Slide 1 -

Slide 2 - Title

I'm Nea Hanscomb. It's an honor to be invited to present my work at AVIOS this year, especially following the last esteemed presenter, Sara Basson from Google.

Slide 3 - Movie of Palmer playing iPad

I am the CEO and Founder of Appropo Software LLC. I'm also Palmer's mother. He's 15 and has severe autism and speech impairments. I like many other parents was told that if he didn't acquire speech by age 4 or 5, most likely he never would—pretty devastating.

Slide 4 - Sayin' it Sam Screen with Birds

Sayin' It Sam is an educational game app I'm producing for the iPad that uses speech recognition software. I patented the idea to use speech input to activate animations in a simple game to label colors. My intent is to provide motivation to children with autism and speech impairments to use their voices for fun.

Slide 5 - Autism Stats

Autism spectrum disorder or (ASD) is a group of developmental disabilities that can cause significant social, communication and behavioral challenges. Currently 1 of every 68 children in the U.S. has been diagnosed with ASD. 75% of those are speech delayed with 25% labeled "non-verbal"

Worldwide there are approximately 1,9 billion children so that means there are approximately 32 Million children with autism and speech impairments.

Slide 6- Disability Scoop

A study conducted last year at Penn State College of Medicine determined that 2/3d's of all children diagnosed with ASD also have apraxia and that there is a severe lack of screening for these children. This is such a tragedy.

Apraxia is a motor speech disorder. Children with apraxia have problems saying sounds, syllables, and words. This is not because of muscle weakness or paralysis. The brain has problems planning to move the body parts such as, lips, jaw, & tongue needed for speech.

Slide 7 - Group Therapy

Apraxia, being prevalent among "non-verbal" children with ASD is treatable. The American Speech and Hearing Association recommends treatment of a minimum of 3 hours of speech therapy per week for apraxia. Severe speech impairments require intensive treatment with frequent practice at school and at home. However, most kids don't receive a diagnosis of apraxia. That cat is kept in the bag by some districts who have limited resources to deliver adequate therapies for their students.

In San Francisco, the most amount of speech therapy a child can receive is 20 minutes per week and often if the parent can't hire a lawyer to demand more, it is not individualized but delivered in a group sessions.

Slide 8 - Current Tools

Because school budgets exclude intensive speech therapy, educators and therapists recommend teaching our kids to communicate using alternative and augmentative communication systems or AAC, which includes Picture Exchange Communication Systems or PECS, Sign Language and/or Speech Generating Devices.

Slide 9 - Sign Language

Briefly, Sign language is self explanatory.

Slide 10 - PECS

PECS involves handing a picture to a caregiver to get something.

Slide 11 - AAC

Traditional speech generating devices were heavy portable expensive computers with proprietary software that generate speech when you hit a series of icon buttons. Fortunately AAC software has been adapted to work on iPads, though the graphics and UI remain quite crude.

Slide 12 - Current Tools

These solutions have become the conventional economical choice especially if the parent pays for it. The most effective method to improve a child's speech would be to pair verbal speech with these systems. Unfortunately due to budget and time constraints of educators, this is rarely done.

Slide 13 - Cerebral Palsy

AAC devices were not originally designed for autism. They were developed for people with Cerebral Palsy and other forms of paralysis. There is nothing intrinsic about speech generating AAC devices to motivate speech in those who have it, but rather they help to obtain desired items or events after the correct icon button is pushed. There is no speech input elicited from the user of these devices or iPad apps to practice speech and articulation or to entice an utterance.

Slide 14 - Assistive Communication Technology

The effectiveness of AAC to improve speech in children with ASD and severe speech delays relies on additional therapies to achieve the best outcome.

Slide 15 - Age 5

I never accepted the heartbreaking message given to me that my son would not be able to speak. So I kept working with him and pushed his educators to teach him to verbalize. I met a lot of resistance and was kicked out of a couple schools because I advocated too hard for my son.

Slide 16 - Hopeful News

As It turned out, in 2013 researchers from the Kennedy Krieger Institute's Center for Autism and Related Disorders and John Hopkins University School of Medicine conducted a study involving 535 children, ages 8 to 17, with autism and severe speech delays and found that nearly half became fluent speakers. Amazing.

Slide 17 - My Son Loves his iPad

My son loves his iPad, as do most children, but children with autism in particular. I was astounded that with his lack of interest for most activities, how motivated he was by it. There is something about the reliable and consistent feedback from a computer that is so appealing to him.

I thought if there was a speech activated app that would require him to use his voice, he might be motivated to speak for fun independently, but I could not find one. SR has been used for several years to assist the learning disabled to learn to read and write. This is accomplished using "Speech to Text" or "Text to Speech" software. But to date, there is no technology principally intended to motivate speech. Sayin' It Sam™ is addressing an area of need that is missing from Speech Generating Devices and other AAC technologies.

Slide 18 - Technology Motivates

The iPad has proven to be highly motivating to children with ASD and can supplement the existing tool sets in both an assistive and recreational way. When they touch a button or image on the screen, it reacts in a clear consistent and predictable manner unlike the way people deliver information with varying intonation, speed and volume.

This technological application of Sayin' It Sam will provide a therapeutic and recreational tool to motivate and elicit speech from the population of children with autism and speech impairments and will show the potential of utilizing Speech Recognition in Augmentative and Alternative Communication devices and software.

These apps will appeal to early language learners from ages 2 to 5 as well and could be translated to other languages.

Slide 19 - "Speech to Action"

I have implemented SR in a novel way to produce animations from speech; which I coined and patented as "Speech to Action" to engage the users with highly motivating mobile technology. The intent is to help shape the user's speech, rather than to have the SR Natural Language Processing reinforce the speaker's unintelligible utterances.

The key objective of Sayin' It Sam™ is to sustain the attention and interest of "non-verbal" or "emerging-verbal" players and to motivate them toward improved articulation.

The goal for the user is to label or make a close approximation of the color of a figure on screen which will react with an animation and sound effect. Sayin' It Sam™ will provide prompts, praise and reinforcement to engage users to verbally identify colors of figures on each screen.

Slide 20 - Sayin' it Sam Prototype

Here is a prototype I produced a year ago. It's currently being re-designed by Appster inc. to include the character Sam, improve the UI and add multi-player data tracking.

Future versions will have settings of three skill levels for pre-verbal, emerging verbal and more fluent speakers. Three different levels of criteria will be used to advance to new sets of animating objects and screens. Users will be helped to shape their utterances as the skill level advances and a caregiver can adjust level settings requiring closer approximations.

Slide 21 - Exceptions

Since Sayin' It Sam™ is relying on single word utterances, it is possible to control what responses will be recognized by modifying the code with specific phonetic spellings.

Sayin' It Sam™ is coded with DragonMobile SDK by Nuance. The SR code for Sayin' It Sam™ is modified to accept approximations of a limited vocabulary of labels for colors, numbers and words with several "exceptions" per utterance. The exceptions will be based on common speech patterns and errors of early language learners (phonological processing). For example; "red" is recognized if it is pronounced "wed", "wet" or "wed duh".

Slide 22 - iOS Platform

Sayin' It Sam™ will initially be published as a mobile device app on the iOS platform for iPads. These are the most popular devices being used by children with autism for recreation and increasingly for AAC use. iPads are much less expensive than traditional AAC speech generating devices, less stigmatizing, lighter weight and unlike AAC devices use a universal system software. iOS mobile devices are more universally accepted and understood and ideal for communication needs.

Slide 23 - Challenges

Challenges to the approach of Sayin' It Sam™ will be the necessity to teach the user to play the game with voice rather than touch. It will require close supervision and instruction which will be provided at the time the app is loaded from the App Store.

Ambient noise and speaker volume may also be issues with the game's performance. A strong internet connection will be required for optimum performance of the app.

A caregiver or educator will be required to load Sayin' It Sam™ from the App Store whereupon they will complete a brief survey about the player's name, age and severity of diagnosis if any. A privacy policy will state that recorded data will be non-identifiable and not be released or sold to any company or individual. Only aggregate results of the apps' data will be published.

Slide 24 - Colors, Numbers & Words

Sayin' It Sam™ has three patented themes; Colors, Numbers and Words. I will research the effectiveness of Colors edition to determine it's effectiveness before beginning further development.

Slide 25 - Game Analytics

Data that is collected from users on the back end will be analyzed with GameAnalytics to track player behavior and measure engagement and response of Sayin' It Sam's users. The data will be able to measure amount of time spent playing the game, number of correct responses and what levels have been reached.

Data will be taken from the player's initial game play and compared to the results at the end of the test period of one month.

Slide 26 - SR technology can help

Because I did not accept the message that my son would never learn to speak, I never gave up hope and pushed his educators to work with him. He now has several phrases and a growing vocabulary that has opened up his world. He can engage with others in a personal spontaneous way.

He can say he's hungry, wants water, wants a hug, wants to go home, needs to got to the bathroom—all pretty important information.

Slide 27 - Thank You

With 32 Million children world-wide having autism and speech delays, there is a huge need and market potential for technological innovation for this population that is woefully under-served.

Thank you very much.