

## Acknowledgements

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## Literacy

### Benefits of Literacy Skills

- Strongly associated with educational achievement
- Enhance employment opportunities (Nearly 90% of the jobs in the US require functional literacy skills)
- Facilitate personal expression & social relationships (e.g., texting, blogs, Facebook, Twitter)
- Allow access to enjoyable leisure pursuits (e.g., reading, accessing the Internet, using social media)
- Support the development of generative language and communicative competence for individuals who use AAC



## Literacy

**There are additional benefits for individuals with autism spectrum disorder (ASD) who have complex communication needs (CCN)**

### Literacy:

- Expands communication options significantly
- Increases perceptions of competence
- Increases self-esteem

**THE PROBLEM**

More than 90% of individuals with CCN enter adulthood without functional literacy skills (Foley & Wolter, 2010)

As a result, they are severely restricted in their participation in:

- Education
- Employment
- Healthcare
- Society

### Barriers to Literacy for Children with ASD and CCN

- While there are various barriers to literacy learning for children with ASD and CCN, one barrier is:
  - **Lack of AAC technologies that support the transition from graphic symbols to text**

### Barriers to Literacy for Children with ASD and CCN

- Children with ASD & CCN who are nonliterate typically use AAC systems/apps with picture symbols
  - The design of these systems/ apps does not support the transition to literacy

Text is displayed in message bar but displacement of text from picture does not support learning association.

Text is available above picture symbol but individuals do not attend to static text (Brown et al., 2015).

### Barriers to Literacy for Children with ASD and CCN

- Eventually, these children who use symbol-based AAC need to transition to an orthographically based system
  - Currently no AAC apps to support this transition from the use of graphic AAC symbols to the use of orthographic text

## A Solution

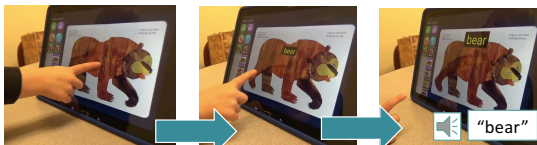
### Transition to Literacy (T2L) software feature

T2L provides dynamic presentation of text with speech output when a picture symbol is selected

- Child selects a picture symbol from AAC display
- Written word appears dynamically
- Written word is spoken by the app

### The app

- VSD T2L app developed by InvoTek (Jakobs)
- Incorporated into SnapScene by TobiiDynavox



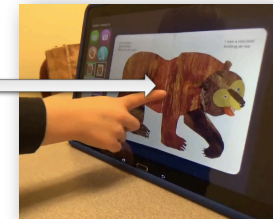
Conceptualized & developed by Light, McNaughton, Jakobs, & Hershberger (2014)

## Research-based design of T2L feature

Design of T2L feature is grounded in the state of the science in visual cognitive processing, literacy instruction, and instructional design (Light et al., 2014)

Individual selects graphic symbol from personalized AAC system

- Literacy learning is driven by the individual's interests & needs and utilizes personally relevant vocabulary, thus increasing motivation & engagement (Light & McNaughton, 2009)

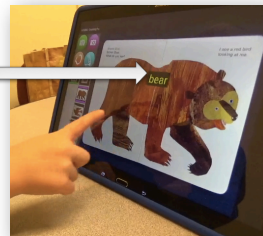


## Research-based design of T2L feature

Design of T2L feature is grounded in the state of the science in visual cognitive processing, literacy instruction, and instructional design (Light et al., 2014)

Text is dynamically presented on the screen

- Movement is strong attractor of visual attention, increasing learner's attention to the text (Wilkinson & Jagaroo, 2004)

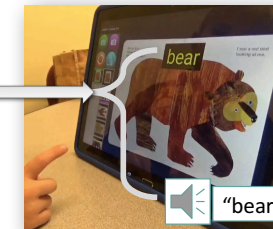


## Research-based design of T2L feature

Design of T2L feature is grounded in the state of the science in visual cognitive processing, literacy instruction, and instructional design (Light et al., 2014)


Text is paired with graphic symbol & speech output

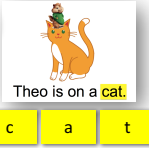
- Direct active pairing supports learning of association between written word & referent (picture symbol and/or spoken word) (e.g., Browder & Xin, 1998)




## A FIRST step

T2L apps are intended to **complement, not replace** literacy instruction.


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**The Current App**

- only supports sight word acquisition
- is a **first step** in T2L technologies that provides a transition from picture-based systems to literacy

Future research and developments are required to further support the **FULL** transition to literacy.


## The Study

What is the effect of the T2L app with dynamically displayed text on the acquisition, maintenance, and generalization of single word reading by pre-literate preschoolers with ASD?

### Participants

3 children diagnosed with Autism Spectrum Disorder

- 3-5 years old
- 3 Males
- All attended a LEAP preschool
  - Each classroom has 4 children with ASD and 8 children who are typically developing
- All were preliterate




## Design

Single-subject across participants multiple probe design  
 Phases: **baseline, intervention, generalization, and maintenance**


**1**

Baseline condition (prior to exposure to tablet technology)




**2**

Exposure to tablet technology with the AAC app




**3**

Generalization (to new photographs of target words not used in intervention)



**4**


Maintenance



### Dependent Variable


% accuracy reading single words (matching written word to picture)

**Materials**  
10 words from Brown Bear Book  
Images from Brown Bear Book



### Probes to Measure Dependent Variable

- Conducted at all 4 phases
- Participants were presented with four images (images from the Brown bear book)
- Participants were told to read the word and match the word to the correct picture.
- No confirmatory feedback was provided.




1 target sight word + 3 foils  
Randomized placement and order of the target words and foils.

### Intervention

During intervention, participants were exposed to the T2L VSD app.

**Brown bear book displayed on the app on Samsung Tablet**

- Dynamic text for each of the animals in the book
- Text appeared with speech output upon selection of the animal
- No other instruction during intervention



### Intervention Procedures

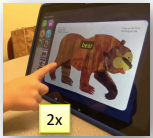

- Words were introduced in sets of 2 for a total of 5 sets
 

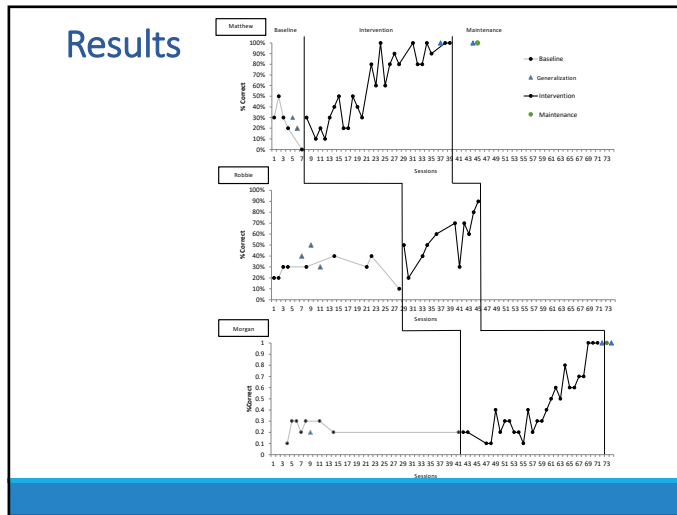
bear	cat
bird	dog
duck	sheep
horse	fish
frog	teacher
- Each participant began the intervention phase with introduction of the first pair of sight words
 

bear	cat
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- Once the first pair reached criterion, the 2<sup>nd</sup> pair was introduced
  - Criterion: 2/2 target words during two consecutive sessions

bird	dog
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### Each intervention session took approximately 5 minutes and included two "read throughs"

- 1<sup>st</sup> Read Through - participant activated the target sight words 2x  
For example:
  - Bear 2x
  - Cat 2x
 Participants also activated any previously acquired sight words during the first read through
 
- 2<sup>nd</sup> Read Through - participants returned **only** to the two target pages for an additional 3 activations/page  
For example, if the target sight words were bear and cat, they only returned to these pages.  
The other pages/sight words were not activated.
 



Pairs of words	Length of Exposure per word (# of sessions)		
	Matthew	Robbie	Morgan
Bear, cat	3 min 15 sec (13)	1 min (4)	4 min 30 sec (18)
Bird, dog	45 sec (3)	45 sec (3)	30 sec (2)
Duck, sheep	30 sec (2)	1 min (4)	45 sec (3)
Horse, fish	1 min (4)	1 min (4)	30 sec (2)
Frog, teacher	1 min (4)	1 min (4)	30 sec (2)

<p><b>Matthew</b> acquired 10 target sight words after 26 intervention sessions (2 hours, 10 minutes of intervention)</p>	<p><b>Robbie</b> acquired 9 target sight words after 11 intervention sessions (55 minutes of intervention)</p>	<p><b>Morgan</b> acquired 10 target sight words after 27 intervention sessions (2 hours, 15 minutes of intervention)</p>
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### Summary of preliminary results

Impact of T2L app on literacy learning for children with ASD

- Introduction of the T2L app resulted in successful acquisition of written words by 3 preschoolers with ASD
  - VSD T2L app
- The children acquired the written words successfully with only minimal exposure to the words via the app
- Remember that these are preliminary results and should be interpreted with caution

### The FIRST step

The T2L software feature is only a first step in promoting the transition from picture-based systems to literacy.

T2L apps are intended to complement, not replace literacy instruction.

- Future research and developments are required to further support the FULL transition to literacy.

Remember, T2L apps are not to replace literacy intervention. Evidence-based Literacy intervention is CRITICAL.

- As professionals, we must hold the beliefs and commitment to the right of all individuals to have the opportunity to learn & seek their full potential.

