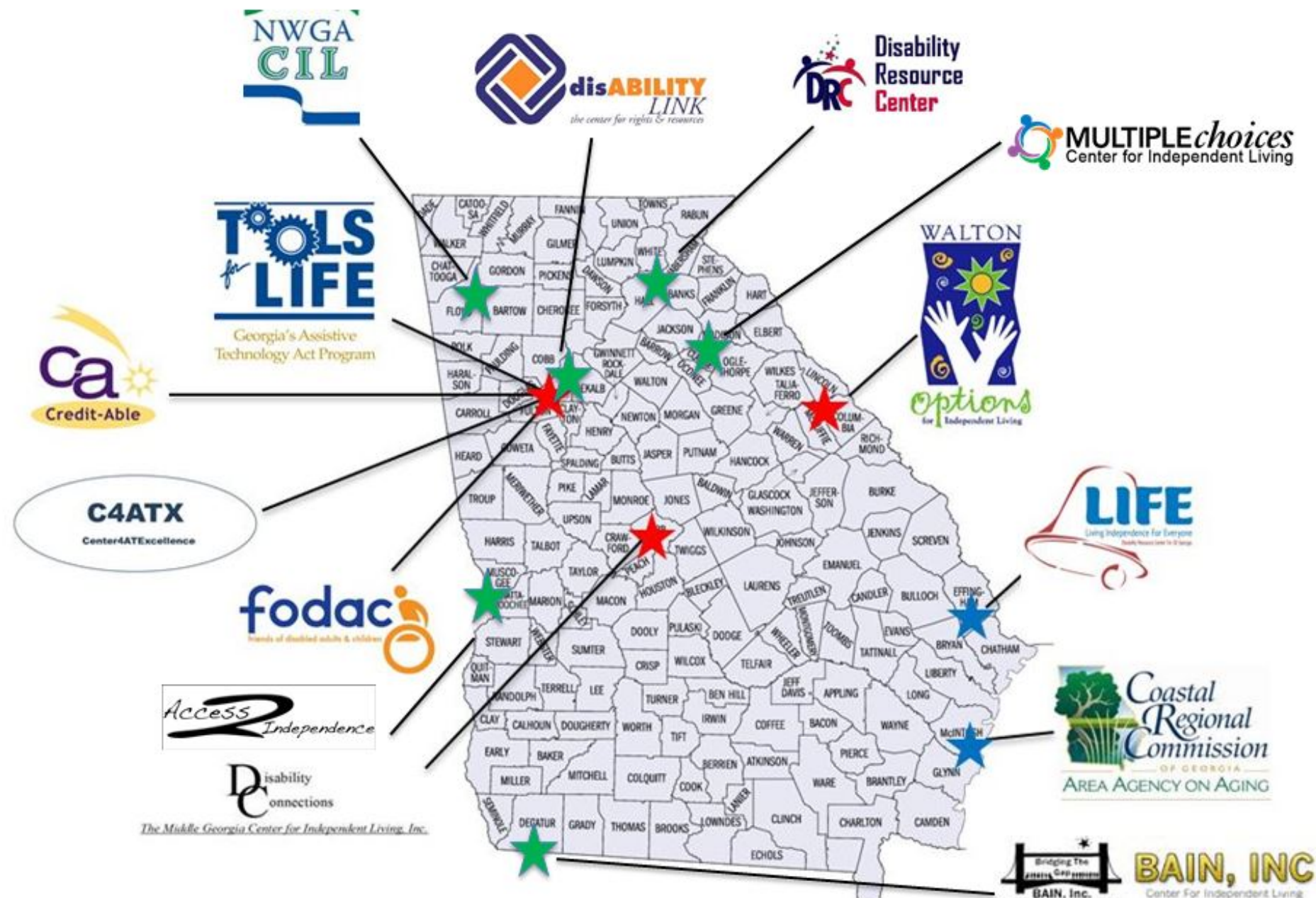
Agenda

- Overview of Georgia Tools for Life
- What is AAC? Who Uses AAC?
- How is communication in 21st Century changing?
- What is a disruptive innovation?
- Innovation and changes on the horizon:
  - Changes to Practice
  - Changes to Access to Technology
  - Changes in How We Think About AAC
- Implications:
  - For clients
  - For practice
- Addendum slides

Tools for Life Mission

We're here to help Georgians with disabilities gain access to and the acquisition of assistive technology devices and assistive technology services so they can live, learn, work, and play independently in the communities of their choice.

Visit us online!

Who Uses AAC?

- Approximately 4 million persons in the United States do not have speech skills to meet their communication needs on a daily basis.

- Light et al., *New AAC Technologies to Enhance Communication and Participation*, NIDILRR 40th Anniversary Celebration, DC, October 18, 2018

AAC users generally fall into one of three functional skills levels:

- Emergent
- Context Dependent
- Independent

Based upon work of Patricia Dowden from Univ. Washington:

http://depts.washington.edu/augcomm/03_cimodel/commind1_intro.htm

What Is AAC?

- Augmentative & Alternative Communication (AAC)
  - ASHA describes AAC as an area of clinical practice that attempts to compensate (either temporarily or permanently) for the impairment and disability patterns of individuals with severe expressive communication disorders including speech-language and writing.

  - Should include individual's full communication abilities: existing speech & vocalizations, gestures, manual signs, communication boards, and speech output devices, etc…

Sevcik & Romski (2010)

What is AAC? (2)

- **Symbols**
- **Aids**
- **Techniques**
- **Strategies**

- ASHA, (1991)
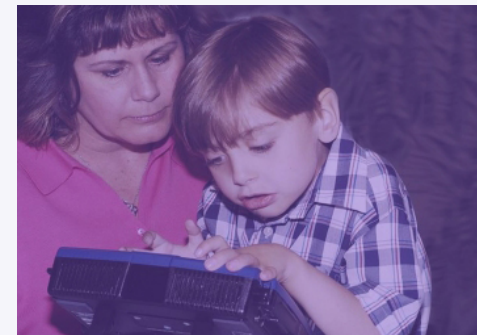
What Is AAC? (3)

Historically, that has meant:

- Costly devices – often customized
- Outside payees: Insurance, Medicaid, Schools
- Formal evaluations
- Approvals required
- Slow Process

How we communicate is changing

- 21st century communication is different
  - Talk more at a distance
  - Showing pictures ~ Telling with AAC?
  - Cell phone cameras, Facebook, text messaging
- We live in a language-based world
  - Language is changing
  - Leveling of the playing field?

Changes go beyond hardware and software

Needs of people with CCN

Changes in social networks

Changes in technology

Changes in definition of communication
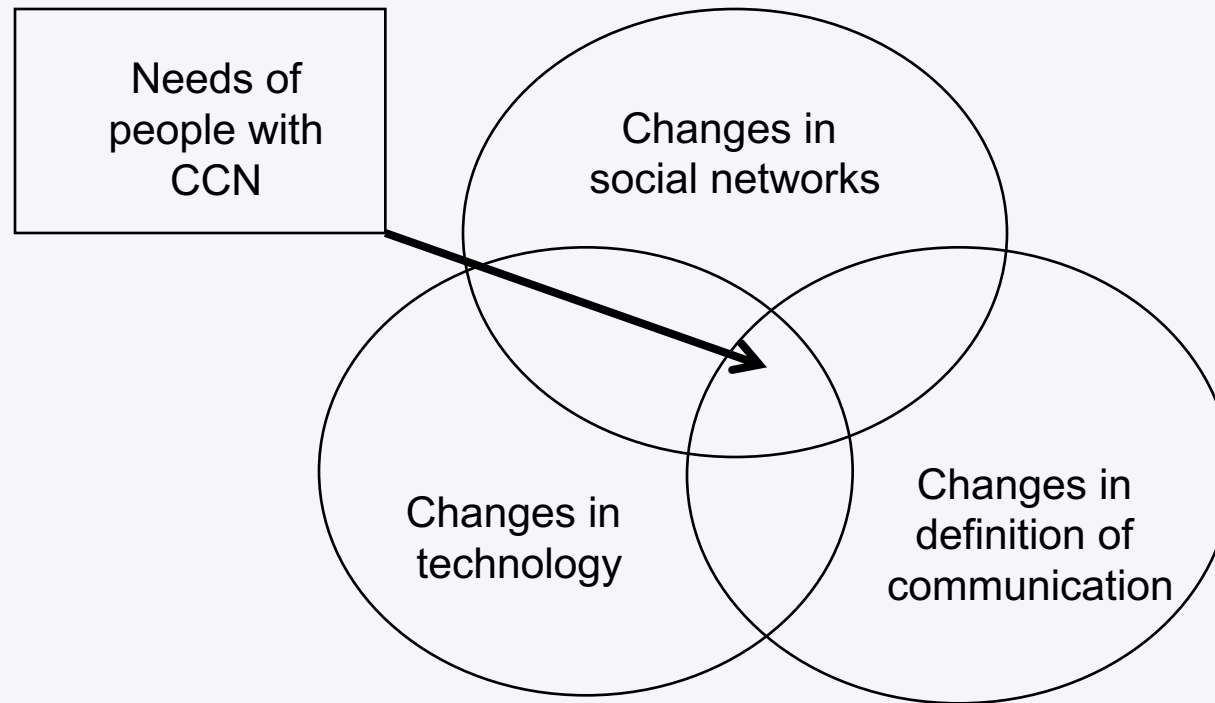
AAC-RERC (2012)

Within a communication culture of change

AAC mobile computing

Typical communication

Typical use of pictures (symbols & photos)

Typical language use and form
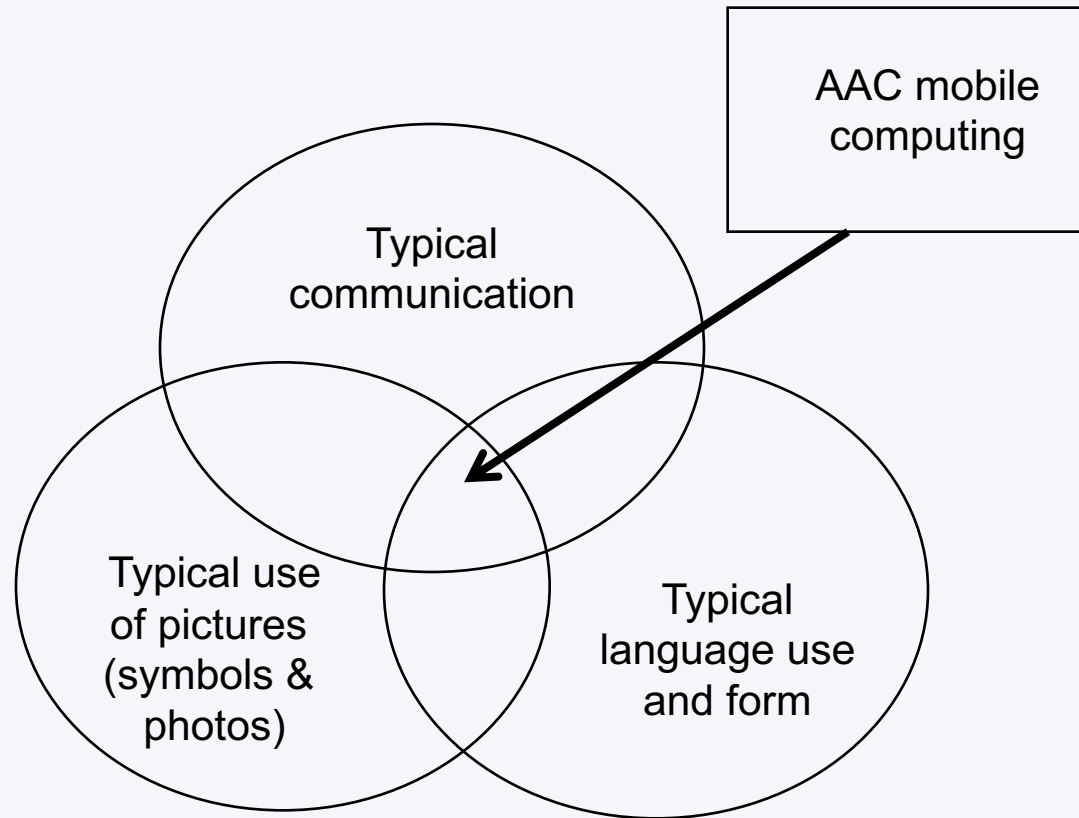
AAC-RERC (2012)

Impact of Apps & Tablets

With the introduction of Apps, we are experiencing a drastic technology evolution that is revolutionizing the field of Assistive Technology and producing positive life changing results for individuals with disabilities.

Apps are assisting students by promoting more independence, increasing opportunities for inclusion, promoting depth of learning, providing equal access in educational settings and supporting smoother transitions.

Disruptive Innovation: ProloQuo2Go

Release of ProloQuo2Go

- 2009

- worked on iPad and iPod

- highly customizable features

- natural sounding voices

- Under $200

- Consumer market platform

- Challenge for AAC manufacturers

Innovation: What is Next?

- Changes to Practice
- Changes to Access to Technology
- Changes in How We Think About AAC

Changes to Practice

Changes to Practice

- Telepractice: Delivery of services via the cloud

- Personal Digitized Voices
  - Message banking
  - VocalID

Addended slides

- Impact of "the Cloud" on AAC

Telepractice

- The "delivery of speech language pathology ...services at a distance by linking clinician to client/patient or clinician to clinician for assessment, intervention, and/or consultation."

- http://www.asha.org/Practice-Portal/Professional-Issues/Telepractice/

- Crutchley, S. & Michael Campbell, M. (2010) TeleSpeech Therapy Pilot Project: Stakeholder Satisfaction, *International Journal of Telerehabilitation* Vol. 2, No. 1 Spring 2010

- Lyn R. Tindall, L.R. & Huebner (2009) The Impact of an Application of Telerehabilitation Technology on Caregiver Burden, *International Journal of Telerehabilitation*, Vol. 1, No. 1 Fall 2009

Telepractice (2)

Synchronous (client/patient interactive)

- interactive audio and video in real time
- Simulate person-to-person interaction as in typical therapy
- Facilitate group interactions (clients, clinicans)

Asynchronous (store and forward).

- Information and activities are stored for later access by client/patient
- Patient/client provides response (voice clips, other outcomes) which is captured for evaluation by SLP.

Telepractice (3)

Hybrid forms

- Combine face-to-face therapy with synchronous and asynchronous

Benefits of Telepractice

- Capacity to serve underserved regions of our state
- Serve medically fragile clients/patients
- Minimize travel for clients and practitioners
- Clients have access to therapists who specialize in their area of need

Telepractice (4)

ASHA cautions that care should be taken to:

- verify state licensure and payer definitions to ensure that a particular type of service delivery is consistent with regulation and payment policies. (For Georgia: http://www.asha.org/Advocacy/state/State-Telepractice-Requirements/?_ga=1.148523447.1647149032.1459467615)

- Adherence to the Code of Ethics, Scope of Practice in Audiology and Scope of Practice in Speech-Language Pathology, state and federal laws (e.g., licensure, HIPAA), and ASHA policy.

Message Banking

Message Banking (mytobii-dynavox.com):

- A free and open message bank for people at risk of losing their voice.

- a way for individuals, like those with ALS, to preserve their voice and maintain a personalized connection with family and friends.

- a free and open message bank for people at risk of losing their voice,

- Cloud based

- The system guides people through the message banking process.

- It helps organize, store, and download messages for use on any system that can replay them.

Personalized Digital Voices

VocalID

- Voice = Identity
- AAC users limited to a small number of voices that "come in the box"
- Goal: to humanize the voice inside any machine that speaks

Solutions

- Voice Banking
- Creation of personalized digital voices

Jamie Dupree 2.0

- WSB-Atlanta (Cox Media) reporter lost his ability to speak (tongue protrusion dystonia) effectively.

- Scottish company named CereProc
  - agreed to sift through years of his archived audio and build a voice
  - paired with a text-to-speech application
  - sounds like Jamie
  - got him back on the radio.

Changes in Access to Technology

Access is changing

• Traditional Forms of Access

• Design: Form + Function

• Brain Computer Interface

Addendum Slides

    • Eye-Gaze Everywhere

    • EMG- Electromyography

    • EEG – Thought Access

    • Tactile Communication

Traditional Forms of Access

Direct Selection

- Touch

- Keyguard

- EyeGaze

- Mouse emulator

  - Head pointing

  - Joystick

- Morse Code

Indirect Selection

- Switch

  - Automatic single switch scanning

  - Dual Switch Scanning

Design: Form + Function

GlassOuse digital glasses,

- Employs Bluetooth to operate computers, phones and televisions

- Emerging design of accessible products in a ways that are functional and pleasing to the eye.

Brain Computer Interface

Brain Computer Interface (BCI)

- Measures brainwave activity
- Interprets signal
- PC Translates into action

AAC Solutions

- ALS
- CP (older individuals)
- Others

BCI SYSTEM

SIGNAL ACQUISITION → Digitized signal → **SIGNAL PROCESSING**: Feature extraction → Translation algorithm

Neuroprosthesis control

P300 Speller control

Neurogame control
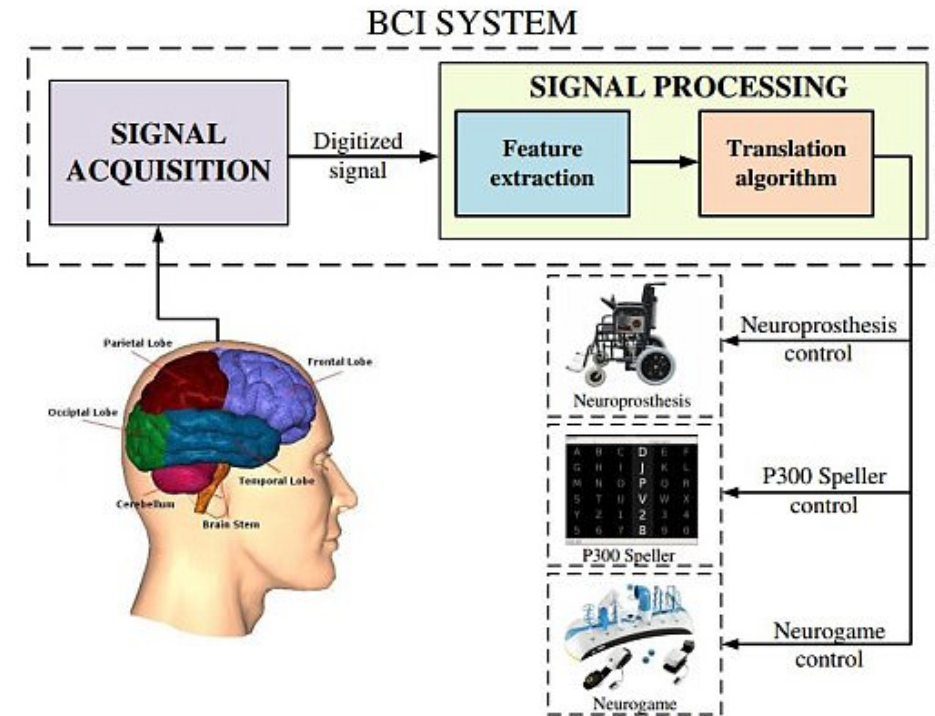
Fig. 1. High-level block diagram of a typical brain-computer interface.

© University of Washington

Brain Computer Interface (2)

P300 (P3) Wave – "Ahah" signal

- Brain emits a signal (1/300 ms) after spotting desired item
- PC can present options (as in scanning)
- Signal is emitted when desired item is presented
- PC Translates signal into action

Voluntary Contraction Wave – "Swipe" signal

- User intentionally moves (thinks about) muscles associated with a task.

- Brain waves are scanned until pattern for movement is recognized/established.

- Then wave is detecded when desired movement is presented (thought).

- PC Translates signal into action
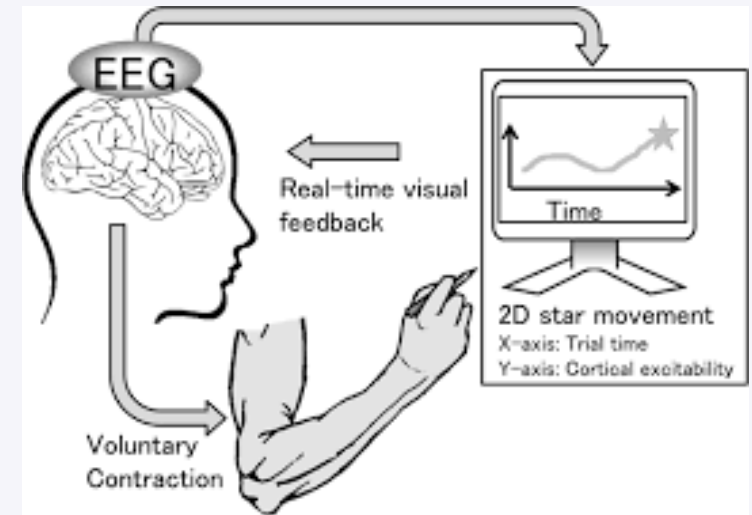
Brain Computer Interface (4)

Pattern: "Flicker" signal

- PC will present multiple flickering patterns on screen.

- Brain (eye) will sync with one specific flicker rate.

- PC can detect brain flicker rate as brain syncs with a particular pattern.

- PC Translates signal into action (i.e. cursor movement)
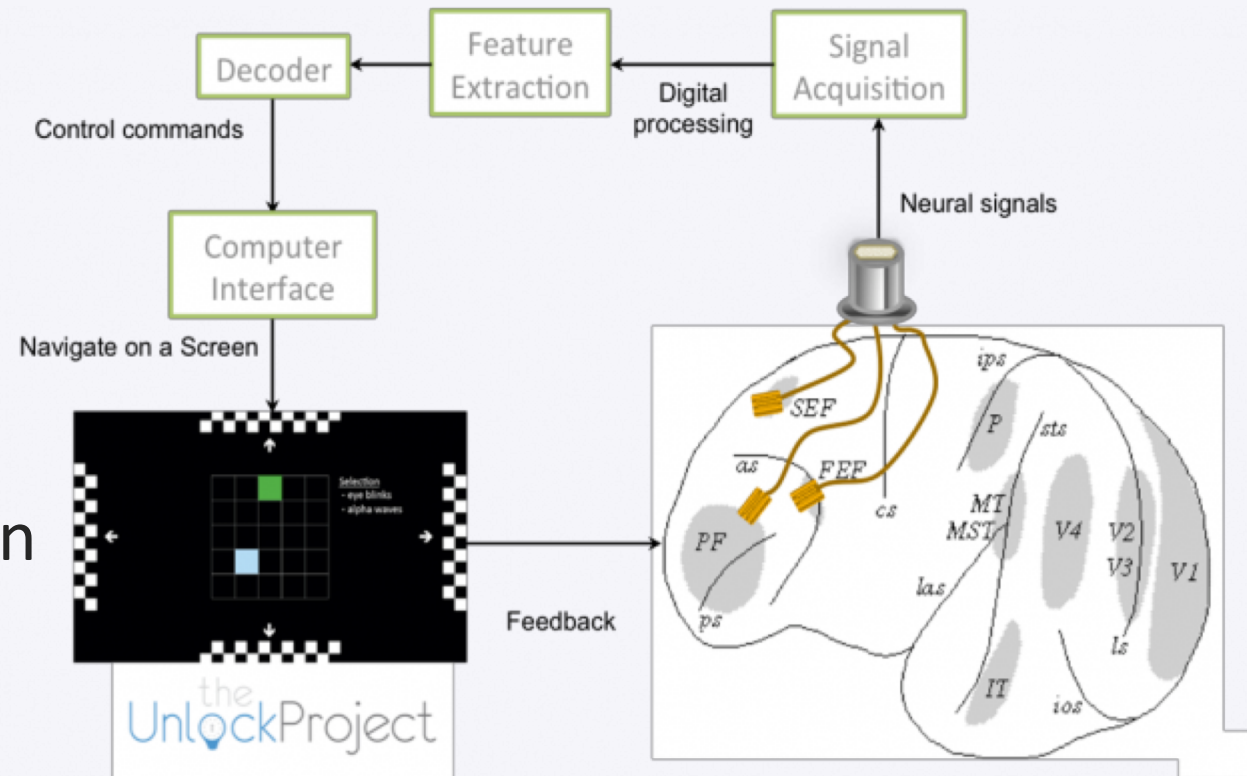
Engagement $E = \beta/(\alpha + \theta)$

- Support maintenance of attention in the classroom

- Nataliya Kosmyna (MIT)

- Uncomplicated headgear (covers forehead and goes behind ears)

- Scarf worn around neck that provides light stimulus (vibration) when focus is lost.

PCEye Mini (Tobii-Dynavox)

- Computer access through gaze interacti... PCEye Mini comes with the Windows Control Software.

- The Tobii Dynavox PCEye Mini is the sma... and most robust eye tracker.

- It replaces the standard keyboard and mouse, allowing you to navigate and co... your laptop or small screen desktop computer using only your eyes.

- The Windows Control software is included in the package.

- **Personal Independence**
- **Environmental Control**
- **Social Networking**
- **Artistic Expression**
- **Ergonomic Access**
- **Independent Recreation**
- **...and AAC**

MyGaze

- Plug & Play – no training & support required
- No-fail calibration: Intuitive "glasses" positioning
- Works like a mouse with most software

EMG- Electromyography

- NeuroNode is the world's first wearable EMG assistive technology device.

- It gives those with ALS/MND, spinal cord injury, or any other condition causing paralysis or loss of speech a connection to the world

EMG- Electromyography

- Bluetooth wireless connection

- Medical-grade, small, wireless sensor attaches directly to your skin

- Connects to any computer, iPad, tablet, or mobile device

- Compatible with iOS10, Android, and Windows operating systems

- Compatible with most popular assistive scanning software such as Apple Switch Control and Google Switch Access

- Uses the latest EMG sensing software developed by Control Bionics

EMG- Electromyography (2)

- Adjustable sensitivity according to individual user and fatigue levels
- Not affected by changes in lighting conditions
- Can be used with existing devices and operating systems
- Allows users to send emails, play games, access social media, text message, watch and download online entertainment, and even operate external devices, such as wheelchairs and TVs

Changes in Ways of Thinking About AAC

Ways we think of AAC are changing:

- Sign Glasses
- Robots and Communication
- Visual Screen Displays

Addendum Slides:

- More examples of Visual Screen Displays
- AI: Speech Prediction
- Data Logging

SignGlasses

- A group at Brigham Young University has turned Google Glass into a device that helps deaf students enjoy a planetarium.

- Gives deaf students a tiny ASL interpreter while watching the planetarium show.

Access Glasses

- Sony and movie theater chain Regal entertainment have been employing "Access Glasses" to provide deaf customers personalized captions while watching a movie.

- Like Glass, Access Glasses are a heads-up display, but this device covers both eyes for a wider display area.

CATS Lab

Center for Accessible Technology in Sign (CATS) at GA Tech. (http://cats.gatech.edu)

- SmartSign Augmented Reality

- SmartSign Library

- CATS Library

- When these tools are paired with Google Glass?

Robots and Communication

- Recent research has found that autistic children are more comfortable interacting with robots than humans, in part because robots are more predictable and can be controlled.

- Teaching social skills to children with autism requires frequent repetition

Milo

- Milo is a two-foot-tall humanoid robot, has proven to be very effective at reaching children with autism who have difficulty interacting with humans.

- Milo helps teach the understanding and meaning of emotions and expressions, and demonstrates appropriate social behavior and responses.
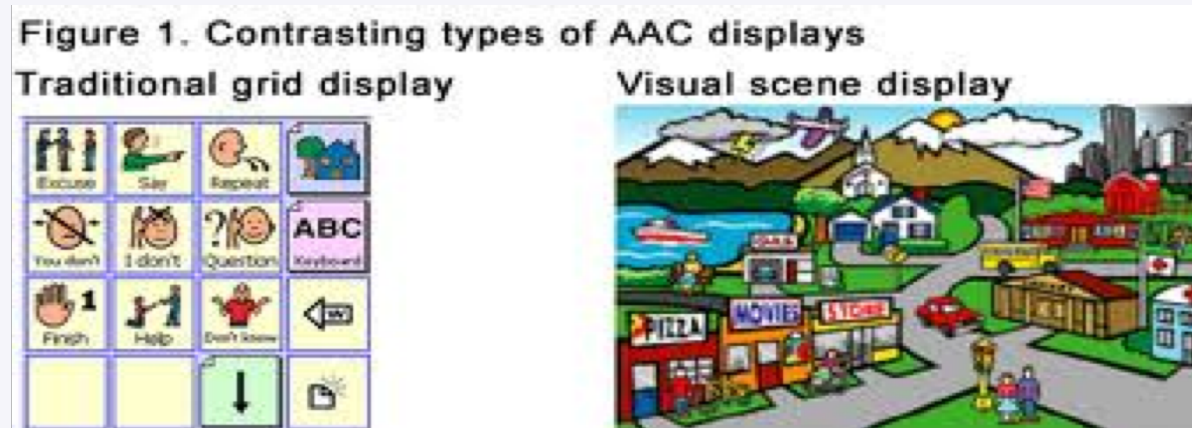
NAO

- Nao prompts the student, waits for the appropriate response, and provides a reward when the response is correct or, when the response is incorrect, encouragement and a clue.

- Nao responds to voice commands and tracks each child's performance.

Leka

- Co-developed with parents, therapists and caregivers to make therapy more accessible to children with autism, Down's syndrome, or multiple disabilities

- Features several educational activities tat foster independence and social skills

Research: Visual Screen Displays

- "A visual screen display (VSD) is a picture, photograph, or virtual environment that depicts and represents a situation, place or experience. Individual elements such as people, actions and objects appear within the visual scene." (Blackstone, 2004)

- VSDs enhance communication on:
  - low-tech boards
  - high-tech devices

Figure 1. Contrasting types of AAC displays
Traditional grid display   Visual scene display

- "(VSDs) are meant primarily to address the need of beginning communicators and individuals with significant cognitive and/or linguistic limitations. These groups are unserved or underserved by current AAC technologies. "(Blackstone, 2004)

- Experiential vs. syntactical approach to language
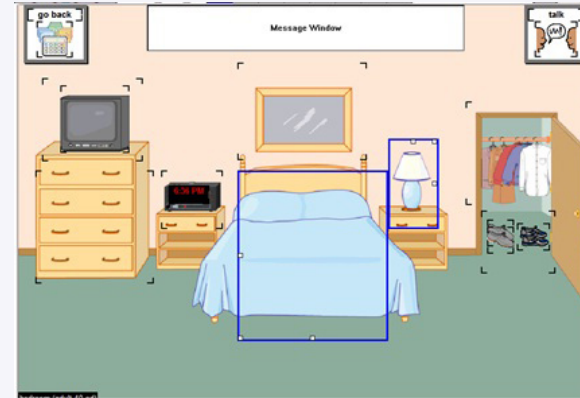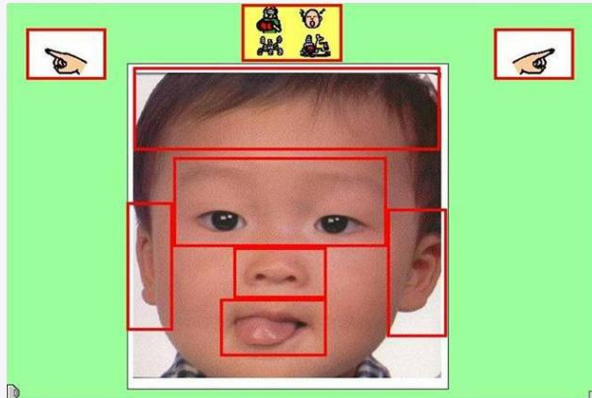
Blackstone, Sarah, (January, 2005) What are visual scene displays? AAC-RERC: Spread the Word, Vol.1 (2). Retrieved July 17, 2014 from http://www.imakenews.com/aac-rerc/e_article000344804.cfm?x=b11,0,w

Video VSDs

Videos with integrated VSDs –

1. Video prompting interventions support the learning of new skills by individuals with severe disabilities and

2. VSDs provide contextual support for communication within real-world contexts

3. Capture dynamic routines that support communication in real world settings

Babb, McNaughton, Light, Widner, & Pierce (2019). Increasing Independence with AAC Video Visual Scene Displays
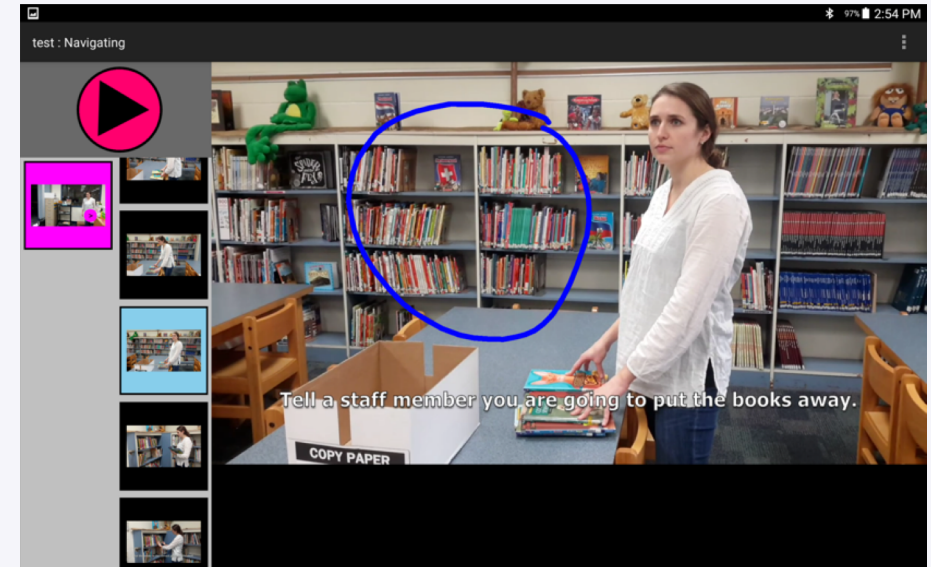
Video VSD Technologies currently available

Snap Scene

Supports the use of still VSDs
with embedded hotspots

Attainment Company's
GoVISUAL

What does the future look like to you?

"Objects in mirror are closer than they appear!"

Questions?

Continuing the Conversation

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Addended Slides

Changes in AAC Industry
- Proloquo2Go

Changes to Practice:
- Cloud based AAC

Changes to Access:

- EEG – Thought Access

- Tactile Communication

Changes in How We Think of AAC
- Examples of Visual Screen Displays
- AI: Speech Prediction

ProloQuo2Go

- Standard Version: Crescendo vocabulary available in 3 levels; basic, intermediate, advanced communication.

- Gateway to Language & Learning© core word vocabulary available as in app purchase

- Custom color coding on Crescendo and Fitzgerald Key color coding on Gateway

- SymbolStix symbols included

- Set up two languages for bilingual users.

- Customization options on device

- Scanning/switch accessible

- Backup and sync options via Dropbox

- Manual & help videos available

Cloud Based AAC

Locabularies:

- Location awareness
- phrases for your places
- Pages called up by GPS

TalkRocket Go

SuperSpeak

CoughDrop

- **open-source**

- **cloud-based**

- **runs on _ALL_ devices**

- **Make edits without taking away user's voice**

CoughDrop

- Simple AAC app that empowers individuals and the teams around them.

- Runs on multiple devices, so you can log in on your tablet, phone or computer and have access to the same communication tools and interface.

- Can be installed without being purchased, but a web site subscription ($200/ 5 yr license or $7/mo.) is required after the two-month trial period has ended.
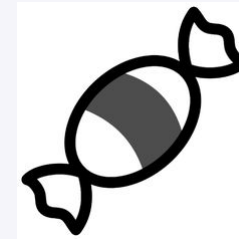
EEG – Thought Access

- Headsets sense the electrical activity inside a person's brain through electroencephalography (EEG)

- Wear a cap/headset with electrodes – touch surface of head.

- Electrodes measure signals produced by brain's neurons

Mind-Machine Interface (MMI)

- BrainWear –
- EMOTIV EPOC
- MUSE – VersaLogic
- NeuroSky MindWave
- Play Attention

EEG

- Used to control high-tech prosthetic limbs

- Control environment

- Play video games

- Bolluyt, J. (2015)What you need to know about mind controlled technology, retrieved from http://www.cheatsheet.com/technology/what-is-mind-controlled-technology-and-how-does-it-work.html/?a=viewall

Tactile Communication & AAC

When a individual has a visual impairment and additional disabilities, she may need to use alternative methods to communicate her thoughts and needs.

- using an actual object to convey meaning; for example, your child hands you a cup to let you know she is thirsty

- pointing to symbols, such as pictures or textures on a communication board or in a book

- activating a device which speaks for them

- Tactile symbols are most often developed specifically for an individual child.

- An actual object can be used as an object cue, such as a spoon to represent lunchtime.

- Part of an object can be used to represent the whole; for example, a small piece of chain might be used to represent going to the park

- Once a symbol system has been designed, it can be used in a variety of ways.
  - Comm board or book
  - Label for objects
  - Schedule box (represent activities in day)
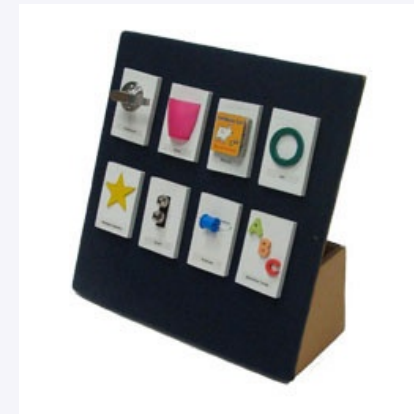
Tactile Communication Technology

ProxTalker

- uses RFID (radio frequency identification) technology to enable independent verbal picture communication

- place any photo, symbol, or object on a sound tag card and have a voice

- To trigger voice output place your sound tag card on any one of the 5 buttons and push

3D Printing: Tactile AAC

- 3D Tactile Graphics
  - Actual shape (to scale)
- Accessible Educational Materials (STEM)
- 3-D Tactile Graphics that talk?

AutisMate
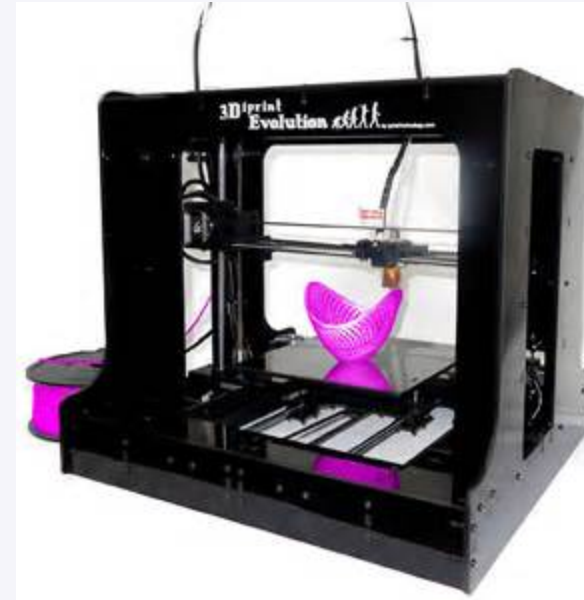
- A comprehensive communication and behavior tool, with Visual Scene Displays, choice boards and symbol-based grid AAC set. Other visual tools to support behavior and social skills are also included. It is designed for the iPad.

- Access to SymbolStix library, and easily add your own photos and videos.

- Video modeling, visual schedules, visual stories and other behavioral tools are included within the app.

- Personalization and customization is quick and easy.

- A LITE version is available to try the app out.

- Share all content via email from within the app.

Snap Scene

- Take a photo and tag it with recordings to let your child communicate on the fly.
- Natural and intuitive navigation between scenes – no training is required to use the program
- Tap on a hotspot and the word/phrase appears on the screen when spoken – this reinforces word meanings and literacy
- Runs on iPad and on Windows devices
- Available in 8 languages
- Recordings are in a familiar voice that's recognizable to your child.
- Free trial with access to 10 scenes

Scene & Heard

- Scene & Heard supports communication and learning through the use of Visual Scene Displays and is designed for iPad and iPod touch.

- Make scenes using your own photos, and also access Widgit symbols.

- Record your own voice messages for scenes.

- Switch Accessible

- Share your scene on Facebook or Twitter

- Link hotspots on page to photos and videos.

Speech Prediction: aacorn

- **aacorn** replaces the outdated grid of folders layout
- introduces a break-through design that is much easier to use and often leads to surprising outcomes!
- Through an innovative visual interface called the Word Tree™
- The child makes a word choice and branching pathways with smart suggestions for the next word in a sentence present themselves!
- By focusing on the relationships and connections between words **aacorn** is modelling language skills while reducing the need for 'hunting and pecking' for hidden single words.

Data Collection

- Language Activity Monitor (LAM) in all Speech Devices

- Now part of selected AAC apps

- Provides a LAM logfile represents the use or events associated with a given AAC device - the selections made by the user.

EXAMPLE:
01:20:10 "I"
01:20:20 "like"
01:20:22 "you"

Realize Language

Collect Data on an AAC Device → Upload Data to Realize Language Website → Create Easy-to-Use Reports and Analysis